J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC AUTONOMOUS)

Bhaskar Nagar, Yenkapally (V), Moinabad (M), Hyderabad – 500075, Telangana, India

Academic Regulations– JBIET - R20

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2020- 2021)

&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2021- 2022)

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

UGC AUTONOMOUS

ACADEMIC REGULATIONS R-20 FOR B. Tech (REGULAR)

(CHOICE BASED CREDIT SYSTEM)

Applicable for the Students of B. Tech (Regular) admitted from the Academic Year 2020-21

1.0 UNDER-GRADUATE DEGREE PROGRAMME IN ENGINEERING & TECHNOLOGY (UGP IN E&T)

J. B. Institute of Engineering and Technology (JBIET) offers a **4-Year (8 Semesters)** Bachelor of Technology (B. Tech.) Degree Programme, under Choice Based Credit System (CBCS) in the following branches of Engineering with effect from the academic year 2020-21.

S.No.	Branch
1	Civil Engineering (CE)
2	Electrical and Electronics Engineering (EEE)
3	Mechanical Engineering (ME)
4	Electronics and Communication Engineering (ECE)
5	Computer Science and Engineering (CSE)
6	Information Technology (IT)
7	Electronics and Computer Engineering (ECM)
8	Mining Engineering (MIE)

ELIGIBILITY FOR ADMISSION

Admission to the under graduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the College, subject to reservations as prescribed by the government from time to time.

The medium of instructions for the entire Under Graduate Programme in Engineering &Technology is English only.

B.TECH. PROGRAMME STRUCTURE

Duration of the UG Program

Minimum Duration: The minimum (normal) duration of the B. Tech. Programme for the student securing admission under Regular mode is **Four Academic Years (8 Semesters)** and for the student admitted under **Lateral Entry Scheme** is **Three Academic Years (6 Semesters)**Starting from the commencement of the First Year First Semester.

Maximum Duration: A student admitted under Regular mode shall complete the B. Tech. Programme in a maximum period of **Eight Academic Years (16 Semesters)** and the student admitted under **Lateral Entry Scheme** shall complete the B. Tech. Programme in a maximum period of **Six Academic Years (12 Semesters)** starting from the date of commencement of First Year First Semester.

UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

*Semester scheme***:** Each under Graduate Programme is of **4 Academic Years (8 Semesters**) with the Academic Year divided into two Semesters of 22 weeks (≥90 instructional days) each. Each Semester is having „Continuous Internal Evaluation (CIE)‟ and „Semester End Examination (SEE)‟ under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC. The guidelines issued by JNTUH and AICTE are followed while designing curriculum/course structure.

*Credit courses***:** The student has to register for all the courses offered in a Semester. The credits assigned for each course are indicated in an L: T: P/D: C (Lecture periods: Tutorial periods: Practical/Drawing periods: Credits) pattern as follows:

- One credit for one hour/ week for Theory/ Lecture (L) courses or Tutorials (T).
- One credit for two hours/ week for Laboratory/ Practical (P) & Drawing (D) courses.Mandatory Courses and Audit Courses will not carry any credits.

Subject Course Classification: All subjects/ courses offered for the Under Graduate Programme in E&T (B. Tech. degree programme) are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES-Engg Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to Humanities, Social sciences and Management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5		Project	B.Tech. project or UG project or UG major project or Project Stage I & II
6		Industrial training/ Mini- project	Industrial training/ Summer Internship/ Industry Oriented Mini-project/Mini-project
7	Elective Courses (EℓC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
8		OE – Open Electives	Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Audit Courses (AC)	-	Value Added Course / Audit Courses (Non-Credit)
11	Mandatory Courses (MC)	-	Mandatory Courses (Non-credit)

Typical Breakup of Credits for each Category

S.No.	Category	Breakup of Credits
1	Humanities and Social Sciences (HS) including Management.	10
2	Basic Sciences (BS) Courses including Mathematics, Physics and Chemistry.	23
3	Engineering Sciences (ES) - Courses including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	22
4	Professional Core (PC)-Courses relevant to the chosen specialization / branch.	60
5	Professional Electives (PE)-Courses relevant to the chosen specialization / branch.	18
6	Open Elective (OE) - Courses from other technical and / or emerging subject areas.	12
7	Mini-project / Project Work / Internship / Industrial training / Seminar	15
8	Mandatory Courses / Audit Courses.	Non-Credit
TOTAL		160

COURSE REGISTRATION

A Faculty Advisor is assigned to I, II, III and IV years in every branch of engineering, who will advise the students about the Under Graduate Programme, it's course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

The Academic Section of the college invites Registration forms from all Eligible students through their concerned departments before beginning of the Semester through a well defined registration process. Registrations for coming semesters shall be completed before the commencement of SEE of the preceding semester. It is mandatory for the student to register for courses as per his course structure in time. Students shall be allowed to register, only if he/she has cleared all the pending fee dues for all the previous semesters including the current semester

A student can apply for registration, only after obtaining the written approval from faculty advisor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor and the student.

Registration for Additional Online SWAYAM/ MOOCs: A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 4 credits, based on progress and SGPA/ CGPA, and completion of the „pre-requisites" as indicated for various subjects/ courses, in the department course structure and syllabus contents.

However, the additional credits scored shall not be considered for award of division and also not considered for calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). For such extra course(s) registered, a certificate will be issued with a letter grade indicated as a performance measure.

Choice for additional subjects/ courses must be clearly indicated, which needs the specific approval and signature of the faculty advisor/ counselor.

A student is allowed to register for 160 credits in completion of B.Tech programme. However, they can register for additional credits (above 160 credits). The additional credits scored shall not be considered for award of division and also not considered for calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). For such extra course(s) registered, a certificate will be issued with a letter grade indicated as a performance measure.

If the student submits ambiguous choices or multiple options or erroneous entries during registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

Subject/ course options exercised while registration are final and cannot be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the head of the department, with due notification and time-framed schedule, within the first week after the commencement of class-work for that semester.

Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor „within a period of 15 days" from the beginning of the current semester.

Open Electives: The students have to choose requisite number of open electives (as prescribed in the course structure) from the list of open electives. However, the student cannot opt for an open elective subject offered by his own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

Professional Electives: The students have to choose requisite number of professional electives (as prescribed in the course structure) from the list of professional electives.

ELECTIVESUBJECTS/ COURSES TO BE OFFERED

A typical section (or class) strength for each semester is 60.

A subject / course may be offered to the students, only if a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

More than one faculty member may offer the same subject (lab / practical may be included along with the corresponding theory subject in the same semester) in any semester. However, the selection of choice for students will be based on - „first come, first serve basis and CGPA criterion".

If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject / course (Professional Elective and Open Electives) for two (or multiple) sections.

In case of options coming from students of other departments/ branches/ disciplines (not considering open electives), first priority shall be given to the student of the „parent department".

ATTENDANCE REQUIREMENTS

A student is eligible to appear for the Semester End Examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in Mandatory Courses and Audit Courses) for that semester. The attendance of Mandatory and Audit Non-Credit Courses should be maintained separately. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the College Academic Committee(CAC) on genuine and valid grounds, based on the student‟s representation with supporting evidence.

A stipulated Condonation fee as decided by the CAC is payable for condoning shortage of attendance.

Shortage of attendance below 65% in aggregate shall in no case be condoned.

Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester.

They will not be promoted to the next semester and no grade allotments or SGPA/ CGPA calculations will be done for such students for the entire semester in which they have been detained.

A student detained in a semester due to shortage of attendance may be readmitted in the same semester as and when offered in the forthcoming academic years for fulfillment of academic requirements. **The academic regulations under which a student has been readmitted shall be applicable.**

A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

ACADEMIC REQUIREMENTS: The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.6.

A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each subject/ course/ Laboratories/ Project Stage-II etc. having both SEE and CIE, if he/she secures not less than 35% of marks (24 out of 70 marks) in the semester end examination and a minimum of 40% of marks in the sum total of the continuous internal evaluation (CIE) and semester end examination (SEE) taken together.

A student is deemed to have fulfilled the minimum academic requirements and earned the credits allotted to subjects having only internal evaluation (CIE), such as Internships / Industry Oriented Mini Project / Seminar / Project Stage - I if the student secures not less than 40% marks in each of them. However, a student who fails to secure minimum 40% marks or abstains from such subjects; he/ she will be permitted to reappear before the Departmental Committee as and when it is arranged.

The student shall deemed to have failed to earn the credits allotted to subjects having only internal evaluation (CIE), if he (i) does not submit a report on Industrial Oriented Mini Project/Summer Internships, Project Stage-I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar or (iii) secures less than 40% marks in Industrial Oriented Mini Project/Summer Internship and seminar evaluations.

Such failed students may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such „one reappearance" evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

Promotion Rules for ***Regular Students***

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	(i) Regular course of study of first year second semester. (ii) Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 40 credits out of 80 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 61 credits out of 122 credits i.e., 50% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

*Promotion Rules for **Lateral Entry Students***

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 42 credits out of 84 credits i.e., 50% credits up to

		third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, (iv) passes all the mandatory courses, to successfully complete the under graduate programme. The performance of the student in these 160 credits shall be taken into account for the calculation of „the final CGPA (at the end of under graduate programme).

If a student registers for „extra subjects" (in the parent department or other departments/branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those „extra subjects" (although evaluated and graded using the same procedure as that of the required 160 credits) will not be taken into account while calculating the SGPA and CGPA. For such „extra subjects" registered, percentage of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of **the attendance and academic requirements similar to other subjects/ courses .**

A Student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure „C" grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

A student detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulation under which a student readmitted is applicable. However, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulation under which the student has been readmitted shall be applicable to him.

A student who fails to earn all the 160 credits as indicated in the Program structure within **Eight Academic Years** of course of study from the year of admission plus Two More Academic years given for appearing in supplementary examinations(i.e. total 10 years), shall forfeit his seat in B.Tech Program.

EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in all theory and Laboratory courses shall be evaluated for 100 marks each, with 30 marks allotted for Continuous Internal Evaluation (CIE) and 70 marks for Semester End-Examination (SEE).The details of course-wise allotment of marks are given below (Table - 1)

Table 1. Distribution of Marks

S. No.	Course	Marks	
		CIE	SEE
1	Theory courses	30	70
2	Laboratory courses	30	70
3	Mandatory courses	30	70
4	Audit Courses	--	--
5	Internship- I	50	
6	Internship- II	50	
7	Mini Project	50	
8	Project Stage - I	50	
9	Seminar	50	
10	Project Stage - II	30	70

Continuous Internal Evaluation (CIE)

Theory Courses: Continuous Internal Evaluation (CIE) for theory courses has the following components.

S. No.	Component	Frequency of Evaluation	Marks for Each test	Final Marks (Average)
1	Mid-Term Examinations	2	20	20
2	Quiz Examinations	2	5	5
3	Assignments	5	5	5
Total				30

(a) ***Mid-term Examinations (20 marks):*** There shall be two Mid-Term Examinations of 60 minutes each. The First Mid-Term Examinations shall be conducted with syllabi from Units I & II and the Second Mid-Term Examinations shall be conducted with syllabi from Units III, IV & V. In each theory course, the question paper for the Mid-Term Examinations consists of four questions each for 5 marks with "either" / "or" option. There shall be a minimum of one question from each unit. A student is required to answer all four questions for maximum 20 marks. In final assessment, the average performance in the two Mid-Term Examinations shall be considered for awarding marks.

If a student is absent for any Mid-Term Examinations on medical grounds, he/she may be permitted to apply for makeup examinations within a week after completion of Mid-Term Examinations. A sub-committee with the following composition will look into such cases.

S. No.	Faculty Member	Designation
1	Concerned Head of the Department	Chairman
2	Faculty nominated by Principal	Member
3	Senior faculty member of the concerned Department	Member
4	Class Teacher of the class/section	Member

(b) Quiz Examinations (5 marks): Two Quiz Examinations of 20 minutes each shall be conducted with syllabi from Units I & II for the first and Units III, IV & V for the second. The Quiz Examination shall have 20 objective questions. In final assessment, the average performance of the student in two Quizzes shall be considered for awarding marks.

(c) Assignments (5 marks): There shall be one assignment from each unit. The average of better four assignments marks shall be considered for awarding marks. The assignments are used to test the student in Bloom‟s higher order thinking skills.

(d) For the courses like **Engineering Drawing**, the CIE shall be 30 marks out which 15 marks for day-to-day work, 10 marks for each mid-term examination and 5 marks for Assignment. The question paper for the mid-term examination consists of 2 questions with "either" / "or" option. The student is required to answer 2 questions for maximum 10 marks in each mid-term examination with minimum of one question from each unit.

Laboratory Courses

(a) Continuous Internal Evaluation (CIE): The continuous internal evaluation for laboratory courses is based on the following parameters:

S. No.	Component	Marks
1	Day-to-Day Evaluation	20
2	Internal Examination	10
	Total	30

Semester End Examinations (SEE)

Theory Courses

The semester end examinations for theory courses (including **Engineering Drawing**) will be conducted for duration of 3 hours. In each course, the question paper shall consist of 5 questions, one from each Unit with either / or option, carrying 14 marks each. A student is required to answer all 5 questions for maximum 70 marks.

Laboratory Courses

The performance of the student in laboratory courses shall be evaluated for 70 marks jointly by Internal and External Examiners for 3 hours duration.

Internship

The students should undergo two Internships, viz, i) Internship-I on areas of Science/ Basic engineering with some social relevance. ii) Internship- II in an Industry of their branch of Engineering. The Internship must involve practical work related to Science/ Basic Engineering, systems engineering, Industry practices etc. The duration of Internship shall be for a period of minimum 4 weeks continuously.

The Internship-I is to be taken up during the summer vacation after I Year II Semester Examination and it will be evaluated in II Year I semester for 50 marks. However, the process might be initiated before the end of I Year II Semester by the concerned department

The Internship-II is to be taken up during the summer vacation after II Year II Semester examination and it will be evaluated in III Year I semester for 50 marks. However, the process might be initiated before the end of II Year II Semester by the concerned department.

For both the Internships, the student shall submit a report on the training undergone, along with a certificate from the organization. The internships shall be evaluated by a three-member committee constituted by the Head of Department to assess the student performance on the following parameters. There shall be no Semester End Examinations for the Internships.

Parameter	Marks
Internship report	15
Quality of work	15
Presentation	15
Viva-Voce	5
Total	50

INDUSTRY ORIENTED MINI PROJECT

A student is required to undergo a Mini Project of his/her choice during the vacation after III Year II Semester Examination by applying theoretical concepts to develop a practical component/element /system that include design/ testing/ analysis. The performance of a student in the Mini Project shall be evaluated in IV Year I Semester by a three-member committee constituted by the HoD as per the following parameters:

Parameter	Marks
Mini Project report	15
Quality of work	15
Presentation	15
Viva-Voce	5
Total	50

The performance of a student in Mini Project shall be evaluated based on two reviews, each carrying 50 marks. The average marks of these two reviews will be awarded. There shall be no Semester End Examination for the Industry Oriented Mini Project.

SEMINAR

There is a Seminar in IV Year II Semester for 50 Marks. The student shall deliver a seminar on any emerging topic of his / her choice from the core technical domain. The student shall submit a duly certified Seminar report. A three-member committee constituted by the HoD will evaluate the Seminar report submitted by the student. There shall be no Semester End Examination.

Project Work

The student is required to undertake a Project Work by using the knowledge acquired by him / her during the course of study. The student is expected to design and build a complete system or subsystem on his / her area of interest. The Project Work consists of two parts namely, Project Stage -I (Project Survey) and Project Stage – II (Project Implementation). Project Stage – I is carried out during IV Year I Semester and the Project Stage – II during IV Year II Semester. A project work shall be taken up by a batch of students not exceeding 4 members under the guidance of a faculty supervisor.

For **Project Stage – I**, the Project Review Committee (PRC) consisting of Head of the Department, Project Coordinator, Project supervisor and one senior faculty member shall evaluate the Project Work for 50 marks. **There shall be no End Semester Evaluation for Project Phase-I.** The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule (ii) secures less than 40% marks in the CIE.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such „one reappearance" evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

For Project Stage – II, Project Review Committee (PRC) consisting of Head of the Department, Project supervisor, Project Coordinator and a senior faculty member shall evaluate for 30 marks as continuous evaluation. The External Examiner shall evaluate the Project work for 70 marks as Semester End Examination. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the External Examiner as per schedule, or (ii) Secures less than 40% marks in the sum total of the CIE and SEE taken together. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such „one reappearance" evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

For conducting Viva-Voce of Project Stage – II, Principal selects the External Examiner from the list of experts in the relevant branch of engineering submitted by the concerned Head of Department.

Mandatory Courses (MC)

Mandatory courses are assessed for PASS or FAIL only. No credits will be assigned to these courses. If a student secures more than 40 out of 100 marks, he / she will be declared PASS, else FAIL. Only Pass/Fail is indicated in Grade Card. PASS grade is necessary to be eligible to get the degree.

Audit Courses (AC)

The audit courses offered provide ample scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen fields of study. No credits will be assigned to these courses. A separate certificate will be issued by the Head of the institution on satisfactory completion of Audit Courses.

Massive Open Online Courses (MOOCs)

A student without backlog courses up to fifth semester shall be permitted to register BOS approved list of online / self-study course in lieu of the Professional Electives, Open Electives from Massive Open Online Courses (MOOCs) offered by SWAYAM / NPTEL / EdX / Coursera / Udacity / Udemy /upgrad/ Khan Academy / Edureka / QEEE etc . However, the syllabus of the MOOC course shall be approved by the concerned BOS. No formal lectures will be delivered for a self-study course.

One faculty member for each course shall be nominated as coordinator by the Department to monitor the progress made by the student. The coordinator need to carry out the conversion of grades awarded to the student in internal and external examinations by the Host institution into corresponding grades of Parent institution. If any student fails in successfully completing the MOOC course in the first attempt he/she must take the same subject/Substitute subject offered by the college and successfully complete it in the examination conducted by the college in the subsequent semesters. The question paper pattern and evaluation process for the examination of such subjects for MOOC courses will be similar to that of any other theory course offered in the Institute.

GRADING PROCEDURE

Grades will be awarded to indicate the performance of students in each Theory subject, Laboratory / Practical, Seminar, Industry Oriented Mini Project, and Project Stage - I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade is given.

As a measure of the performance of a student, a **10-pointAbsolute Grading System** using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks is followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

A student passes the subject/ course only when GP $\geq$ 5 („C‟ grade or above).

The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points (Σ CP) secured from all subjects/ courses registered in a semester, by the total number of Credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as given below:

$$SGPA = \left(\sum_{i=1}^{N} C_i G_i \right) \Big/ \left(\sum_{i=1}^{N} C_i \right) \text{ For each Semester}$$

where „i" is the subject indicator index (takes into account all subjects in a semester), „N" is the no. of subjects „registered" for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the I Year II Semester onwards at the end of each semester as per the formula.

$$CGPA = \left(\sum_{j=1}^{M} C_j G_j \right) \Big/ \left(\sum_{j=1}^{M} C_j \right) \text{ for all S number of semesters registered}$$

(i.e., up to and inclusive of S semesters, $S \geq 2$),

where „M" is the total no. of subjects (as specifically required and listed under the course structure of the parent department) the student has „registered" i.e., from the 1st semester onwards up to and inclusive of the 8th semester, „j" is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I Year I Semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course/Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16

III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

CGPA = 518/69 = 7.51

The above illustrated calculation process of CGPA will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B. Tech. Programme.

For merit ranking or comparison purposes or any other listing, only the „rounded off" values of the CGPAs will be used.

SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA is mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, Mandatory Courses will not be taken into consideration.

10. PASSING STANDARDS

A student is declared successful or „**PASSED**" in a semester, if he secures a GP ≥ 5 („C" grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥5.00 at the end of that particular semester); and he is declared successful or **'PASSED'** in the entire Under Graduate Programme, only when gets a CGPA ≥ 5.00 for the award of the degree as required.

After the completion of each semester, a grade card or grade sheet is issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned.

11. DECLARATION OF RESULTS

Computation of SGPA and CGPA are done using the procedure listed in 10.3 to 10.6.

For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

Eligibility for award of B. Tech. Degree for Regular Students:

i. A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within **8Academic Years and Two more Academic Years for writing supplementary examinations** from the date of commencement of the First Academic Year, is declared to have „qualified‟ for the award of B.Tech. Degree in the chosen branch of Engineering selected at the time of admission.

ii. A student who qualifies for the award of the degree as listed in item 12.3 (i) is awarded with one of the classes mentioned in 12.5.

Eligibility for award of B. Tech. Degree (LES)

i. The LES students after securing admission shall pursue a course of study for not less than **Three Academic Years** and not more than **Six Academic Years**.

ii. The student shall register for 122 credits and secure 122 credits with CGPA ≥ 5 from II Year to IV Year B. Tech. Programme (LES) for the award of B. Tech. degree.

iii. The students, who fail to fulfill the requirement for the award of the degree in Six Academic Years from the year of admission. However, he/she is permitted to write the examinations for two more Academic Years after Six Academic Years of course work, failing which he/she shall forfeit his/her seat in B. Tech course.

iv. The attendance requirement of B. Tech. (Regular) is also applicable to B. Tech. (LES).

A student with final CGPA (at the end of the Under Graduate Programme) ≥ 8.00, and fulfilling the following conditions - is placed in „First Class with Distinction‟.

However, he / she:

(i) Should have passed all the subjects/courses in „first appearance‟ within the First 4 Academic Years (or 8 sequential Semesters) from the date of commencement of First Year First Semester.

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from I Year I Semester onwards.

(iii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

(iv) A student not fulfilling any of the above conditions with final CGPA > 8 is placed in First Class.

Students with final CGPA (at the end of the Under Graduate Programme) ≥ 6.50 but <8.00 are placed in „First Class‟. Students with final CGPA (at the end of the Under Graduate Programme) ≥ 5.50 but < 6.50, are placed in „Second Class‟. All other students who qualify for the award of the degree (as per item 12.3.1), with final CGPA (at the end of the Under Graduate Programme) ≥ 5.00 but < 5.50, are placed in „Pass Class‟. A student with final CGPA (at the end of the Under Graduate Programme)< 5.00 will not be eligible for the award of the degree. Students fulfilling the conditions listed under item 12.5 alone will be eligible for award of „Gold Medal‟.

However any amendments related to 12.5 by JNTUH for award of class will be applicable accordingly.

WITHHOLDING OFRESULTS

If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14. 0 STUDENTTRANSFERS

Transfer of students from other Colleges or Universities are permitted subjected to the rules and regulations of Telangana State Council for Higher Education (Technical Education Department) and JNTUH in vogue.

SCOPE

The academic regulations should be read as a whole, for the purpose of any interpretation.

In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

The College may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made is applicable to all students with effect from the dates notified by the College authorities.

Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

16. MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S. No.	Nature of Malpractices/Improper conduct	Punishment
1. (a)	If the student: Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1. (b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the Subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and Project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
4.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

5.	Refuses to obey the orders of the chief superintendent/assistant superintendent/ any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they is expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a Police case is registered against them.

6.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
7.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
8.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.

9.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/yea
10.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.
11.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be referred to the Malpractice Committee for further action and to award suitable punishment.	

R 20

B. Tech – AI&DS
Course Structure

I Year I Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J110A	Differential Equations and Calculus	3	1	0	0	4	BSC	Y	Mathematics
2	J110B	English	3	0	0	0	3	HMSC	Y	English
3	J110D	Semiconductor Physics	3	0	0	0	3	BSC	Y	Physics
4	J115A	Programming for Problem Solving	3	0	0	0	3	ESC	Y	**CSE**
5	J1101	English Language and Communication Skills Lab	0	0	2	0	1	HMSC	Y	English
6	J1104	Physics Lab	0	0	2	0	1	BSC	Y	Physics
7	J1151	Programming for Problem Solving Lab	0	0	4	0	2	ESC	Y	**CSE**
8		Induction Program								**S&H**
Total			**12**	**1**	**8**	**0**	**17**			

I Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J120A	Linear Algebra and Advanced Calculus	3	1	0	0	4	BSC	Y	Mathematics
2	J1231	Engineering Drawing	1	0	0	4	3	ESC	Y	MECH
3	J120D	Engineering Chemistry	3	0	0	0	3	BSC	Y	Chemistry
4	J122A	Basic Electrical Engineering	3	0	0	0	3	ESC	Y	EEE
5	J124A	Basic Electronics Engineering	3	0	0	0	3	ESC	Y	ECE
6	J1201	Chemistry Lab	0	0	2	0	1	BSC	Y	Chemistry
7	J1221	Basic Electrical Engineering Lab	0	0	2	0	1	ESC	Y	**EEE**
8	J1241	Basic Electronics Engineering Lab	0	0	2	0	1	ESC	Y	**ECE**

9	J1292	Engineering and IT Workshop Lab	0	0	4	0	2	ESC	Y	**IT**
10	J12M1	Environmental Sciences	2	0	0	0	0	ESC	Y	**S&H**
		Total	**14**	**1**	**10**	**6**	**21**			

II Year I Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J210B	Probability and Statistics	3	1	0	0	4	BSC	**Y**	Mathematics
2	J215A	Data Structures	3	0	0	0	3	PCC	**Y**	**CSE**
3	J216A	Database Management Systems	3	0	0	0	3	PCC	**Y**	**IT**
4	J21DA	Mathematics for Data Science	3	0	0	0	3	BSC	**N**	**S&H**
5	J215D	Python Programming	3	0	0	0	3	PCC	**Y**	**CSE**
6	J21M1	Gender Sensitization	2	0	0	0	0	MC	**Y**	**S&H**
7	J2151	Data Structures Lab	0	0	2	0	1	PCC	**Y**	**CSE**
8	J2161	Database Management Systems Lab	0	0	3	0	1.5	PCC	**Y**	**IT**
9	J2153	Python Programming Lab	0	0	3	0	1.5	PCC	**N**	**CSE**
10	J21D1	Internship-1	0	0	0	0	1	PW	**N**	
		Total	**17**	**1**	**10**	**0**	**21**			

II Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J225B	Operating Systems	3	0	0	0	3	PCC	Y	**CSE**
2	J225K	Introduction to Data Mining	3	0	0	0	2	PCC	Y	**CSE**
3	J22D2	Digital Image Processing	3	1	0	0	4	ESC	Y	**ECE**
4	J225C	Design and Analysis Of Algorithms	3	0	0	0	3	PCC	Y	**CSE**
5	J22D2	Data Science Through R Programming	3	0	0	0	3	PCC	Y	**AI&DS**
6	J22A3	Machine Learning	3	0	0	0	3	PCC	N	**AIML**
7	J22M1	Professional Ethics	2	0	0	0	0	MC	Y	**S&H**
8	J2201	Soft Skills	2	0	0	0	0	AC	Y	**S&H**
9	J22A1	Machine Learning Lab	0	0	3	0	1.5	PCC	Y	**AIML**
10	J22D1	R Programming Lab	0	0	3	0	1.5	PCC	Y	**AI&DS**
		Total	**22**	**1**	**6**	**0**	**21**			

III Year I Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J31EA	Managerial Economics and Management Science	3	1	0	0	4	HMSC	Y	MBA
2	J315E	Artificial Intelligence & Its Applications	3	1	0	0	3	PCC	Y	CSE
3	J31DA	Big Data Analytics	3	0	0	0	3	PCC	Y	CSE
4	J31AA	Deep Learning	3	0	0	0	3	PCC	Y	CSE
5	BTAID O1	Open Elective-I	3	0	0	0	3	OPE		
6	J31M3	Software Engineering	2	0	0	0	0	MC	Y	CSE
7	J3101	Employability Skills	2	0	0	0	0	AC	Y	S&H
8	J31A1	Deep Learning Lab	0	0	3	0	2	PCC	Y	CSE
9	J31D1	Big Data Analytics Laboratory	0	0	3	0	2	PCC	N	CSE
10	J31D2	Internship-II	0	0	2	0	1	PW		
		Total	**19**	**2**	**8**	**0**	**21**			

III Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J325L	Cloud Computing	3	0	0	0	3	PCC	Y	IT
2	J326J	Automata and Compiler Design	3	0	0	0	3	PCC	Y	IT
3	J325M	Information Security	3	0	0	0	3	PCC	Y	CSE
4	BTAIDE1	Professional Elective-I	3	0	0	0	3	PEC		AI&DS
5	BTAIDE2	Professional Elective-II	3	0	0	0	3	PEC		AI&DS
6	BTAIDO2	Open Elective-II	3	0	0	0	3	OPE		
7	J32M2	Cyber Security	2	0	0	0	0	MC	Y	IT
8	J32D1	Data Science Through Python Laboratory	0	0	2	0	1	PCC	N	AI&DS
9	J3201	Life Skills & Professional Skills Lab	0	0	4	0	2	HMSC	Y	S&H
		Total	**20**	**0**	**6**	**0**	**21**			

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J41AA	Reinforcement Learning	3	0	0	3	PCC	N	CSE
2	BTAIDE3	Professional Elective-III	3	0	0	3	PEC		AI&DS
3	BTAIDE4	Professional Elective-IV	3	0	0	3	PEC		AI&DS
4	BTAIDE5	Professional Elective-V	3	0	0	3	PEC		AI&DS
5	BTAIDO3	Open Elective-III	3	0	0	3	OPE		
6	J41A1	Reinforcement Learning Lab	0	0	4	2	PCC	N	CSE
7	J41D1	Computer Vision Lab	0	0	4	2	PCC	N	AI&DS
8	J41D2	Industry Oriented Mini Project	0	0	4	2	PW	N	AI&DS
9	J41D3	Project Stage-I	0	0	6	2	PW		AI&DS
		Total	**15**	**0**	**18**	**24**			

IV Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	BTAIDE6	Professional Elective-VI	3	0	0	0	3	PEC		AI&DS
2	BTAIDO4	Open Elective-IV	3	0	0	0	3	OPE		
3	J42D2	Project Stage-II	0	0	14	0	7	PW		AI&DS
4	J42D1	Seminar	0	0	2	0	1	PW		AI&DS
		Total	**6**	**0**	**16**	**0**	**14**			

Professional Elective-I

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J32D1	Design Thinking	3	0	0	0	3	PEC	N	AI&DS
2	J32D2	Predictive Analytics	3	0	0	0	3	PEC	N	AI&DS
3	J325E	Object Oriented Analysis and Design	3	0	0	0	3	PEC	Y	CSE

Professional Elective-II

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J32D3	UI/UX	3	0	0	0	3	PEC	N	AI&DS
2	J32D4	Information Extraction and Retrieval	3	0	0	0	3	PEC	N	AI&DS
3	J32D5	NoSQL Data Base	3	0	0	0	3	PEC	N	AI&DS

Professional Elective-III

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J417E	Internet Of Things	3	0	0	0	3	PEC	**Y**	**ECM**
2	J415D	Computer Vision	3	0	0	0	3	PEC	**N**	**CSE**
3	J415E	Intelligent Robotics	3	0	0	0	3	PEC	**N**	MECH

Professional Elective-IV

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
	J415F	Web Services	3	0	0	0	3	PEC	Y	CSE
	J41D6	Knowledge Representation and Reasoning	3	0	0	0	3	PEC	N	AI&DS
	J416H	Software Architecture And Design Pattern	3	0	0	0	3	PEC	Y	CSE

Professional Elective-V

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J415H	Database Security	3	0	0	0	3	PEC		CSE
2	J415J	Data Modelling And Simulation	3	0	0	0	3	PEC		CSE
3	J416E	Quantum Computing	3	0	0	0	3	PEC		IT

Professional Elective-VI

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	J426D	Block chain Technology	3	0	0	0	3	PEC	Y	CSE
2	J42D7	Artificial Intelligence for Business	3	0	0	0	3	PEC	N	AI&DS
3	J425N	Android Application Development	3	0	0	0	3	PEC	Y	CSES

Open Elective-I

S. No	Code	Course Title	L	T	P	D	Credits	Category	Approving BOS
1	J31OA	Elements of CIVIL Engineering	3	0	0	0	3	OPE	CIVIL
2	J31OB	Environmental Impact Assessment	3	0	0	0	3	OPE	CIVIL
3	J31OC	Energy Engineering	3	0	0	0	3	OPE	EEE
4	J31OD	Sensors and Transducers	3	0	0	0	3	OPE	EEE
5	J31OE	Automotive Technology	3	0	0	0	3	OPE	MECH
6	J31OG	Principles of Sensors and their Application	3	0	0	0	3	OPE	ECE
7	J31OH	Principles of Communications	3	0	0	0	3	OPE	ECE
8	J31OI	Fundamentals of Database	3	0	0	0	3	OPE	CSE
		Management System	3	0	0	0	3	OPE	
9	J31OJ	Principles of Operating Systems	3	0	0	0	3	OPE	CSE
10	J31OK	Introduction to Data Structures through Python	3	0	0	0	3	OPE	IT
11	J31OL	Introduction to Web Design	3	0	0	0	3	OPE	IT
12	J31OM	Basics of Object Oriented Programming	3	0	0	0	3	OPE	ECM
13	J31ON	Fundamentals of Digital Logic Design	3	0	0	0	3	OPE	ECM
14	J31OP	Introduction to Mining Technology	3	0	0	0	3	OPE	MIE
15	J31OR	Numerical solution of Ordinary differential equations (Common to EEE,ECE,CSE,IT & ECM) OR Number Theory & Cryptography	3 S	0	0	0	3	OPE	Mathematics
16	J31OS	Nano Materials	3	0	0	0	3	OPE	Physics
17	J31OT	Chemistry of Engineering Materials	3	0	0	0	3	OPE	Chemistry

18	J31OU	Technical Communication Skills	3	0	0	0	3	OPE	English
19	J31OV	Entrepreneurship	3	0	0	0	3	OPE	MBA

S. No	Code	Course Title	L	T	P	Credits	Category	Approving BOS
1	J32OA	Construction Management,	3	0	0	3	OPE	CIVIL
		Contracts and valuation	3	0	0	3	OPE	
2	J32OB	Energy Audit & Green buildings	3	0	0	3	OPE	CIVIL
3	J32OC	Hybrid Electric Vehicles	3	0	0	3	OPE	EEE
4	J32OD	Energy Auditing Conservation and Managements	3	0	0	3	OPE	EEE
5	J32OE	Fundamentals of Operations Research	3	0	0	3	OPE	MECH
6	J32OG	Software Defined Radio	3	0	0	3	OPE	ECE
7	J32OH	Basics of IC Technology	3	0	0	3	OPE	ECE
8	J32OI	Fundamentals of Computer Networks	3	0	0	3	OPE	CSE
9	J32OJ	Introduction to Java Programming	3	0	0	3	OPE	CSE
10	J32OK	Computer Organization	3	0	0	3	OPE	IT
11	J32OL	Fundamentals of Human Computer Interaction	3	0	0	3	OPE	IT
12	J32OM	Introduction to Microprocessors and Microcontrollers	3	0	0	3	OPE	ECM
13	J32ON	Internet of Things	3	0	0	3	OPE	ECM
14	J32OP	Introduction to Surface Mining	3	0	0	3	OPE	MIE
15	J32OR	Numerical Solution of Partial Differential Equations	3	0	0	3	OPE	Mathematics
16	J32OS	Advanced Physics for Engineers	3	0	0	3	OPE	Physics
17	J32OT	Green Chemistry	3	0	0	3	OPE	Chemistry

18	J32OU	Technical Writing Skills	3	0	0	3	OPE	English
19	J32OV	Research Methodology	3	0	0	3	OPE	MBA

Open Elective-III

S. No	Code	Course Title	L	T	P	D	Credits	Category	Approving BOS
1	J41OA	Waste Management	3	0	0	0	3	OPE	CIVIL
2	J41OB	Road Safety Engineering	3	0	0	0	3	OPE	CIVIL
3	J41OC	Electrical Engineering Materials	3	0	0	0	3	OPE	EEE
4	J41OD	Non-Conventional Energy Sources	3	0	0	0	3	OPE	EEE
5	J41OE	Basics of Robotics	3	0	0	0	3	OPE	MECH
6	J41OG	Digital Systems Using VHDL	3	0	0	0	3	OPE	ECE
7	J41OH	MATLAB Programming Language	3	0	0	0	3	OPE	ECE
8	J41OI	Introduction to Python Programming	3	0	0	0	3	OPE	CSE
9	J41OJ	Introduction to Mobile Application Development	3	0	0	0	3	OPE	CSE
10	J41OK	Fundamentals of Object Oriented Programming Through C++	3	0	0	0	3	OPE	IT
11	J41OL	Fundamentals of Data Science	3	0	0	0	3	OPE	IT
12	J41O M	Introduction to Neural networks	3	0	0	0	3	OPE	ECM
13	J41ON	IC Applications	3	0	0	0	3	OPE	ECM
14	J41OP	Introduction to Geology	3	0	0	0	3	OPE	MIE
15	J41OR	Integral Transforms And Integral Equations	3	0	0	0	3	OPE	Mathematics
16	J41OS	NDT And Vacuum Technology	3	0	0	0	3	OPE	Physics
17	J41OT	Nano Chemistry	3	0	0	0	3	OPE	Chemistry
18	J41OU	Teamwork and Team Building	3	0	0	0	3	OPE	English

19	J41OV	Intellectual Property Rights	3	0	0	0	3	OPE	MBA

Open Elective-IV

S. No	Code	Course Title	L	T	P	D	Credits	Category	Approving BOS
1	J42OA	Air Pollution & Control	3	0	0	0	3	OPE	CIVIL
2	J42OB	Disaster Management	3	0	0	0	3	OPE	CIVIL
3	J42OC	Special Electrical Machines	3	0	0	0	3	OPE	EEE
4	J42OD	Electrical Safety Engineering	3	0	0	0	3	OPE	EEE
5	J42OE	Digital Manufacturing	3	0	0	0	3	OPE	MECH
6	J42OG	Consumer Electronics	3	0	0	0	3	OPE	ECE
7	J42OH	Nano Electronics	3	0	0	0	3	OPE	ECE
8	J42OI	Fundamentals of Cloud Computing	3	0	0	0	3	OPE	CSE
9	J42OJ	Introduction to Big Data Analytics	3	0	0	0	3	OPE	CSE
10	J42OK	Fundamentals of E-Commerce	3	0	0	0	3	OPE	IT
11	J42OL	E-Waste Management	3	0	0	0	3	OPE	IT
12	J42OM	Introduction to Embedded Systems	3	0	0	0	3	OPE	ECM
13	J42ON	Introduction to Network Security	3	0	0	0	3	OPE	ECM
14	J42OP	Introduction to Mine Environment	3	0	0	0	3	OPE	MIE

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS I Year – I Sem**				
Course Code: J110A	**DIFFERENTIAL EQUATIONS AND CALCULUS**	**L**	**T**	**P**	**D**
Credits: 4		**3**	**1**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Methods of solving first order differential equations and learn about its applications to basic engineering problems
2. Methods of solving higher order differential equations and learn about its applications to basic engineering problems
3. The fourier series of a periodic function
4. Improper integrals using beta and gamma functions
5. Maximum and minimum value of a given function

Module 1:

First Order, First Degree ODE and it Applications: (9L)

Differential equations of first order and first degree - Exact differential equation, Linear and Bernoulli differential equation, applications of differential equations of first order and first degree -Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories.

Module 2:

Second and Higher order ODE with Constant Coefficients: (10L)

Second order linear differential equations with constant coefficients: Solution of Homogenous, non-homogeneous differential equations, Non-Homogeneous terms of the type eax, sin(ax), cos (ax),polynomials in x, e^{ax} .V(x), xV(x).Method of variation of parameters; Equations reducible to linear ODE with constant Coefficients: Euler-Cauchy equation, Legendre's equation.

Module 3:

Sequences and Fourier Series: (10L)

UNIT I: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, P-test, Alternating series: Leibnitz test, Absolute and Conditionally Convergence.

UNIT II: Determination of Fourier coefficients – Fourier series – even and odd functions, Fourier series in an arbitrary interval- even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

Module 4:

Calculus and Improper Integrals: (9L)

UNIT I: Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series

UNIT II: Definition of Improper Integrals, Beta functions: Properties and other forms of beta functions (statements only) and problems, Gamma functions: Properties of Gamma functions (statements only), Relation between the Beta and Gamma functions (without proofs) and Evaluation of improper integrals using Beta and Gamma functions

Module 5:

Functions of Multi variables: (10L)

Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2015 Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
2. R.K.Jain& S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2015.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

Web Links

1. https://nptel.ac.in/courses/111106100
2. https://www.math.ust.hk/~machas/differential-equations.pdf
3. https://en.wikipedia.org/wiki/Fourier_series
4. https://www.khanacademy.org/math/ap-calculus-bc/bc-integration-new/bc-6-13/a/improper-integrals-review
5. https://onlinecourses.nptel.ac.in/noc20_ma15/preview

Course outcomes:

The student will be able to:

1. Formulate and solve the First order linear differential equations
2. Apply the concepts of higher order linear differential equations with constant coefficients solving physical problems arising in engineering.
3. Determine Fourier series expansion of a given function
4. Analyze the improper integrals
5. Find the maxima and minimal of multivariable functions

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	2	2	1	1	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	2	-	-
Average	**3.0**	**3.0**	**1.9**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**-**	**-**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – I Sem			
Course Code: J110B	ENGLISH	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives:

The Students will:

1. To improve the language proficiency of students in English with an emphasis on LSRW skills
2. To enrich Vocabulary and Grammar.
3. To equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
4. To develop study skills
5. To enhance the communication skills in formal and informal situations.

Module 1:

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions. **Reading:** Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

Module 2:

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms, Homophones, Homonyms, and Homographs.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, and Job Application with Resume.

Module 3:

‘Blue Jeans’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying-** Providing Examples or Evidence and Essay Writing

Module 4:

‘What Should You Be Eating’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension**-** Intensive Reading and Extensive Reading

Writing: Writing Practices--Writing Introduction and Conclusion -Précis Writing.

Module 5:

‘How a Chinese Billionaire Built Her Fortune’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports

Text Books:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

Reference Books:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.

6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

Course outcomes:

The student will be able to:

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Use the proper vocabulary and grammatically correct sentences.
4. Communicate confidently in various contexts and different cultures.
5. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Average	-	-	-	-	-	-	-	-	-	**2.0**	**2.0**	-	-	-

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS I Year – I Sem**			
Course Code: J110D	**SEMICONDUCTOR PHYSICS**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. To illustrate the phenomena of old quantum theory and derive Heisenberg Uncertainty principle and Schrödinger's equations.
2. Learns the fundamental concepts of solids and semiconductors.
3. Develop strong fundamentals of electronic and optoelectronic materials.
4. To understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.
5. To construct Maxwell's equations from basic principles and use it to solve electromagnetic plane wave equations.

Module 1:

Quantum Mechanics: (9L)

Introduction to Quantum mechanics, Black body radiation, Planck's law, Compton effect, Photoelectric effect -Einstein's photoelectric equation. de Broglie's concept of matter waves, Davisson and Germer's experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time dependent and Independent Wave Equation; Physical Significance of the Wave Function, Energy of a particle in One Dimensional Infinite Potential well.

Module 2:

Electronic Materials & Semiconductors (9L)

UNIT-I: Electronic Materials: Free electron theory, Fermi Energy level, Fermi distribution function, Density of states, Bloch's theorem, Kronig-Penny model (Qualitative treatment), E-K diagram, Effective mass of electrons, origin of energy bands, Classification of materials on the basis of energy bands.

UNIT-II: Semiconductors: Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect.

Module 3:

Semi-conductor Devices: (9L)

UNIT-I: Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Bipolar Junction Transistor (BJT): Construction and Principle of operation. PIN, Avalanche photodiode, LED – working principle and characteristics, Solar Cell and Photo diode.

Module 4:

Lasers &Fibre Optics: 9L

UNIT-I: **Lasers:** Introduction, absorption, spontaneous emission, Stimulated emission, calculation of Einstein co-efficient of A &B, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, He-Ne laser, Semiconductor laser, Applications of laser.

UNIT-II: **Fibre Optics:** Introduction, Construction and working principle of Optical fibres, Acceptance angle, Acceptance cone and Numerical aperture, Types of optical fibres, Applications of optical fibres.

Module 5:

Electromagnetism & Dielectric Properties 9L

UNIT-I: **Electromagnetism**: Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations .

UNIT-II: **Dielectric Properties**: Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic ,ionic and orientation polarizations (quantitative treatment), Internal fields in a solid, Clausius-Mossotti equation, Applications – Piezo electricity and Ferro-electricity.

Text Books:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
2. Physics, Halliday and Resnick, - Wiley.
3. A textbook of Engineering Physics, Dr.TVSArunMurthy , Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar – Chand.

Reference Books:

1. Richard Robinett, Quantum Mechanics.
2. Semiconductor Optoelectronics: Physics and Technology, J.Singh, Mc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL.
4. P.K.Palanisamy, "Engineering Physics", Scitech Publications, Fourth edition.

E - Resources:

1. https://www.researchgate.net/publication/259574083 Lecture Notes on Engineering Physics.
2. https://www.researchgate.net/publication/292607115_Applied Physics
3. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational +physics/journal/40094
4. http://www.springer.com/physics/journal/340.
5. http://nptel.ac.in/courses/113104012/
6. 6.https://www.youtube.com/watch?v=jnjjWI1s9_s&list=PLzJaFd3A7DZse2tQ2qUFCh SiCj7jBidO0.
7. https://www.youtube.com/watch?v=4a0FbQdH3dY.

Course outcomes:

The student will be able to:

1. Realize the concept of uncertainty principle and to compute quantized energy levels.
2. Analyze the formation the bands thereby classification of materials on the basis of transport properties.
3. Identify the semiconductors for engineering applications.
4. Analyze working principle of lasers and to summarize its applications.
5. Formulate and solve the engineering problems on electromagnetism and dielectrics.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	-
Average	**2.4**	**1.8**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.2**	**-**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & DS I Year – I Sem			
CourseCode: J115A	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Mathematical Knowledge.
2. Analytical Skills.

Course objectives:

The Student will:

1. Learn the fundamentals of computers.
2. Understand the various steps in program development.
3. Understand the syntax and semantics of C programming language.
4. Learn the usage of structured programming approach in solving problems.
5. Gain the knowledge on searching and sorting methods.

Module 1:

INTRODUCTION TO PROGRAMMING:

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems.

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments

Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

Module 2:

ARRAYS, STRINGS, STRUCTURES AND PREPROCESSOR:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays.

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures.

Preprocessor: Commonly used Preprocessor commands like include, define, undef, If, ifdef, ifndef.

Module 3:

POINTERS AND FILE HANDLING IN C:

Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type.

Files: Text and Binary files, Creating and Reading and writing text and binary files, appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

Module 4:

FUNCTION AND DYNAMIC MEMORY ALLOCATION:

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions.

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types.

Module 5:

INTRODUCTION TO ALGORITHMS:

Basic searching algorithms (linear and binary search techniques),Basic sorting algorithms (Bubble, Insertion, Quick, Merge and Selection sort algorithms) Basic concept of order of complexity through the example programs.

Text Books:

1. Ream Thareja, Programming in C, Oxford university press.
2. B.A. Forouzan and R.F. Gilberg, C Programming and Data Structures, Cengage Learning, (3rdEdition).

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)

3. Stephen G. Kochan, Programming in C, Fourth Edition, PearsonEducation.
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4thEdition
5. Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill

E - Resources:

1. https://fresh2refresh.com/c-programming/
2. https://www.studytonight.com/c/
3. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/
4. https://www.programiz.com/c-programming
5. http://www.gtucampus.com/uploads/studymaterials/Degree%20EngineeringSandipFundaments_of_C.pdf
6. http://cs.indstate.edu/~cbasavaraj/cs559/the_c_programming_language_2.pdf

Course outcomes:

The student will be able to:

1. Design the algorithms/flowcharts of C-programs.
2. Write the Code and test a given logic in C programming language.
3. Decompose a problem into functions and to develop modular reusable code.
4. Make Use of arrays, pointers, strings and structures to write C Programs.
5. Apply searching and sorting algorithms.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	3
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	3
Average	**2.8**	**2.0**	**2.3**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**2.0**	**2.8**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – I Sem			
Course Code: J1101	English Language and Communication Skills Lab	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Nil

Course objectives:

The Student will:

1. To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
2. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
3. To improve the fluency of students in spoken English and neutralize their mother tongue influence
4. To train students to use language appropriately for public speaking.
5. To train students to face the interviews.

SYLABUS:

English Language and Communication Sills Lab (ELCS) will have two parts:

a) Computer Assisted Language Learning (CALL) Lab:

b) Interactive Communication Skills (ICS) Lab:

Exercise – I:

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. ***Practice***: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II:

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise – III:

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV:

CALL Lab:

Understand: Listening for General Details.

Practice:Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – V:

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.

Practice: Mock Interviews.

Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. **System Requirement (Hardware component):** *Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

Course outcomes:

The student will be able to:

1. Better understanding of nuances of English language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking skills with clarity and confidence which in turn enhances their employability skills
4. The public speaking skills and facing the interviews
5. Good communication skills and use them at workplace.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	2	-	-	-	-	..	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO4	-	-	-	-	-	-	-	-	1	2	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Average	-	-	-	-	**2.0**	-	-	-	**1.0**	**1.49**	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – I Sem			
Course Code: J1104	Physics Lab	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Demonstrate skills in scientific inquiry, problem solving
2. and laboratory techniques.
3. Demonstrate competency and understanding of the concepts found in LED, Electric and Electronic materials a broad base of knowledge in physics.
4. Solve Experimental problems that potentially draw an experimental knowledge in multiple Areas of physics.
5. Study applications in engineering like Hall effect, and magnetic properties.
6. Study applications in engineering like Optical fiber, Lasers, Photodiode and Solar cell.

List of Experiments:

1. Energy gap of P-N junction diode:

To determine the energy gap of a semiconductor diode.

2. Solar Cell:

To study the V-I Characteristics of solar cell.

3. Light emitting diode:

Plot V-I characteristics of light emitting diode.

4. Optical fiber:

Determination of Numerical Aperture and Bending losses of an optical fibre.

. Hall effect:

To determine Hall co-efficient of a given semiconductor.

6. Photoelectric effect:

To determine work function of a given material.

7. LASER:

To study the Wave length of LASER Source.

8. Dielectric Constant:

To determine the Dielectric constant of the given material.

9. LCR Circuit:

To determine the Quality factor of LCR Circuit (Series& Parallel).

10. R-C Circuit:

To determine the time constant of R-C circuit (Growth and Decay).

Note: Any 8 experiments are to be performed.

Course outcomes:

The student will be able to:

1. Learn the experimental concepts on in LED, Electric and Electronic materials.
2. Get the knowledge of fundamentals of Semiconductor physics.
3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
4. Be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
5. Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO4	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	1	-
Average	**3.0**	**1.4**	**1.33**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	-

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS I Year – I Sem**

Course Code: J1151	**Programming for Problem Solving Lab**	**L**	**T**	**P**	**D**
Credits: 2		**0**	**0**	**4**	**0**

Pre-Requisites:

1. Mathematical Knowledge.
2. Analytical Skills.

Course objectives:

The Student will:

1. Work with an IDE to create, edit, compile, run and debug programs
2. Analyze the various steps in program development.
3. Develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. Develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. Write programs using the Dynamic Memory Allocation concept, files

1. SIMPLE NUMERIC PROBLEMS:

a) Write a program for find the max and min from the three numbers.

b) Write the program for the simple, compound interest.

c) Write program that declares Class awarded for a given percentage of marks, where mark<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >=70% = Distinction. Read percentage from standard input.

2. EXPRESSION EVALUATION:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

b) Write a program that finds if a given number is a prime number

A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

3. ARRAYS AND POINTERS AND FUNCTIONS:

a) Write a C program to find the minimum, maximum and average in an array of integers.

b) Write a C program to find Addition of Two Matrices

c) Write a C program to find Multiplication of Two Matrices.

d) Write C programs that use both recursive and non-recursive functions

e) Write a program for reading elements using pointer into array and display the values using array.

4.FILES:

a) Write a C program to display the contents of a file to standard output device.

b) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents

c) Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

5. STRINGS:

a) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

b) Write a C program to count the lines, words and characters in a given text.

6. SORTING AND SEARCHING:

a) Write a C program for using binary search method.

b) Write a C program for linear search.

c) Write a C program that implements the Bubble sort method.

d) Write a C program that implements the Insertion sort method.

e) Write a C program that implements the Quick sort method.

f) Write a C program that implements the Merge sort method.

ADDITIONAL PROGRAMS (Given to Student as Assignment):

1) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

    a. 5 x 1 = 5

    b. 5 x 2 =10

    c. 5 x 3 =15

2) Write a program that shows the binary equivalent of a given positive number

between 0 to255.

3) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

4) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

5) Write a C program to calculate the following, where x is a fractional value.

1-x/2+x^2/4-x^3/6.

6) Write a C program to read in two numbers, x and n, and then compute the sum of this Geometricprogression:1+x+x^2+x^3+ +x^n. For example: if n is3 and x is 5, then the program computes 1+5+25+125.

7) Write a C program to find the minimum, maximum and average in an array of integers.

8) Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.

9) Write a C program that uses functions to perform the following:

(a) Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

(b) To find the factorial of a given integer.

(c) To find the GCD (greatest common divisor) of two given integers.

10) Write a C program that does the following:

(a) It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function). The program should then read all 10 values and print them back.

(b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

11) Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

12) Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

13) Write a C program that uses functions to perform the following operations:

(a)To insert a sub-string in to a given main string from a given position.

(b) To delete n Characters from a given position in a given string.

14) Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* *
				*

15) Write a C program that sorts a given array of names.

Course outcomes:

The student will be able to:

1. Formulate the algorithms for simple problems
2. Examine syntax errors as reported by the compilers
3. Define and manipulate data with arrays, strings and structures
4. Make use of pointers of different functions types
5. Create, read and write to and from simple text and binary files

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	2	-	-	-	-	2
Average	3.0	2.0	-	-	-	-	-	-	2.0	-	-	-	-	2.0

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS I Year – II Sem**			
Course Code: J120A	**Linear Algebra and Advanced Calculus**	**L**	**T**	**P**	**D**
Credits: 4		**3**	**1**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

The Students will:

1. Rank of the matrix and its application to consistency of system of linear equations
2. Eigen Values and Eigen Vectors and Nature of Quadratic forms
3. Evaluation of multiple integrals and their applications
4. Basic properties of vector point functions
5. Vector Integration like line, surface and volume integrals

Module 1:

Matrices and System of Equations: (10L)

Matrices: Types of Matrices, Symmetric, Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations.

Module 2:

Eigen values, Eigen vectors and Matrix of Transforms: (12L)

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms using Linear Transformation and Orthogonal Transformations

Module 3:

Multiple Integrals: (10L)

Evaluation of double integrals, change of order of integration, Change of variables (Cartesian & Polar coordinates), evaluation of triple integrals, change of variables (Cartesian to Spherical and Cylindrical polar coordinates) Applications: computation of Areas and volumes.

Module 4:

Vector Differential Calculus: (8L)

Scalar and vector fields, vector differentiation, level surfaces, directional derivative, gradient of a scalar field, divergence and curl of a vector field, Laplacian, Scalar potential functions, Tangent plane and normal line. Vector Identities (without proofs

Module 5:

Vector Integral Calculus: (8L)

Line, Surface and Volume Integrals, Green's theorem in a plane, Gauss-Divergence theorem and Stokes theorem (without proofs)

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2015
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. R.K.Jain& S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2015.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

E-Resources:

1. https://nptel.ac.in/courses/122/104/122104018/
2. https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
3. https://nptel.ac.in/courses/111/107/111107108/
4. https://www.cheric.org/files/education/cyberlecture/e200303/e200303-301.pdf
5. https://www.whitman.edu/mathematics/calculus_online/chapter16.html

Course outcomes:

At the end of this course students will be able to

1. solve the consistent system of linear equations
2. apply orthogonal congruent Transformations to a quadratic form
3. evaluate multiple integrals in various coordinate system
4. apply the concept of gradient, divergence and curl to formulate engineering problems
5. convert line integrals to surface integrals and surface integrals to volume integrals

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	3	-	-
Average	**3.0**	**3.0**	**1.6**	**3.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**-**	**-**

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS
I Year – II Sem</td></tr>
<tr><td>Course
Code:
J1231</td><td rowspan="2">Engineering Drawing</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>0</td><td>0</td><td>0</td><td>6</td></tr>
</table>

Pre-requisite: Engineering Mathematics.

Course Objectives:

This course will enable students to:

1. Learn how to prepare Engineering Drawings by Manual Drafting and Computer-Aided Drawings and Practice various methods of drawing Conic Sections & Curves.
2. Learn the principles of Orthographic Projections to show the projections of points, lines and planes effectively.
3. Learn to use the various methods for drawing the projections of solids.
4. Learn to use various methods for drawing the projections of sections of solids and surface developments of solids.
5. Learn to convert orthographic views into isometric views and vice versa.

Module 1

Unit 1: Principles of Engineering Drawing: Introduction to Engineering Drawings, Significance, Introduction to AutoCAD.

Unit 2: Conic Sections: Ellipse – Eccentric Method, Arcs Method, Concentric, Circle Method, Rectangular Method; Parabola – Eccentric Method, Rectangular Method, Tangent Method; Hyperbola – Eccentric Method, Rectangular Hyperbola.

Unit 3: Curves: Cycloid – Epicycloid, Hypocycloid, Involute of Circles.

Unit 4: Scales: Construction of Plain, Diagonal Scales.

Module 2

Unit 1: Principles of Orthographic Projections: Introduction to Orthographic Projections, Conventions.

Unit 2: Projections of Points and Lines: Projections of Points in four Quadrants, Projection of Lines in first quadrant, inclined to both Principle Planes.

Unit 3: Projections of Planes: Projections of Planes in first quadrant and inclined to both Principle Planes for Regular Geometrical Figures – Circle, Square, Rectangle, Triangle, Pentagon, Hexagon.

Module 3

Unit 1: Projections of Solids: Projections of Right Regular Solids – Prisms and Pyramids of Square, Rectangle, Pentagon, Hexagon; Projections of Generated Solids – Cone, Cylinder.

Module 4

Unit 1**: Sections of Solids:** Sectional and Auxiliary Views of Right Regular Solids – Prisms and Pyramids of Pentagon, Hexagon; Generated solids – Cylinder and Cone.

Unit 2: Development of Surfaces of Solids: Surfaces of Right Regular solids – Prism, cylinder pyramid and cone

Module 5

Unit 1: Isometric Projections and Views: Principles of Isometric Projections, Isometric Scale, Isometric Views of Simple and Compound Solids; Conversion of Orthographic Views of simple objects to Isometric Views.

Unit 2: Orthographic Views: Conversion of Isometric Views to Orthographic Views.

(First Angle Projection Convention to be followed)

Note: *Practice of few exercises from Unit I to Unit V using open source AutoCAD software to be considered for Internal Evaluation only.*

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing House,2014.

2. K. Venugopal & V. Prabhu Raja, "Engineering Drawing + Auto CAD", New Age International Publishers. Fifth Edition, 2011.

3. AutoCAD Software Theory and User Manuals

Reference Books:

1. Narayana, K.L. & P Kannaiah, "Text book on Engineering Drawing", Scitech Publishers, 2008

2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH Publication, 2012.

E - Resources:

1. https://nptel.ac.in/courses/112/103/112103019/

2. http://www.autocadtutorials.net/

3. https://urlzs.com/fLJ3T

4. https://urlzs.com/zky46

Course Outcomes:

Students will be able to:

1. Equipped with the basic knowledge of using the drawing instruments and dimensioning practice.
2. Represent any three-dimensional object with two-dimensional drawings and exposed to the visual aspects of lines and planes.
3. Visualize of solids inclined to both the planes.
4. Visualization of sections of solids and their developments.
5. Representation of 3D objects through isometric and orthographic views

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	2	-	-	-	-	-	-	3	-	-
CO2	3	3	2	1	2	-	-	-	-	-	-	3	-	-
CO3	3	3	2	1	2	-	-	-	-	-	-	3	-	-
CO4	3	3	3	1	2	-	-	-	-	-	-	3	-	-
CO5	3	3	3	1	2	-	-	-	-	-	-	3	-	-
Average	**3.0**	**3.0**	**2.4**	**1.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**-**	**-**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS I Year – II Sem**				
Course Code: J120D	**Engineering Chemistry**	**L**	**T**	**P**	**D**	
Credits: 3		**3**	**0**	**0**	**0**	

Pre-Requisites: Nil

Course objectives:

The Student will:

1. To understand the microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. To know the suitability of water for domestic and industrial purposes.
3. To acquire Knowledge about different types of batteries and to understand the concepts of corrosion.
4. To impart the basic knowledge of spectroscopic techniques and molecular energy levels
5. Gain the knowledge of chemical reactions those are used in the synthesis of molecules.

Module 1:

Atomic Structure And Theories Of Bonding: (9L)

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N2, O2, F2, CO and NO. Crystal Field Theory (CFT), Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries.Band structure of solids and effect of doping on conductance.

Module-2:

Water And Its Treatment: (8L)

Introduction – hardness of water – Causes of hardness - Types of hardness- temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler troubles-scale & sludge formation, foaming & priming Boiler feed water and its

treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process.Desalination of water – Reverse osmosis.Numerical problems.

Module–3:

Unit-1:Electro Chemistry **(11L)**

Electrochemical cells – electrode potential, standard electrode potential, Nernst equation, Numerical problems. Types of electrodes – calomel, Quinhydrone and glass electrode.determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Unit-2: **Corrosion**

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods.techniques of coating(applications)-hot dipping, cementation and electroless plating of Nickel.

Module–4: Spectroscopic applications and techniques. **(9L)**

Principles of spectroscopy, molar-extinction co-efficient, types of transitions in UV, selection rules, important terms in UV spectra and applications of electronic spectroscopy.Vibrational spectroscopy-principle, stretching and bending vibrations in IR, selection rule and applications.Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift-factors effecting chemical shift (Electronegativity, Anisotropic effect, Hydrogen Bonding) and spin-spin splitting, coupling constant.Introduction to Magnetic resonance imaging.

Module-5:

Reaction Mechanism And Synthesis Of Drug Molecules: **(7L)**

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions.Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid. Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$.

Unit-2: Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Text Books:

1. P. C. Jain & M. Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. C.N. Banwell, "Fundamentals of Molecular Spectroscopy".
3. K.P.C. Volhardt and N. E. Schore, Organic Chemistry: Structure and Function 5th Edition.
4. B.M. Mahan, Pearson,"University Chemistry", Narosa Publishing house, New Delhi, IV Edition.
5. P.W. Atkins, J.D.Paula, "Physical Chemistry", Oxford 8th edition.

References Books:

1. M.Thirumalacharyand Laxminarayan, "Engineering Chemistry" by Scitech Publications.
2. B. L. Tembe, Kamaluddin and M.S.Krishnan "Engineering Chemistry" NPTEL web book).

3. Stereochemistry of organic compounds by D.Narsipuri published by New age international publishers.

E-Resources:

1. https://www.imnh.isu.edu/digitalatlas/hydr/basics/main/chmtxt
2. https://chem.libretexts.org/Core/.../Electrochemistry/Basics_of_Electrochemistry
3. https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm
4. https://www.scribd.com/document/6668739/Chemical-Energy-Source
5. https://sengerandu.wordpress.com/tutorials/physical-metallurgy/engineering- materials

Course outcome:

1. Acquire the knowledge of atomic, molecular and electronic changes.
2. Apply the various methods used in treatment of water for domestic and industrial purposes.
3. Understand the concepts of electrochemistry and corrosion.
4. Understand the basic concepts of spectroscopy.
5. Learn the major chemical reactions and implement the synthesis of drug molecules

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	1	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	1	-	-	-	-	-	2	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	2	-	-	-	-	-	-	-	-	-
Average	**2.2**	-	-	-	**2.0**	**1.0**	-	-	-	-	-	**2.0**	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – II Sem			
Course Code: J122A	**BASIC ELECTRICAL ENGINEERING**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Introduce the concept of electrical circuits using network laws and theorems.
2. Outline and Analyze single phase A.C and three phase A.C circuits.
3. Study and understand magnetic circuits and transformers.
4. Understand the different types of D.C and A.C rotating electrical machine.
5. Import the knowledge of protection of electrical components and Measuring Instruments.

Module 1:

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with DC excitation. Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

Module 2:

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC series combinations, resonance in series RLC circuit. Three phase balanced circuits, voltage and current relations in star and delta connections.

Module 3:

Transformers: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4:

Rotating Electrical Machines: D.C Motors - principle of operation, characteristics, speed control and application of series and shunt motor. Three-phase induction motor - construction, generation of rotating magnetic fields, principle of operation, torque-slip characteristics. Single-phase induction motor - construction, working, torque-speed characteristic.

Module 5:

Electrical Installations: Components of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables, earthing. Types of batteries, important characteristics for batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

E - Resources:

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://nptel.ac.in/courses/108/105/108105112/
3. https://www.electrical4u.com/

Course outcomes:

The student will be able to:

1. Illustrate and solve electrical circuits using network laws and theorems.
2. Acquire knowledge about the single phase and three phase electrical circuits.
3. Get exposure of magnetic circuits and transformers.
4. Demonstrate the working principle of electrical machines.
5. Introduce components of low voltage electrical installation and applications of Measuring Instruments.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	2	1	-	-	-	-	-	1	1	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	1	-
CO3	3	1	1	-	1	1	-	-	-	-	-	1	1	-
CO4	3	1	1	-	2		-	-	-	-	-	1	1	-
CO5	3	-	-	1	3	2	-	-	-	-	-	1	1	-
Average	**3**	**1.5**	**1.5**	**1**	**1.8**	**1.3**	-	-	-	-	-	**1**	**1**	-

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS I Year – II Sem**			
Course Code: J124A	**Basic Electronics Engineering**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Understand PN junction diode operation, characteristics and applications.
2. Learn Transistor characteristics in various configurations.
3. Gain knowledge on FET & MOSFET operations & Characteristics.
4. Understand the biasing of BJT & FET in various models.
5. Understand fabrication of integrated circuits.

Module 1:

UNIT-1: P-N Junction diode: **(8 hours)**

Construction and working of a P-N junction diode, V-I relationship of a P-N junction diode. (Qualitative analysis only, No Derivation) V-I characteristics of a P-N Junction diode, static and dynamic resistance of a diode , ideal diode, Zener Diode, Avalanche and Zener Breakdowns , V-I characteristics of Zener Diode

UNIT-2: Reciters:

The PN- Junction as a Rectifier Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, rectifier with Capacitor filter and π- Section filter, zener diode as a voltage regulator.

Module 2:

UNIT-I: Special Diodes: **(10 hours)**

Tunnel diode construction and working (using Energy Band diagram) , V-I Characteristics of tunnel diode .Photo diode construction, working and V-I Characteristics, UJT construction, working and V-I Characteristics, SCR construction, working and V-I Characteristics.

UNIT-II: Transistor (BJT) Characteristics

Construction and operation of Bi-Polar Junction Transistor (BJT), Different configurations, current components in a junction Transistor ,V-I characteristics in CB and CE configurations, determination of " α" and " β " of a transistor from the V-I characteristics , relation between " α" and " β " of a transistor .

Module 3:

Field Effect Transistors (FET): **(6 hours)**

Comparison of BJT & JFET, Construction & Operation of JFET, V-I Characteristics of JFET, Determination of FET Parameters from the V-I characteristics. derivation for pinchoff voltage, MOSFET Construction & Operation in Enhancement and Depletion modes, V-I Characteristics of MOSFET.

Module 4:

Biasing and Analysis of Transistor amplifiers: **(10 hours)**

Need for Biasing of transistors, Determination of Quiescent point from the CE characteristics, stability factors S, fixed bias, Self bias, and collector to base bias, quiescent point **Q(V_{ce}, I_c)** and stability factor **S** calculations . H -Parameter equivalent circuit for BJT , Definition & Determination of h-Parameters from CE V-I Characteristics, Analysis of single stage transistor amplifiers (Ai ,Ri , Av , Ro Calculations) for CE,CB,CC Amplifiers Small Signal model for JFET, Self-Bias circuit for FET.

Module 5:

Integrated circuit fabrication process: **(6 hours)**

Basic Monolithic Integrated Circuits, Integrated Resistors, Capacitors & inductors Epitaxial growth Masking and Etching oxidation, diffusion, ion implantation, photolithography.

Monolithic circuit layout, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text Books:

1. Electronic devices and circuits, Millman & Halkias, McGraw Hill.(mandatory).
2. Integrated Electronics, Millman & Halkias, McGraw Hill.

Reference Books:

1. G.Streetman, and S.K.Banerjee, “Solid State Electronic Devices,” 7th edition,

Pearson,2014.

2. D.Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. .T.Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc,1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford

Univ.Press, 2011.

6. Electronc Devices and Circuits, BOYLESTAD.

E - Resources:

1. en.wikipedia.org/wiki/Electronic Devices & Circuits

2. www.modernelectronics.org

3. www.electronicsforyou.com

4. www.npteliitm.ac.in

5.http://books.google.co.in/books?id=sxswmJgMbEsC&pg=PA118&lpg=PR16&ots=DXZAEipuZB&focus=viewport&dq=Electronics+Devices +Circuits -Millman +Halkias

#v=onepage&q= %-%20J.%20Millman%20and%20H.%20Halkias&f=false

6.http://www.youtube.com/watch?v=aO6tA1z9.

Course outcomes:

The student will be able to:

1. Construct different circuits using PN-Junction diode.
2. Analyze working of transistor in different configurations.
3. Operate and study the characteristics of JFET, MOSFET in Enhancement and Depletion Modes.
4. Apply BJT & MOSFET for biasing and analysis using small signal models.
5. Analyze the fabrication process of Integrated circuits.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2							2	2	
CO2	3	3	3	2	2							2	2	
CO3	3	3	3	2	2							2	2	
CO4	3	3	3	2	2							2	2	
CO5	2	3	3	2	2							2	2	
Average	**2.0**	**3.0**	**3.0**	**2.0**	**2.0**							**2.0**	**2.0**	

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – II Sem			
Course Code: J1201	Chemistry Lab	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Intermediate basic concepts.

Course objectives:

The Student will:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. Determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. Synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.
5. Measure the conductance and EMF values of solutions

Experiments:

1. Determination of total hardness of water by complex metric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conduct metric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe^{2+} by Potentiometry using KMnO4
7. Estimation of amount of Cu^{+2} by Colorimetry
8. Estimation of amount of $KMnO_4$ by Colorimetry
9. Synthesis of Aspirin and Paracetamol
10. Determination of acid value of coconut oil
11. Thin layer chromatography calculation of R_f values. egortho and para nitro phenols
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n- butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

Course outcomes:

The student will be able to:

1. Determination of parameters like hardness and chloride content in water.
2. Estimation of rate constant of a reaction from concentration – time relationships.
3. Determination of physical properties like surface tension and viscosity.
4. Calculation of Rf values of some organic molecules by TLC technique
5. Determine the partition coefficient of organic compound in two immiscible liquids.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	2	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**1.2**	-	-	-	-	**2.0**	-	-	-	-	-	**2.0**	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – II Sem			
Course Code: J1221	Basic Electrical Engineering Lab	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Analyze a given network by applying various electrical laws and network theorems.
2. Know the response of electrical circuits for different excitations.
3. Calculate, measure and know the relation between basic electrical parameters.
4. Analyze the performance characteristics of DC and AC electrical machines.

Choice of 10-12 experiments from the following

Experiments:

1. Verification of Ohms Law.
2. Verification of KVL and KCL.
3. Transient response of series RL and RC circuits using DC excitation.
4. Transient response of RLC series circuit using DC excitation.
5. Resonance in series RLC circuit.
6. Calculations and verification of impedance and current of RL, RC and RLC series circuits.
7. B-H loop for single phase transformers.
8. Measurement of voltage, current and real power in primary and secondary circuits of a single phase transformer.
9. Load test on single phase transformer (Calculate Efficiency and Regulation).
10. Three phase transformer: Verification of relationship between voltages and currents (Star-Delta, Delta-Delta, Delta-star, and Star-Star).
11. Measurement of active and reactive power in a balanced three-phase circuit.
12. Performance Characteristics of a DC Shunt Motor.

13. Torque-Speed Characteristics of a DC Shunt Motor.
14. Performance Characteristics of a Three-phase Induction Motor.
15. Torque-speed Characteristics of a Three-phase Induction Motor.

Course outcomes:

The student will be able to:

1. Get an exposure to basic electrical laws.
2. Relate the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters.
4. Inspect the basic characteristics of transformers and electrical machines.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1	1	-	-	-	2	2	-	-	1	-
CO2	3	1	1	1	1	-	-	-	2	2	-	-	1	-
CO3	3	1	-	1	1	-	-	-	2	2	-	-	-	-
CO4	3	1	-	1	1	-	-	-	2	2	-	-	-	-
CO5	3	1	1	1	1	-	-	-	2	2	-	-	1	-
Average	**3.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	-	-	**2.0**	**2.0**	-	-	**1.0**	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – II Sem			
Course Code: J1241	**Basic Electronics Engineering Lab**	**L**	**T**	**P**	**D**
Credits: 1		**0**	**0**	**2**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Learn Color coding of different components like Resistor, capacitor and Inductor.
2. Study basic electronic equipment like CRO, RPS, Function generator etc
3. Observe characteristics of electronic devices
4. Calculate various parameter of rectifier circuits
5. Get the Knowledge Frequency Response of various Amplifier circuits

PART A: (Only for Viva-voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions) :

1. Identification, Specifications, Testing of R, L, C Components (Color Codes),

Potentiometers,

Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB‘s

2.Identification, Specifications and Testing of Active Devices, Diodes, BJT‘s, Low power

JFET‘s, MOSFET‘s, Power Transistors, LED‘s, LCD‘s, SCR, UJT.

3. Study and operation of

Multimeters (Analog and Digital)

Function Generator

Regulated Power Supplies .CRO.

PART B: (For Laboratory Examination – Minimum of 10 experiments)

1. Forward & Reverse Bias Characteristics of PN Junction Diode.

2. Zener diode characteristics and Zener as voltage Regulator.

3. Input & Output Characteristics of Transistor in CB Configuration.

4. Input & Output Characteristics of Transistor in CE Configuration.

5. Half Wave Rectifier with & without filters

6. Full Wave Rectifier with & without filters

7. FET characteristics

8. Measurement of h parameters of transistor in CB, CE, CC configurations

9. Frequency Response of CC Amplifier.

10. Frequency Response of CE Amplifier.

11. Frequency Response of Common Source FET amplifier

12. SCR characteristics.

13. UJT Characteristics

Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30 V

2. CRO‘s - 0-20 MHz.

3. Function Generators - 0-1 MHz.

4. Multimeters

5. Decade Resistance Boxes.

6. Decade Capacitance Boxes

7. Ammeters (Analog or Digital) - 0-20 µA, 0-50µA, 0-100µA, 0-200µA, 0-10 mA.

8. Voltmeters (Analog or Digital) -0-50V, 0-100V, 0-250V

9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs,

UJTs,FETs, LEDs, MOSFETs,diodes Ge& Sitype,Transistors – npn,pnp type).

Course outcomes:

The student will be able to:

1. Calculate value of Resistor, capacitor and Inductor using colour coding
2. Measure voltage, frequency and phase of any waveform using CRO.
3. Generate sine, square and triangular waveforms with required frequency and amplitude using function generator
4. Analyze the characteristics of different electronic devices such as diodes, transistors etc., and simple circuits like rectifiers, amplifiers , etc
5. Analyze Frequency Response of various Amplifier circuits

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	-	2	-	-	-	-	-	-	-	2	2	-
CO2	2	-	-	2	-	-	-	-	-	-	-	2	2	-
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	-
CO4	3	3	3	3	2	-	-	-	-	-	-	2	2	-
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	-
Average	**2.6**	**3.0**	**3.0**	**3.0**	**2.0**	-	-	-	-	-	-	**2.0**	**2.0**	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – II Sem			
Course Code: J1292	Engineering and IT Workshop Lab	L	T	P	D
Credits: 2		0	0	4	0

Pre-Requisites: Basic knowledge about tools and different trades

Course objectives:

The Student will:

1. Develop understanding of various Engineering materials and Manufacturing processes
2. Know different tools used in Carpentry, fitting, tin smithy, house wiring, welding, foundry, machine shop and black smithy.
3. Develop Engineering Skill in making components, system integration and assembly to form a useful product.
4. Study/demonstrate the concepts of computer w.r.t. it's hardware.
5. Install the operating system and perform various tasks.

Trades for Practice (Minimum 1 Exercise from each category)

1. Carpentry
2. Fitting shop
3. Tin Smithy
4. Electrical house wiring
5. Foundry practices – mould preparation
6. Welding (Arc Welding)

Trades for Demonstration

1. Black Smithy
2. Machine shop

IT Workshop

1. a. Computer Hardware: Identification of Peripherals

b. Study of UPS and SMPS

2. a. Assembling and disassembling of a PC

b. Simple diagnostic exercises – Related to hardware

3. a. Installation of Windows Operating System

b. Installation of Linux Operating System

4. a. Basic Windows and Linux Commands

b. Simple diagnostic exercises –Related to Operating System.

Course outcomes:

The student will be able to:

1. Understand trades and techniques used in Workshop, chooses the best material/ manufacturing process
2. Use Apt tools for different engineering applications following precautionary measures.
3. Gain different skills of manufacturing and importance of dimensional accuracies and dimensional tolerances in assembling of various components.
4. Identify, assemble and dissemble the given configuration of a computer.
5. Install the operating system in the given configuration of a computer and execute commands for LINUX Operating System.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	2	2	2	3	-	-
CO2	-	-	-	-	-	-	-	-	2	2	2	3	-	-
CO3	-	-	-	-	-	-	-	-	2	2	2	3	-	-
CO4	-	-	-	-	-	-	-	-	2	2	2	3	-	-
CO5	-	-	-	-	-	-	-	-	2	2	2	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.0**	**2.0**	**3.0**	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS I Year – II Sem			
Course Code: J12M1	Environmental Sciences	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Study about the different natural resources available and how to use them.
2. Explain about biodiversity.
3. Discuss about Global Environmental Problems and Global Efforts.
4. Identify the global environmental problems.
5. Explain about sustainable development.

Module 1:

Unit 1: Ecosystems & Natural Resources, **Biodiversity:** Concept, Classification of Resources: Water resources, Land resources, land degradation, Forest resources, Mineral resources, Energy resources. Concept of ecosystem, Classification of ecosystem, Functions of ecosystem. Biodiversity, Level, values, hotspots of biodiversity, Threats To Biodiversity, Conservation Of Biodiversity.

Module 2:

Unit 1: Global Environmental Problems and Global Efforts: Deforestation, Green house effect, Global Warming, Sea level rise, Ozone depletion. International conventions/protocols: green-belt-development, Concept of Green Building, Clean Development Mechanism (CDM).

Unit 2: Environmental Impact Assessment (EIA) And Environmental Management Plan: Definition of Impact, classification of impacts, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society, impact assessment methodologies. Environmental management plan (EMP).

Module 3:

Unit 1: Environmental Policy, Legislation, Rules And Regulations: Environmental Protection Act: Air (Prevention and control of pollution) Act-1981, Water (Prevention and control of pollution) Act-1974, Forest Conservation Act**.**

Unit 2: Towards Sustainable Future: Concept of Sustainable Development, Threats to Sustainability, Strategies for achieving Sustainable development, Environmental Ethics, Environmental Economics, Concept of Green Computing.

Text Books:

1. Text Book Of Environmental Science and Technology by M.Anji Reddy2007
2. Principles of Environmental Science and Engineering by P.Venugopal Rao.
3. Introduction to Environmental Studies by K.Mukkanti
4. Text book of Environmental studies by Kaushik&Anubha kaushik

Reference Books:

1. Tata McgrawHill : Introduction to Environmental Studies by Benny Joseph
2. Environmental Studies by Erach Bharucha 2005, University Grants Commission, University Press.

E - Resources:

1. https://nptel.ac.in/courses/120/108/120108004/

Course outcomes:

The Student will be able to:

1. Compare the different natural resources available and how to use them.
2. Describe about biodiversity.
3. Analyze the Global Environmental Problems and Global Efforts.
4. Categorize the global environmental problems.
5. Prioritize the Sustainable development.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO2	-	-	-	-	-	3	3	-	-	-	-	2	1	1
CO3	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO4	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO5	-	-	-	-	-	3	3	-	-	-	-	2	2	1
Average	**1.8**	**1.8**	**1.2**	**1.2**	**-**	**1.2**	**1.8**	**-**	**-**	**-**	**-**	**1.4**	**1.8**	**1**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS II Year – I Sem**			
Course Code: J210B	**Probability and Statistics**	**L**	**T**	**P**	**D**
Credits: 4		**3**	**1**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. The concepts of discrete and continuous random variables, the probability distribution and density function.
2. Evaluation of marginal and conditional distribution of multiple random variables.
3. The concept of correlation and regression to find covariance.
4. Evaluation of the given data for appropriate test of hypothesis.
5. Analyzing the data for variance.

Module 1:

Single Random Variables: (9L)

Introduction to probability, Random Variables, Discrete and Continuous. Probability distributions, mass function/ density function of a probability distribution, mathematical expectation, moments about origin, central moments. Moment generating function of probability distribution.

Module 2:

Probability Distributions: (10L)

Binomial, Poisson, Normal, exponential distributions -their Properties. Moment generating functions of the above distributions and hence find the mean and variance. Joint probability distributions- Joint probability mass /density function, Marginal probability, mass / density functions.

Module 3:

Correlation & Regression Sampling Distributions (10L)

UNIT I : Correlation: Types of Correlation, Coefficient of correlation, the rank correlation, Covariance of two random variables. Regression- Regression Coefficient, The lines of regression and multiple correlation & regression

UNIT II: Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means ,sampling distribution of variance and sampling distribution of proportions Parameter estimation- Point estimation and interval estimation

Module 4:

Testing of Hypothesis – I **(10L)**

UNIT I: Testing of hypothesis: Null hypothesis, Alternate hypothesis, Type I& Type II errors – critical region, confidence interval, and Level of significance. One sided test, Two sided test.

UNIT II: Large sample tests:

(i) Test of Equality of means of two samples, equality of sample mean and population mean (cases ofknown variance & unknown variance, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii) Tests of significance difference between sample proportion and population proportion, difference between two sample proportions

Module 5:

Testing of Hypothesis – II: **(9L)**

Student t-distribution, its properties and applications, test of significance sample mean and population mean, difference between means of two small samples. Snedecor's F- distribution and its properties. Test of equality of two population variances. Chi-square distribution, its properties, Chi-square test of goodness of fit, Chi-square test for independence & applications of attributes

Text Books:

1. S.C.Gupta and V.K.Kapoor : Fundamentals of Mathematical Statistics, 2006
2. Kantiswarup, P.K.Gupta and Manmohan Singh : Operations Research, S.Chand& Co, 2010.

Reference Books:

1. R. A. Johnson: Miller and Freund's Probability and Statistics for Engineers, Pearson Publishers, 9th Edition, 2017
2. Freund: Modern elementary statistics, PHI, 2006
3. Probability and Statistics for Engineers by Richard Arnold Johnson, Irwin Miller and John E. Freund, New Delhi, Prentice Hall

E-resources:

1. https://nptel.ac.in/courses/117/104/117104117/
2. https://en.wikipedia.org/wiki/Probability_distribution
3. http://www.randomservices.org/random/sample/Covariance.html
4. https://nptel.ac.in/content/storage2/courses/103106120/LectureNotes/Lec3_1.pdf
5. https://www.smartbugmedia.com/blog/hypotheses-worth-testing-on-your-website

Course outcomes:

The students will be able to

1. Understand the concept of probability and statistics.
2. Find the mean and variance of a given probability distribution.
3. Find the coefficient of correlation and lines of regression.
4. Test the hypothesis for large samples.
5. Test the hypothesis for small samples.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO2	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO4	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO5	3	1	2	2	-	-	-	-	-	-	-	1	-	-
Average	**3.0**	**1.0**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**-**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS II Year – I Sem**			
Course Code: J215A	**Data Structures**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. C Programming.

Course objectives:

The Student will:

1. Implement the different linked list operations.
2. Understand the fundamentals and applications of linked list, stacks and queues.
3. Classify different types of tree data structures
4. Understand the concepts of graph data structures.
5. Identify the importance of pattern matching algorithms in text matching.

Module 1:

Basic concepts - Algorithm Specification, Data Abstraction, Performance analysis - time complexity and space complexity, Asymptotic Notation - Big O, Omega and Theta notations, Introduction to Linear and Non Linear data structures.

Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circular linked list implementation, doubly linked list implementation, insertion, deletion and searching operations. Applications of linked lists.

Module 2:

Stacks-Operations, array and linked representations of stacks, stack applications-infix to postfix conversion, postfix expression evaluation, recursion implementation.

Queues-operations, array and linked representations. Circular Queue operations, Dequeue, applications of queue.

Module 3:

Trees – Terminology, Representation of Trees, Binary tree ADT, Properties of Binary Trees, Binary Tree Representations-array and linked representations, Binary Tree traversals, Threaded binary trees, Binary Heap-Properties, Max and Min Heap, Operations-Insertion and Deletion.

Search Trees-Binary Search tree, Tree traversals, AVL tree – operations, B-tree – operations, B+ trees, Red Black tree.

Module 4:

Graphs-Terminology, sequential and linked representation, graph traversals: Depth First Search & Breadth First Search implementation. Spanning trees, Prims and Kruskals method.

Searching and Sorting - Linear Search, Binary Search, Insertion Sort, Selection Sort, Merge Sort, Quick sort, Heap Sort.

Module 5:

Hashing-Hash table, Hash table representations, hash functions, collision resolution techniques-separate chaining, open addressing-linear probing, quadratic probing, double hashing, Re hashing, Extendible hashing,

Pattern matching : Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm.

Textbooks:

1. Data Structures Using C, Reema Thareja, Oxford University Press, 2011 Learning.
2. Introduction to Algorithms, TH Cormen, PHI

Reference Books:

1. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
2. Design methods and analysis of Algorithms, SK Basu, PHI.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

E - Resources:

1. http://masterraghu.com/subjects/Datastructures/ebooks/rema%20thareja.pdf.
2. https://www.slideshare.net/adisesha12/data-structure-ppt-138483078
3. https://lecturenotes.in/subject/81/data-structure-using-c-ds
4. http://www.tutorialspoint.com/data_structures_algorithms
4. http://www.geeksforgeeks.org/data-structures/
5. http://www.coursera.org/specializations/data-structures-algorithms

Course outcomes:

The student will be able to:

1. Demonstrate operations like searching, insertion, deletion, traversing mechanism using linked list.
2. Use linear data structures like stacks and queues
3. Differentiate different types of tree data structures.
4. Implement the concepts of graph data structures.
5. Apply the pattern matching Techniques for string matching.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	2
CO5	3	1	-	-	-	-	-	-	-	-	-	-	-	2
Average	**2.8**	**1.4**	-	-	-	-	-	-	-	-	-	-	-	**2.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – I Sem			
Course Code: J216A	Database Management Systems	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: A course on "Data Structures".

Course objectives:

The Student will:

1. Understanding of the architecture and functioning of database management systems as well as associated tools and techniques.
2. Understand and apply the principles of data modeling using entity relationship and develop a good database design.
3. Understand the use of structured query language (SQL) and its syntax.
4. Apply normalization techniques to normalize a database.
5. Understand the need of database processing and learn techniques for controlling the consequences of concurrent data access.

Module 1:

Unit I: Introduction

Database System Applications, Database Systems Vs File Systems, View of Data-Data Abstraction, Instances and Schemas.Data Models – The ER Model, Relational Model, Other Data Models. Database Languages – DDL, DML. Database Access for Applications Programs, Data Base Users and Administrator, Transaction Management, Data Base System Structure, Storage Manager, The Query Processor.

Unit 2: Database Design and ER-Diagrams

Beyond ER Design, Entities, Attributes and Entity Sets,Relationships and Relationship Sets, Additional Features of ERModel, Conceptual Design with the ER Model.

Module 2:

Unit 1: The Relational Model

Introduction to the Relational Model,Integrity Constraints Over Relations, Enforcing Integrity Constraints, Querying Relational Data,Logical Database Design,Introduction to Views, Destroying /Altering Tables and Views.

Unit 2: Relational Algebra and Calculus

Relation Algebra-Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries.Relational Calculus – Tuple Relational Calculus, Domain Relational Calculus, Expressive Power of Algebra and Calculus.

Module 3:

Unit 1: SQL Queries

Form of Basic SQL Query, Examples of Basic SQL Queries, Union, Intersect and Except. Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators. Aggregative Operators, Null Values, Comparison Using Null Values, Logical Connectives AND, OR and NOT, Impact on SQL Constructs, Outer Joins, Disallowing Null Values. Complex Integrity Constraints in SQL, Triggers and Active Databases.

Unit 2: Schema Refinement: Problems Caused by Redundancy, Decompositions, Problem Related to Decomposition, Reasoning about FDs. Normal Forms-First, Second, Third Normal Forms, BCNF. Lossless Join Decomposition – Dependency Preserving Decomposition, Schema Refinement in Data Base Design, Multi Valued Dependencies, Forth Normal Form.

Module 4:

Unit 1: Transaction Management

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, testing for Serializability. Lock –Based Protocols, Timestamp- Based Protocols, Validation- Based Protocols, Multiple Granularity.

Unit 2: Recovery System

Failure Classification, Storage Structure, Recovery and Atomicity**,** Log- Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advance Recovery Techniques, Remote Backup Systems.

Module 5

Unit 1: Storage and Indexing

Data On External Storage,File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index Data Structures, Hash Based Indexing, Tree Base Indexing, Comparison of File Organizations, Indexes and Performance.

Unit 2:Tree Structured Indexing

Intuitions for Tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. **Data Base Management Systems**, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. **Data base System Concepts**, Silberschatz, Korth, McGraw hill, V edition.

Reference Books:

1. **Data base Systems design,** Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. **Fundamentals of Database Systems,** Elmasri Navrate Pearson Education
3. **Introduction to Database Systems,** C.J.Date Pearson Education.

E - Resources:

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs15/
2. https://www.alljntuworld.in/download/database-management-system-dbms-materials-notes/

Course outcomes:

The Students will be able to:

1. Describe basic concepts of database system.
2. Design a data model and schemas in RDBMS.
3. Use RDBMS for developing industry applications.
4. Be competent in use of structured query language SQL.
5. Analyze functional dependencies for designing a robust database

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	3	-
CO3	-	2	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	2	-	3	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	3	-	-	-	-	-	-	-	3	-
Average	**2.5**	**2.0**	**3.0**	**2.3**	**3.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**-**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – I Sem			
Course Code: J21DA	Mathematics for Data Science	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites : Nil

Course Objectives: To learn

1. Finding a basis of vector space
2. Determine orthogonality in inner product spaces
3. Able to reduce the computation time on matrix operations and make the system easier to solve.
4. To predict the value of dependent variable based on an independent variable
5. To study the basic components of an ***optimization*** problem

Module-1:Linear Algebra

System of linear equations-matrices-solving systems of linear equations-vector spaces-linear independence-Basis and rank- linear mappings-Affine spaces

Module-2:Analytic Geometry

Norms-Inner product spaces-lengths and distances-angles and orthogonality-Orthonormal Basis-Orthogonal componenet-Inner product of functions-orthogonal projections

Module-3: Matrix Decomposition

Determinant and trace-Eigen values and Eigen vectors-Cholesky Decomposition-Eigen decomposition and Diagonalization-singular value decomposition-matrix approximation-matrx phylogeny

Module-4:Linear Regression

Problem Formulation-parameter estimation-Bayesian linear regression-Maximum likelihood as orthogonal projection

Module-5: Optimization

Unconstrained optimization; Necessary and sufficiency conditions for optima; Gradient descent methods; Constrained optimization, KKT conditions; Introduction to non-gradient techniques; Introduction to least squares optimization; Optimization view of machine learning. Introduction to Data Science Methods: Linear regression as an exemplar function approximation problem; Linear classification problems.

TEXT BOOKS:

1. David G. Luenberger . Optimization by Vector Space Methods, John Wiley & Sons (NY), 1969.
2. Mathematics for machine learning,Marc PeterDeisenroth ,A. Aldo Faisal ,Cheng Soon Ong

REFERENCES:

1. G. Strang . Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA, 2016

2. Advanced Engineering Mathematics by Jain and S.R.K. Iyangar, NarosaPublicationsG. Strang .Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA, 2016.

3 .Bendat, J. S. and A. G. Piersol. Random Data: Analysis and Measurement Procedures. 4th Edition.John Wiley & Sons, Inc., NY, USA, 2010

4. Montgomery, D. C. and G. C. Runger. Applied Statistics and Probability for Engineers.5th Edition. John Wiley & Sons, Inc., NY, USA, 2011.

Course outcomes:

At the end of this course students will be able to

1. Find the basis of vector space
2. Solvematrix operationsby using matrix decomposition
3. Solve matrix operation in easier way
4. Predict the relationship between two variables
5. Apply optimization techniquesin problems of Engineering and Technology.

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS II Year – I Sem**			
Course Code: J215D	**Python Programming**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. Need basic knowledge about computer.
2. Need Basic understanding of Programming language.

Course objectives:

The Student will:

1. Design and program Python applications.
2. Use lists, tuples, and dictionaries in Python programs.
3. Learn to identify Python object types, Components, decision statements, pass arguments in Python.
4. Build and package Python modules for reusability, design object oriented programs with Python classes, use class inheritance in Python for reusability.
5. Use exception handling in Python applications for error handling.

Module 1:

Programming paradigms; Structured programming vs object oriented programming, OOPs fundamentals- class, object, abstraction, encapsulation, polymorphism, and inheritance; Introduction to Python Getting started to Python- an interpreted high level language, interactive mode and script mode. Variables, Expressions and Statements Values and types, Variables and keywords, statements, evaluating expressions, operators and operands, order of operations, composition. Functions function calls, type conversion, type coercion, pre-defined functions, composition, user define functions, flow of execution, passing parameters, function parameters and scope. Conditionals and recursion modulus operator, Boolean expression, logical operators, conditional execution, alternative execution, chained and nested conditionals, return statement; Recursion, infinite recursion.

Module 2:

Python data structures Strings Creating, initializing and accessing the elements; String operators, comparing strings using relational operators; String functions and methods. **Lists:** Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements; List operations; List functions and Methods, list parameters, nested lists, Matrices.

Dictionaries

Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, dictionary operations traversing, appending, updating and deleting elements, Dictionary functions and methods.

Tuples

Mutability and tuples, Immutable concept, creating, initializing and accessing the elements in a tuple, Tuple functions.

Set: operations and methods**, Frozenset**: operations and methods

Module 3:

Object oriented programming using Python: creating python classes, classes and objects: user defined compound types, objects are mutable, copying; Access modifiers, classes and functions: pure function, modifiers, Classes and methods: object oriented features, optional arguments, initialization method, operator overloading and polymorphism.

Inheritance: Basic Inheritance: extending built-ins, overriding and super; Multiple inheritance: the diamond problem;

Module 4:

Exceptions: raising exceptions, handling exceptions, exception hierarchy.

Regular Expressions, match, search & replace function, Regular Expression modifiers, Special Character Classes, Repetition Cases, Non-greedy repetition grouping with Parentheses Back-references Anchors.

Module 5:

Files handling and Exceptions: Text files, writing variables, Directories, Pickling;

Database Programming in Python: Connection module, connect MySQL Data base, perform DDL, DML and DQL operations.

Introduction to Machine Learning With Python ,Tasks in Machine Learning Using Python, Applications of Python Machine Learning.

Text Books:

1. **Python 3 Object Oriented Programming,** Dusty Phillips, Packet Publishing, 2010.

2. **Programming in Python 3 -** A complete Introduction to the Python Language- Second Edition, Mark Summerfield, Addison-Wesley 2010.

3. Introduction to Machine Learning with Python: A Guide for Data Scientists Book by Andreas C. Müller and Sarah Guido Publisher(s): O'Reilly Media, Inc.

Reference Books:

1. **Programming Python- 4th Edition**, Mark Lutz, O'Reilly, 2011.

2. **Object-Oriented Programming in Python**, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

E - Resources:

1. https://www.youtube.com/watch?v=MLP1v80yU14
2. https://pythonprogramming.net/functions-python-3-basics-tutorial/
3. https://www.youtube.com/watch?v=QGLNQwfTO2w
4. https://www.youtube.com/watch?v=ZDa-Z5JzLYM
5. https://www.youtube.com/watch?v=M-t4ILRHnxE

Course outcomes:

The Student will be able to:

1. Explain basic principles of Python programming language
2. Analyze the use of lists, tuples, and dictionaries in Python programs.
3. Implement object oriented concepts in Python, and how to use exception handling in Python applications for error handling.
4. Demonstrates how to achieve reusability using inheritance, interfaces and packages.
5. Explain how to read and write files in Python and evaluate different database operations.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	3	-	-	-	-	-	-	-	-	1	2
CO4	3	2	1	2	-	-	-	-	-	-	-	-	-	3
CO5	3	2	2	2	-	-	-	-	-	-	-	-	-	3
Average	3.0	2.0	1.8	2.2	-	-	-	-	-	-	-	-	1.5	2.4

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – I Sem			
Course Code: J21M1	Gender Sensitization	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites: Nil

Course objectives:

The Student will:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.

Module 1:

UNDERSTANDING GENDER AND BIOLOGY-1

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction.Preparing for Womanhood.Growing up Male.First lessons in Caste.Different Masculinities.

Module 2:

UNDERSTANDING GENDER AND BIOLOGY-2

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)

Declining Sex Ratio.Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many?Struggles with Discrimination.

Module 3:

GENDER AND LABOUR

Housework: The Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction.Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Module 4:

ISSUES OF VIOLENCE-1

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim- "I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

Module 5:

JUST RELATIONSHIPS: BEING TOGETHER AS EQUALS

Mary Kom and Onler, love and acid just do not mix, love letters, mothers and fathers- further reading: Rosa Parks-The braveheart.

Course outcomes:

The student will be able to:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Average	-	-	-	-	-	-	-	-	-	2.0	2.0	1.0	-	-

AY 2021-22 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – I Sem			
Course Code:J2151	DATA STRUCTURES LAB	L	T	P	D
Credits: 1		0	0	2	0

-Requisites:

1. The Algorithmic Design and Techniques.

2. One programming language like C.

Course objectives:

The Student will:

1. Define the basic data structures like linked list.
2. Understand the fundamentals and applications of linked list, stacks and queues.
3. Classify different types of tree data structures
4. Understand the concepts of graph data structures.
5. Know the fundamentals of basic searching, sorting and pattern matching algorithms.

Experiment 1:

Write a C program that uses functions to perform the following operations on singly linked list:

I) Creation II) Insertion III) Deletion IV) Traversal V) merge two single linked lists

Experiment 2:

Write a C program that uses functions to perform the following operations on doubly linked list.

I) Creation II) Insertion III) Deletion IV) Traversal

Experiment 3:

Write a C program that implement stack operations using

I) Arrays II) Linked Lists

Experiment 4:

I) Write a C program to convert infix expression to postfix expression using stack

II) Write a C program to evaluate postfix expression

Experiment 5:

I) Programs using recursion

II)Write a C program to convert infix expression to prefix expression using stack

Experiment 6:

Write a C program to implement Linear queue using

I) Arrays   II) Linked Lists

Experiment 7:

Write a C program to perform following operations on a circular Queue

I) insertion II) deletion III) search and count

Experiment 8:

Write a C program to perform following operations on a circular DeQueue

I)insertion II) deletion III) search and count

Experiment 9:

I) Write a C Program to implement binary tree traversals

II) Write a C Program to implement AVL tree operations

Experiment 10:

I) Implementation of a Graph representation using Adjacency Matrix

II) Write a C program to implement graph traversals.

Experiment 11:

I) Write a C program to implement Linear search

II) Write a C program to implement Binary Search

Experiment 12:

I) Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:

I) I) Bubble sort II) Selection sort III) Insertion Sort

Experiment 13:

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:

I) Merge sort   II) Quick sort

Experiment 14:

I) Write a C Program to Implement the Hashing technique

II) Write a C Program to Implement the KMP Pattern Searching Algorithm

Course outcomes:

The Student will be able to:

1. Demonstrate operations like searching, insertion, deletion, traversing mechanism using linked list.
2. Use linear and non-linear data structures like stacks, queues etc.
3. Implement different types of tree data structures.
4. Implement the concepts of graph data structures.
5. Apply the basic searching, sorting and pattern matching Techniques.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	1	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	1	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	1	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	1	-	-	-	-	2
Average	**3.0**	**2.0**	-	-	-	-	-	-	**1.2**	-	-	-	-	**2.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – I Sem			
Course Code: J2161	**Database Management Systems Lab**	**L**	**T**	**P**	**D**
Credits: 1.5		**0**	**0**	**3**	**0**

Requisites: Nil

Course objectives:

The Student will:

1. Familiarize with the nuances of database environments towards an information- oriented data-processing oriented framework.
2. Gain a good formal foundation on the relational model of data present sql and procedural interfaces to Sql comprehensively.
3. Gain an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design and to motivate the Student to relate all these to one or more commercial product environments as they relate to the developer tasks.
4. Present the concepts and techniques relating to query processing by sql engines and present the concepts and techniques relating to ODBC and its implementations.
5. Introduce the concepts of transactions and transaction processing and to present the issues and

Experiment – 1.

E-R Model: Analyze the Problem with the entities which identify data persisted in the database which contains entities, attributes**.**

Experiment – 2.

Concept design with E-R Model

.Experiment – 3.

Relational Model

Experiment – 4.

Normalization

Experiment - 5.

Installation of Mysql and Practicing DDL and DML commands

Experiment – 7

Querying using Aggregate functions, GROUP BY,HAVING and creation and dropping of views

Experiment – 8.

Create tables for the following schema. Student(snum: integer, sname: string, major: string, level: string, age: integer) Class(name: string, meets at: time, room: string, fid: integer) Enrolled(snum: integer, cname: string) Faculty(fid: integer, fname: string, deptid: integer)

Experiment – 9.Querying

1. Find the names of all Juniors (Level = JR) who are enrolled in a class taught by I. Teacher.
2. Find the age of the oldest student who is either a History major or is enrolled in a course taught by I. Teacher.
3. Find the names of all classes that either meet in room R128 or have 5 or more **Student** enrolled.
4. Find the names of all **Student** who are enrolled in two classes that meet at the same time.
5. Find the names of faculty members who teach in every room in which some class is taught.
6. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than 5
7. Print the Level and the average age of **Student** for that Level, for each Level.
8. Print the Level and the average age of **Student** for that Level, for all Levels except JR. 9
9. Print the Level and the average age of **Student** for that Level, whose average age is greater than 20.
10. Find the names of **Student** who are enrolled in the maximum number of classes.
11. Find the names of **Student** who are not enrolled in any class.
12. Count the number of junior level **Student**.
13. Display all the**Student** whose names starts with the letter “p”.
14. Display all the teachers whose names contain letter ‘a’ or ‘I’ in their names.

Experiment – 10. Procedures

Experiment – 11.CASE STUDY E-R MODEL: GENERAL HOSPITAL

Course outcomes:

The student will be able to:

1. Acquire the underlying concepts of database technologies
2. ssDesign and implement a database schema for a given problem-domain
3. Apply Normalization to a database.
4. Populate and query a database using SQL DML/DDL commands.
5. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	3	2	3	1	-	-	-	-	-	2	2	-
CO2	3	3	2	2	2	1	-	-	-	-	-	2	-	-
CO3	3	3	2	3	3	1	-	-	-	-	-	-	2	-
CO4	2	3	3	2	2	-	-	-	-	-	-	2	2	-
CO5	2	2	2	2	2	-	-	-	-	-	-	2	2	-
Average	**2.6**	**2.6**	**2.4**	**2.2**	**2.4**	**1.0**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.0**	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – I Sem			
Course Code: J2153	Python Programming Lab	L	T	P	D
Credits:1.5		0	0	3	0

Pre-Requisites:

1. Need basic knowledge about how to operate computer.
2. Need Basic understanding of how to write code for Programming language.

Course objectives:

The Student will:

1. Implement Basic input /output operations with various Data Types supported by python.
2. Develop functions for code reusability and experiment string manipulation operations with the use of inbuilt functions.
3. Create a python program for experimenting list, tuple and dictionary
4. Demonstrate Class and objects to make use of object oriented programming concepts.
5. Implement File handling operations to access the contents of file

Experiment 1.

i. Write a python program to obtain user input data (int, float, string) and display.

ii. Write a python program to find the roots of a quadratic equation

iii. Write a python program to perform arithmetic operations (+, -, *, /, %) for given input values and printout the result values.

Experiment 2.

i. Write a python programs that use both recursive and non-recursive functions to find the factorial of a given integer

ii. Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements.

iii. (Assignment statement); Taking input (using raw input () and input ()) and displaying output (print statement); Putting Comments.

Experiment 3.

i. Write python programs to perform operation on Strings using following functions: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase.

ii. Enter the details of 5 **Student** and display the details sequentially.

Experiment 4.

i. Write python programs to perform List operators: (joining, list slices)

ii. Write python programs to perform List functions: len, insert, append, extend, sort, remove, and reverse, pop.

iii. Write python programs to check whether the string is palindrome or not?

Experiment 5.

i. Write python programs to perform Tuple functions: cmp(), len(), max(), min(), tuple()

ii. Write python programs to check whether the word is present in the tuple or not?

iii. Write python programs to Take a string as ("1234567890") and create a pair {(1,2),(3,4),(5,6),(7,8),(9,0)} using tuple.

Experiment 6.

i. Write python programs to perform Dictionary functions & Methods: cmp, len, clear (), get(), has_key(), items(),keys(), update(), values() .

ii. Write python programs to Create a list of animal using dictionary variable "animal" and find out if the specific animal present in the list or not?

Experiment 7.

i. Write a python program to create a class, its objects and accessing attributes.

ii. Create a Customer class and check the balance and withdraw and deposit some amount.

Experiment 8. Write a python script to implement exception handling.

i. Check whether the input no is integer or not.

ii. Handel the exceptions that are come at the time of division.

Experiment 9. Write a python script to perform inheritance.

Experiment 10. Write a python script to perform various FILE handling operations.

Open, close, read, write, copy.

Experiment 11.

i. Write a python script to connect to the database and perform DDL operations.

ii. Create table, insert data into table and display the table data.

Experiment 12. Write a python script to connect to the database and perform various DML and DQL operations.

Text Books:

1. **Programming in Python 3-** A complete Introduction to the Python Language- Second Edition, Mark Summerfiels, Addison-Wesley 2010.

2. **Programming Python-** 4th Edition, Mark Lutz, O'Reilly, 2011.

Reference books:

1. **Object-Oriented Programming in Python**, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

E - Resources:

1. https://www.tutorialspoint.com/python3/python_strings.htm

2. https://www.youtube.com/watch?v=yCH9CUiXrP0

3. https://www.youtube.com/watch?v=RSl87lqOXDE

4. https://www.youtube.com/watch?v=bSZtsYYwFS0

Course outcomes:

The Student will be able to:

1. Apply Basic input /output operations for working with different data types in python.

2. Design functions for achieving code reusability and string manipulations.

3. Create a python program for implementing list, tuple dictionary.

4. Demonstrate Class and objects

5. Implement File handling operation

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	2	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	3	-	-	-	-	-	-	-	-	1	2
CO4	3	2	1	2	-	-	-	-	-	-	-	-	-	3
CO5	3	2	2	2	-	-	-	-	-	-	-	-	-	3
Average	**3.0**	**2.0**	**1.8**	**2.2**	**2.0**	-	-	-	-	-	-	-	**1.5**	**2.4**

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td>B.Tech: AI&DS
II Year – II Sem</td></tr>
<tr><td>Course Code:
J225B</td><td rowspan="2">Operating Systems</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Programming for Problem solving, Data structures and Algorithms (not mandatory).
2. Computer Organization

Course objectives:

The Student will:

1. Understand the basic concepts and functions of computer operating systems.
2. Apply the concurrency control among the operating system programs execution.
3. Demonstrate the techniques used to manage the memory during program execution.
4. Explain the various storage management methods and functions of operating systems.
5. Design the security features against attacks on operating system.

Module 1:

Basic Concepts

Overview: OS Introduction, Computer Systems Organization, Computer System Architecture, Operating System Architecture, Resource Management, Virtualization, Distributed Systems, Open-source operating system.

Operating System Structures: Systems Calls, System services, Linkers and Loaders, Operating System Design and Implementation, Operating System structure, Building and Booting an Operating System.

Module 2:

Process Management

Process Concepts: Introduction, Process Scheduling, Interprocess Communication, Communication in Client-Server systems, Thread concepts, Multithreading Model, Scheduling Criteria, Scheduling Algorithms, Algorithm Evaluation.

Process Synchronization: Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization, System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Module 3:

Memory Management

Main Memory: Background, Contiguous Memory Allocation, Paging, Page-Table Structure, Swapping, Segmentation.

Virtual Memory: Background, Demand Paging, Page Replacement Algorithms, Frames Allocation, Thrashing.

Module 4:

Storage Management

File system Management: File Concepts, Access Methods and Directory Structure, File Protection, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery

Mass-Storage Structure: Overview, Disk Scheduling, Storage Device Management, Swap-Space Management, Storage Attachment, RAID Structure.

Module 5:

Security and Protection

Security: Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Case Studies: Windows 10.

Protection: Goals of Protection, Principles of Protection, Protection Rings, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Role-based Access Control, Capability-Based Systems, Language Based Protection.

Text Books:

1. **Operating System Concepts-Abraham Silberchatz**, Peter B. Galvin, Greg Gagne, 7th Edition, John Wiley.
2. **Operating Systems- A Concept based Approach**-D.M.Dhamdhere, 2nd Edition, TMH.

Reference Books:

1. **Principles of Operating Systems-Naresh Chauhan,** Oxford Higher Education.
2. **Operating System A Design Approach**-Crowley, TMH.
3. **Modern Operating Systems**-Andrew S Tanenbaum, 2nd Edition Pearson, PHI.

E - Resources:

1. https: // www.tutorialspoint .com/operating_system/
2. https: // www.studytonight.com/operating-system/
3. https: // learn.saylor.com/course/view.php?id=948&sectioned=967
4. https: //nptel.ac.in/courses/106/105/106105214/
5. https://www.edx.org/course/computer-hardware-and-operating-systems

Course outcomes:

The student will be able to:

1. Compare differing structures of operating systems including process management.
2. Apply different CPU scheduling algorithms and various Memory management techniques.
3. Illustrate the use of Bankers algorithm for deadlock avoidance and File system organization.
4. Demonstrate various mass storage management techniques.
5. Analyze different aspects of protection and security concepts.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	3
CO3	3	2	3	-	-	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	2
Average	**2.8**	**2.2**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – II Sem			
CourseCode: J225K	Introduction To Data Mining	L	T	P	D
Credits: 2		3	0	0	0

Pre-Requisites:

Basic knowledge in **DBMS**

Course objectives:

The Student will:

1. Introduce the basic concepts and techniques in building a Data Warehouse.
2. Apply pre-processing techniques for any given raw data.
3. Implement and apply basic algorithms for finding frequent patterns in transactional databases.
4. Implement and apply basic algorithms for supervised and unsupervised learning.
5. Discuss an overview of mining complex types of data.

Module 1:

Unit 1Introduction:

Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System.

Unit 2 Data Preprocessing:

Need for preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

Module 2:

Unit 1Data Warehouse and OLAP Technology for Data Mining:

Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture,

Unit 2

Data Warehouse Implementation, From Data Warehousing to Data Mining.

Module 3:

Unit 1Mining Frequent Patterns:

Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods

Unit 2Associations and Correlations:

Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Module 4:

Unit 1Classification:

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines.

Unit 2 Prediction:

Simple linear regression, Logistic Regression, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

Module 5:

Unit 1Cluster Analysis Introduction:

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods Clustering ,Outlier Analysis.

Unit 2Mining Complex Types of Data:

Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, MiningText Data and Mining the World Wide Web.

Text books:

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier,2nd Edition, 2006.

2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

Reference book:

1. Data Mining Techniques – Arun K Pujari,2nd edition, Universities Press.

2. Data Warehousing in the Real World – Sam Aanhory & Dennis Murray Pearson Edn Asia.

3. Insight into Data Mining, K.P.Soman, S.Diwakar, V.Ajay, PHI, 2008.

E-Resources:

1. https://drive.google.com/file/d/1KwbqsxdL-R3PoRyf8o4Ewdjm98MOKFJv/view

2. https://onlinecourses.nptel.ac.in/noc18

3. www.vssut.ac.in/lecture_notes/lecture1428550844.pdf

4. www.vssut.ac.in/lecture_notes/lecture1428550844.pdf

Course outcomes:

The Student will be able to:

1. Assess raw input data, and process it to provide suitable input for a range of data mining algorithms.
2. Identify a data warehouse for an organization.
3. Apply Data mining techniques such as characterization, comparison, association.
4. Apply an appropriate data Mining algorithms for classification and clustering from large databases.
5. Demonstrate knowledge on mining complex types of data.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	2	2	-	-	-	-	-	-	-	2	-
CO2	2	2	3	2	2	-	-	-	-	-	-	-	3	-
CO3	2	3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	2	3	2	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	2	1	2	-	-	-	-	-	-	-	2	-
Average	**2.2**	**2.4**	**2.2**	**1.6**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.3**	**1.0**

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
II Year – II Sem</td></tr>
<tr><td>Course Code:
J22D2</td><td rowspan="2">Digital Image Processing</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Course Objectives: The student will

1. Understand fundamental concepts of digital image processing.
2. Analyze images in frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Learn the fundamental dip algorithms and implementation.
5. Gainexperienceinapplyingimageprocessingalgorithmstorealproblems.

Module-1DIGITALIMAGEFUNDAMENTALS:

What is Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception. Point Spread Function (PSF), Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Li near and Nonlinear Operations.

Module-2 IMAGE TRANSFORMS: Two-dimensional Orthogonal & Unitary Transforms, Properties of Unitary Transforms, Two Dimensional Discrete Fourier Transform.

Discrete Cosine Transform, Sine Transform, Hadamard Transform, Haar Transform, Slant Transform, KL transform.

Module-3 IMAGE ENHANCEMENT:

Image enhancement in Spatial Domain, Some Basic Gray Level transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations.

Image Filters, Smoothing, Frequency Domain Filters in frequency domain, Sharpening, Homomorphic Filtering.

Module-4 Model of Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise, Spatial Filtering.

Periodic Noise Reduction by Frequency Domain Filtering, Linear Position- Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Weiner) Filtering.

Module 5:**Color Fundamentals**: Color Models, Pseudo Color Image Processing, Basics of Full Color Image Processing, Color Transformations.

Smoothing and Sharpening, Image Segmentation Based on Color, Noise in Color Images, Color Image Compression.

TEXT BOOKS:

1. "Digital Image Processing", Rafael C.Gonzalez, Richard E. Woods, etal , TMH, 2nd Edition.

REFERENCE BOOKS:

1. "Fundamentals of Digital Image Processing", Anil K. Jain, Pearson Education, 2001.

2. "Digital Image Processing and Analysis", B. Chanda and D. Dutta Majumdar, PHI, 2003.

Course Outcomes:

The Student will be able to:

1. Discuss the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Analyze 2d fourier transform concepts, including the 2d dft and fft, and their use in frequency domain filtering.
3. Interpret the human visual system (hvs) and its affect on image perception and understanding.
4. Describe the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.
5. Analyze programming skills in digital image processing related problem

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – II Sem			
Course Code: J225C	Design and Analysis Of Algorithms	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Knowledge on data structures.

Course objectives:

The Student will:

1. Realize the time and space complexities, asymptotic notations, union and find algorithms, connected components and bi-connected components.
2. Assess divide and conquer and greedy methods of problem solving.
3. Increase skills in exploring and inferring dynamic programming predicaments.
4. Familiar with working out backtracking challenges.
5. Resolve the branch and bound complications and as certain the NP-Hard and NP-Complete Problems

Module 1:

Introduction to algorithms

Algorithm, Pseudo Code for expressing Algorithms, Performance Analysis: Space Complexity, Time Complexity, asymptotic Notations: Big-oh Notation, Omega Notation, Theta Notation, Little-oh Notation.

Disjoint Sets: Disjoint Set Operations, Union and Find Algorithms, Spanning Trees, Connected Components and Biconnected Components.

Module 2:

Divide and Conquer

General Method, Applications: Binary Search, Quick Sort, Merge Sort, Stassen's Matrix Multiplication.

Greedy Method

General Method Applications: Job Sequencing with Deadlines, 0/1 Knapsack Problem, Minimum Cost Spanning Trees: Prim's and Kruskal's Algorithms, Single Source Shortest Path Problem, Huffman Codes.

Module 3:

Dynamic Programming

General Method, Principle of Optimality, Applications: Multistage Graphs, Matrix Chain Multiplication, Optimal Binary Search Trees, 0/1 Knapsack Problem, All Pairs Shortest Path Problem, Travelling Sales Person Problem, Reliability Design.

Module 4:

Backtracking

General Method, Applications: Nqueen Problem, Recursive Permutation Generator, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles.

Module 5:

Branch and Bound

General Method, Applications: Travelling Sales Person Problem, 0/1 Knapsack Problem, LC Branch and Bound Solution, FIFO Branch and Bound Solution.

NP-Hard and NP-Complete Problems: Basic Concepts, Non-Deterministic Algorithms, NP-Hard and NP-Complete Classes, Cook's Theorem.

Text Books:

1. Fundamentals of Computer Algorithms-Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia Publications Pvt. Ltd.

2. Introduction to Algorithms-T.H.Cormen, C.E.Leiserso, R.L.Rivest and C.Stein, 2nd Edition, Pearson Education, PHI Pvt. Ltd.

Reference Books:

1. Algorithm Design: Foundations, Analysis and Internet Examples-M.T.Goodrich and R.Tomassia, John Wiley and Sons.

2. Introduction to Design and Analysis of Algorithms A strategic Approach-R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc-Graw Hill.

3. Design and analysis of Algorithms-S. Sridhar, Oxford Higher Education.

E - Resources:

1. https://nptel.ac.in/courses/106/106/106106131/

2. https://onlinecourses.nptel.ac.in/noc19_cs47/preview

3. http://www.cse.iitd.ernet.in/~ssen/csl356/notes/root.pdf

4. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf

5. https://mrcet.com/downloads/digital_notes/IT/Design%20and%20Analysis%20Algorithms.pdf

Course outcomes:

The Student will be able to:

1. Analyze time complexity and space complexity as well as asymptotic notations for a given algorithm, union and find algorithms, connected components and bi-connectedcomponents.
2. Apply divide and conquer method for solving sorting and searching problems and greedy method to solve variety of problems.
3. Make use of dynamic programming to solve a collection of problems.
4. Utilize backtracking to solve different types of problems.
5. Choose branch and bound to unravel diverse forms of predicaments.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	3	-	-	-	-	-	-	-	-	2	2
CO2	2	3	3	3	-	-	-	-	-	-	-	-	2	2
CO3	3	3	3	3	-	-	-	-	-	-	-	-	2	2
CO4	2	3	3	3	-	-	-	-	-	-	-	-	2	2
CO5	2	3	3	3	-	-	-	-	-	-	-	-	2	2
Average	**2.4**	**2.8**	**2.8**	**3.0**	-	-	-	-	-	-	-	-	**2.0**	**2.0**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS II Year – II Sem**			
Course Code: J22D2	**Data Science Through R Programming**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. Probability and statistics.

Course objectives:

The Student will:

1. Know about the fundamental concepts of Data Science.
2. Explore Data Analysis and the Data Science Process and Linear Regression.
3. Investigate the various methods of Data Analysis.
4. Understand the Basics of R Environment.
5. Develop the Data Science analysis using R programming and Data Visualisation.

Module 1: Introduction to Data Science

Unit 1:

What is Data Science? - Big Data VS Data Science, Datafication, Current landscape of perspectives and Skill sets needed.

Unit 2:

Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model.

Module 2: Exploratory Data Analysis and the Data Science Process.

Unit 1:

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process.

Unit 2:

Simple Linear Regression, Multiple Linear Regression, other Considerations in the Regression Model, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbours.

Module 3: Classification

Unit 1:

An Overview of Classification, Why Not Linear Regression? Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods.

Unit 2:

Cross- Validation and The Bootstrap.

Module 4: The R Environment:

Unit 1:

Command Line interface, R Studio, Installing R Packages. Basics of R:Basic math, variables, data types, vectors, calling function, missing data, data frames, lists, matrices, arrays.

Unit 2:

Reading CSVs, Excel Data.

Base Graphs, ggplot2. Writing R functions, control statements – if and else, switch, compound tests, for loops, while loops.

Module 5: Group manipulation and Data Reshaping

Unit 1:

Apply Family, aggregate, plyr, data.table. Data Reshaping: cbind, rbind, joins, reshape2. Strings:paste, sprint, extracting text, regular expressions.

Doing math and simulations in R: Math Functions: Calculating a Probability, cumulative sums and products, minima and maxima, calculus, sorting, set operations.

Unit 2:

Simulation Programming in R: Built-in-Random Variable generators, obtaining the same random stream in repeated runs, an example to a combinatorial simulation.

Text Books:

1. Gareth James, Daniela Witten, Trevor Hatie, RoberstTibhirani , "An Introduction to Statistical Learning-with Applications in R ",

2. Jared P. Lander, R for Everyone, Addison Wesley Data & Analytics Series, Pearson, 2014.

Reference Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
2. Mark Gardener, "Beginning R: The statistical programming language", 2012.
3. Norman Matloff, The Art of R Programming, No Strach Press, San Francisco 2011.

E-Links:

1. https://nptel.ac.in/courses/106/106/106106179/
2. https://towardsdatascience.com/
3. https://www.r-bloggers.com/

Course outcomes:

The Student will be able to:

1. Analyze the fundamental concepts of Data Science.
2. Evaluate the Data analysis and Data Science Process and Linear Regression.
3. Analyze the various methods of Data Analysis.
4. Apply the Basics of R in its Environment.
5. Evaluate the Data Science analysis using R programming and Data Visualisation.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	-	2	2	-	-	-	-	-	-	-	1	2
CO2	3	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	-	1	2	-	-	-	-	-	-	-	1	2
CO4	1	2	-	1	1	-	-	-	-	-	-	-	1	1
CO5	2	2	-	2	1	-	-	-	-	-	-	-	1	1
Average	**2**	**2.2**		**1.6**	**1.6**								**1.2**	**1.6**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS II Year – II Sem**			
Course Code: J22A3	**Machine Learning**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. A course on Linear Algebra and Advanced Calculus.
2. A course on "Probability and Statistics."
3. A course on "Data structures".

Course Objectives

The student will:

1. Use Models, methods and tools to solve regression, classification, feature selection, dimensionality reduction and density estimation problems.
2. Learn and adapt in supervised, unsupervised and semi-supervised modes of learning.
3. Gain knowledge of recognition, decision making and statistical learning problems.
4. Understand current research topics and issues in machine learning.
5. Conduct and present a literature review on a research topic.

Module 1:

Introduction - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

Module 2:

Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

Module 3:

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm, **Computational learning theory –** Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning

Instance-Based Learning- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning, **Genetic Algorithms** – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Paralleling Genetic Algorithms

Module 4:

Learning Sets of Rules –Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

Module 5:

Combining Inductive and Analytical Learning –Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

Reinforcement Learning –Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming.

Text Books:

1. Machine Learning – Tom M.Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC).

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William whsieh, Cambridge Univ Press.
2. Richard O. Duda. Peter E. Hart and David G. Stork, Pattern classification, John Wiley & Sons Inc., 2001.
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

E - Resources:

1. https://www.slideshare.net/darshanharry/machine-learning-46440299
2. https://news.vidyaacademy.ac.in/wp-content/uploads/2018/10/NotesOnMachineLearningForBTech-1.pdf
3. https://nptel.ac.in/courses/106/106/106106202/

Course Outcomes

The Student will be able to:

1. Summaries on well posed problem, concept learning and various perspectives of machine learning
2. Apply machine learning algorithms such as Decision tree, Artificial Neural Networks to solve real world problems and formulate evaluation hypotheses.
3. Compare and contrast various machine learning methodologies such as Bayesian Learning, Computational learning theory, instance based learning and Genetic algorithms.
4. Implement rule based learning and analytical learning strategies to solve complex problems.
5. Combine inductive learning with analytical learning and deploy Reinforcement learning which supports dynamic programming.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	-	2	-	-	-	-	-	-	-	-	1	2
CO2	-	2	2	2	-	-	-	-	-	-	-	-	-	2
CO3	2	2	-	3	-	-	-	-	-	-	-	-	2	2
CO4	2	3	2	1	-	-	-	-	-	-	-	-	1	2
CO5	2	1	2	2	-	-	-	-	-	-	-	-	2	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	-	-	-	-	-	-	-	-	**1.5**	**2.0**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS II Year – II Sem**			
Course Code: J22M1	**Professional Ethics**	**L**	**T**	**P**	**D**
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. To know the importance of corporate social responsibility and values.
2. To understand ethics as a professional responsibility.
3. Corporate ethical course and ethical audit.
4. To understand importance of values and ethical living.
5. To ensure safety at work place.

Module 1:

Introduction to Ethics

Corporate Governance – importance of Corporate Governance, Ethics & CSR (Corporate Social Responsibility)

Indian and western thoughts on ethics, value education, dimensions of ethics, goal setting importance of morality and ethics, basic ethical principles, moral developments theories, classification of ethical theories.

Module 2:

Professional and professionalism

Introduction to profession, professional associations, professional's roles and professional risks.

Professional accountability, successful professional, ethics and profession, engineering as social experimentation, engineering ethics, roles of engineers, professional responsibilities, professional rights. Professional etiquettes- Dress code, Telephone call, Email writing.

Module 3:

Ethical codes and audits

Introduction, need for ethical codes, sample codes, corporate codes, limitations of the codes. Need for Ethical Audit, Sustainability, Ethical standards, Ethical audit.

Module 4:

Human values and ethical living

Introduction, terminology, domains of learning, human values, attitudes, Behaviour values, attitudes and professionals. Needs of life, harmony in life, what is ethical living, case studies.

Module 5:

Global issues and safety

Introduction, current scenario, business ethics, environmental ethics, computer ethics, media ethics, war ethics, bio-ethics, research ethics, intellectual property right.

Safety and risk, assessment of risk, risk and cost, engineers responsibility for safety, risk benefit, analysis, risk cause and management, case studies, providing for safe exit, ethical issues of safety.

Text Books:

1. Professional ethics by R. Subramanian, Oxford press.
2. Text book on Professional ethics and human values by R.S.Nagarajan, New age international.

Reference Books:

1. Professional ethics and human value by D.R.Kiran, Tata McGraw Hills education.
2. Ethics in engineering by Mike W. Martin and Roland Schinzinger, Tata McGraw Hills education.
3. Fundamental of Ethics by Edmund G Seebauer and Robert L.Barry, Oxford

E-Resources:

1. http://jits.ac.in/humanvalues_professional-ethics/
2. https://www.tutorialspoint.com/engineering_ethics/engineering_ethics_introduction.htm
3. https://www.onlineethics.org/
4. https://onlinecourses.nptel.ac.in/noc19_hs35/preview

Course outcomes:

The student will be able to:

1. Use of ethical values and attitudes in their life.
2. Implement once he/she becomes a professional.
3. Solve the issues related with environment and technology
4. Apply the different types of professional ethical codes in their organization.
5. Use of the rules framed by the auditors.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	-	-	-	-	-	-	3	2	1	-	3	-	-
CO2	1	-	-	-	-	-	-	3	2	-	-	3	-	-
CO3	-	1	-	-	-	-	-	3	2	-	-	3	-	-
CO4	1	-	-	-	-	-	-	3	2	1	-	3	-	-
CO5	1	-	-	-	-	-	-	3	2	1	-	3	-	-
Average	**1.0**	**1.0**	-	-	-	-	-	**3.0**	**2.0**	**1.0**	-	**3.0**	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – II Sem			
CourseCode: J2201	**Soft Skills** (Audit Course)	**L**	**T**	**P**	**D**
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

This course will enable students to:

1. Understand the importance of advanced communication skills.
2. Obtain knowledge on intra personal skills and inter personal skills.
3. Gain knowledge on design thinking.
4. Know about the neuro linguistic programming.
5. Learn about self- concept and self- reliance.

Module 1:

Advanced Communication:

Barriers of Communication Skills – Real-life case studies, Intra personal skills & Inter personal skills-Practical sessions, Adjustability, Adaptability, Change Planning & Management- For Self, Communication skills-debates, practical sessions & public speaking skills, Body language through NLP (neuro linguistic programming) communication.

Module 2:

Design Thinking:

Introduction of Design Thinking, Digitization & Data – Latest Trends in Human Resource,

Thinking Out-of-the Box – Case-study & Activity Based, Dealing with Criticism & Conflict Resolution & Management, Diversity, Social Responsibility, Positive Attitude & Power of Positive Energy.

Module 3:

Self-concept & Self-reliance:

Wheel of Life – Self-assessment & Activities, SWOT Analysis, Johari Window tool, developing a Vision & Action-plan, Emotional Intelligence, Stress & Anger Management, Empathy- Practice Sessions & Role-plays, Time management & Prioritization, Problem solving & Decision-making skills.

Reference books:

1. Dr Alex. K, Soft Skills, New Delhi: S.Chand, 2009.
2. DrRavikanth Rao. K, Dr P. Dinakar. Life Skills Education Paperback, 2016.

E - Resources:

1. https://www.youtube.com/watch?v=Bhf35YngKl4&ab_channel=DanielAlly
2. https://www.youtube.com/watch?v=gHGN6hs2gZY&ab_channel=AJ%26Smart
3. https://www.youtube.com/watch?v=_r0VX-aU_T8&ab_channel=Sprouts.
4. https://www.youtube.com/watch?v=aKGm3nprVA0&t=465s&ab_channel=DreamsAroundTheWorld
5. https://www.youtube.com/watch?v=JXXHqM6RzZQ&ab_channel=SmartDraw
6. https://www.youtube.com/watch?v=Zi4SvpAFRmY&t=309s&ab_channel=CommunicationCoachAlexLyon
7. https://www.youtube.com/watch?v=LgUCyWhJf6s&ab_channel=TheSchoolofLife
8. https://www.youtube.com/watch?v=BsVq5R_F6RA&ab_channel=watchwellcast
9. https://www.youtube.com/watch?v=czh4rmk75jc&ab_channel=WaysToGrow

Course outcomes:

The students will be able to:

1. Use the advance communication skills in daily life.
2. Utilize the importance of positive energy and positive attitude.
3. Handle criticism in a positive way.
4. Use knowledge to take proper decision in life
5. Acquire knowledge on Self-awareness and time management.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	3	-	-	-	-	3	3	-	3	3	-	-
CO2	-	-	2	-	-	-	-	3	3	-	3	3	-	-
CO3	-	-	2	-	-	-	-	3	2	-	3	2	-	-
CO4	-	-	2	-	-	-	-	2	2	-	3	2	-	-
CO5	-	-	2	-	-	-	-	2	2	-	2	1	-	-
Average	-	-	2.2					2.6	2.4		2.8	2.2	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – II Sem			
Course Code: J22A1	Machine Learning Lab	L	T	P	D
Credits: 1.5		0	0	3	0

Pre-Requisites:

1. Linear Algebra
2. Python
3. DAA

Course objectives:

The Student will:

1. Familiarize with ANACONDA framework and JUPYTER IDE.
2. Learn Python Packages like numpy, pands and Matplotlib for data preprocessing and visualization
3. Practice inductive learning algorithms using python.
4. Understand the applications of neural networks and back propagation algorithm.
5. Apply machine learning concepts for Text mining.

Experiment 1: Familiarizing with Anaconda and Jupyter, for importing modules and dependencies for ML

Experiment 2: Familiarization with numpy, Panda and Matplotlib by Loading Dataset in Python.

Experiment 3: Find S algorithm in Python

Experiment 4: Candidate Elimination Algorithm in Python

Experiment 5: ID3 algorithm for Decision Tree in Python

Experiment 6: Demonstration of Logistic Regression using Python.

Experiment 7: Demonstration of Classification using Python.

Experiment 8: Demonstration of Clustering using Python.

Experiment 9: Implementation of SVM using Python.

Experiment 10: Implementation of XOR function using NN and Python.

Experiment 11: Implementation of Back propagation using Python.

Experiment 12: Sentiment Analysis using "Bag of Words" in Python

Experiment 13: Recommender System in Python.

Course objectives:
The Student will be able to:

1. Effectively use ANACONDA framework and JUPYTER IDE.
2. Use Python Packages like numpy, pands and Matplotlib for data preprocessing and visualization
3. Implement inductive learning algorithms using python.
4. Implement the applications of neural networks and back propagation algorithm.
5. Use machine learning concepts for Text mining.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	3
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	3
Average	**2.8**	**2.0**	**2.3**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**2.0**	**2.8**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS II Year – II Sem			
Course Code: J22D1	R Programming Lab	L	T	P	D
Credits: 1.5		0	0	3	0

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Know about the fundamental concepts of Data Science.
2. Explore Data Analysis and the Data Science Process and Linear Regression.
3. Investigate the various methods of Data Analysis.
4. Understand the Basics of R Environment.
5. Develop the Data Science analysis using R programming and Data Visualization.

Experiment 1:R AS CALCULATOR APPLICATION

Write an R script, to create R objects for calculator application.

Experiment 2:DESCRIPTIVE STATISTICS IN R

a. Write an R script to find basic descriptive statistics using summary, str, quartile function on MT cars &cars datasets.

b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.

Experiment 3:READING AND WRITING DIFFERENT TYPES OF DATASETS

a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.

b. Reading Excel data sheet in R.

Experiment 4:VISUALIZATIONS

a. Find the data distributions using box and scatterplot.

b. Find the outliers using plot.

c. Plot the histogram, bar chart and pie chart on sample data.

Experiment 5: CORRELATION AND COVARIANCE

a. Find the correlation matrix.

b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.

c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

Experiment 6: REGRESSION MODEL

Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign),

require (MASS).

Experiment 7:MULTIPLE REGRESSION MODEL

Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.

Experiment 8:REGRESSION MODEL FOR PREDICTION

Apply regression Model techniques to predict the data on above dataset.

Experiment 9:CLASSIFICATION MODEL

a. Install relevant package for classification.

b. Choose classifier for classification problem.

c. Evaluate the performance of classifier.

Experiment 10:CLUSTERING MODEL

a. Clustering algorithms for unsupervised classification.

b. Plot the cluster data using R visualizations.

Course outcomes:

The Student will be able to:

1. Analyze the fundamental concepts of Data Science.
2. Evaluate the Data analysis and Data Science Process and Linear Regression.
3. Analyze the various methods of Data Analysis.
4. Apply the Basics of R in its Environment.
5. Evaluate the Data Science analysis using R programming and Data Visualisation.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	-	2	2	-	-	-	-	-	-	-	1	2
CO2	3	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	-	1	2	-	-	-	-	-	-	-	1	2
CO4	1	2	-	1	1	-	-	-	-	-	-	-	1	1
CO5	2	2	-	2	1	-	-	-	-	-	-	-	1	1
Average	**2**	**2.2**	**-**	**1.6**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.2**	**1.6**

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31EA</td><td rowspan="2">Managerial Economics and
Management Science</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Learn principles and practices of the organization.
2. Learn preparation of balance sheet and accounting standards.
3. Understand the principles of management.
4. Gain knowledge on graphical presentation of improving the quality.
5. Understand the importance of inventory control in the organization.

Module 1:

Introduction to managerial economics, concepts of Managerial Economics: Demand Analysis: Law of Demand, Elasticity of demand & Demand forecasting.

Production & cost Analysis: Production functions, Law of returns, Economies of scale.

Cost concepts: Variable cost, fixed cost, Marginal cost, Semi-variable cost. Break – even analysis.

Module 2:

Market Structures: Different types of Markets.

Pricing: Methods of pricing and Strategies, Skimming and Penetration pricing.

Capital Budgeting: Estimation of fixed and working capital, methods & sources of raising capital. Methods of capital budgeting, Traditional & Discounted Techniques.

Financial Accounting & Financial Analysis: Overview of financial Accounts, Journal, Subsidiary books, Ledger, Trial Balance and preparation of Trading Account, Profit& Loss Account and Balance Sheet. Financial Analysis with the help of Ratios.

Module 3:

Management: Functions of Management, Taylor’s scientific management, Fayol’s principles of management.

Designing of organization structures: Different methods with merits and demerits and their suitability.

Human Recourse Management: Recruitment, Selection, Training and Development and Performance.

Module 4:

Operation Management: Types of plant layout, Methods of production, Work study – procedure involved in Methods study and work Measurement. Statistical quality control. X, R, C & P charts.

Project Management: Program Evaluation & Review Technique (PERT), Critical Path Method (CPM), Identification of critical path.

Module 5:

Material Management: objectives, need for inventory control, EQC, ABC Analysis, VED Analysis, Purchase procedure, Store Management.

Marketing: Functions, Marketing Mix, Marketing strategies based on product life cycle, channels of distribution.

Text books:

1. Managerial Economics & Financial Accounting – Prentice Hall of Inadia: Dr. M. Kasi Reddy, Dr. S. Saraswathi
2. Varshney&Maheswari: Managerial Economics, Sulthan Chand, 2009.
3. P. Subba Rao: Human Recourse Management.

Reference books:

1. AmbrishGuptha, Financial Accounting for Management, Pearson Education, New Delhi, 2009.
2. Naraanaswamy: Financial Accounting – A Managerial Perspective, PHI, 2008.
3. S. N. Maheswari& S. K. Maheswari, Financial Accounting, Vikas, 2008.

E-resources:

1. https://nptel.ac.in/courses/110/101/110101005/
2. https://sites.google.com/site/economicsbasics/
3. http://www.whatishumanresource.com/system/app/pages/search?scope=search-site&q=Compensation+and+Reward+Management

Course outcomes:

The Student will be able to:

1. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.
2. Develop in-depth understanding on continuous process improvement & benchmarking process
3. Learn the applications of quality tools and techniques in both manufacturing and service Industry.
4. Develop in-depth knowledge on various tools and techniques of quality management.
5. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	3	3	-	-	-	-	-	-	-	-	-	-
Average	**2.4**	**2.0**	**2.5**	**2.67**	-	-	-	-	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year – I Sem			
Course Code: J315E	ARTIFICIAL INTELLIGENCE AND IT'S APPLICATIONS	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Mathematics, Probability and statistics
2. Knowledge in programming Language

Course objectives:

The Student will:

1. Know the AI based problems.
2. Illustrate AI techniques for representing the basic problem.
3. Illustrate Advanced AI techniques to solve the problem.
4. Define Learning and explain various learning techniques.
5. Understand the usage expert system.

Module 1:

Introduction to AI, AI Problems, Agents and Environments, Structure of Agents, Problem Solving Agents.

Problem Spaces and Search: Defining the Problem as a State space Search

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. Uninformed Search (Breadth-First, Depth-First Search, Depth A* algorithm, backtracking.

Module 2:

Knowledge Representation Using Predicate Logic, Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution

Basic Knowledge Representation and Reasoning: Propositional Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

Module 3:

Slots and Filler Structures Weak slot and-filler structures: Semantic Nets, Frames, Strong slot-and filler structures: Conceptual dependency, Scripts Knowledge Representation Issues, Non- monotonic Reasoning, Other Knowledge Representation Schemes.

Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

Module 4:
Game Playing Min Max search Procedure, Adding alpha beta cutoffs, Additional Refinements, Iterative Deepening. Goal stack planning, nonlinear planning, Hierarchical planning, representation for planning, partial order planning algorithm.

Learning Concepts: rote learning, learning by taking advices, learning by problem solving, learning from examples, learning by analogy, explanation based learning, neural nets, genetic algorithms Winston's Learning Program, Decision Trees.

Module 5:

Introduction to expert system- Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge, Heuristics, representing and Using Domain Knowledge Shell, Explanation, Knowledge Acquisition.

Introduction to Natural Language Processing Syntactic processing, Semantic Analysis, Discourse and Programmatic Processing, Statistical Natural Language Processing

Text Books:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall,2010

References Books:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition,2009.

2. GeorgeF.Luger,ArtificialIntelligence:StructuresandStrategiesforComplexProblemSolving, Pearson Education, 6th ed.,2009.

E - Resources:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_pdf_version.htm

2. https://www.alljntuworld.in/download/artificial-intelligence-ai-materials-notes/

3. https://drive.google.com/file/d/1mPiI4jy6YkJRDiCT21xgzN0VDNkrW23X/view

4. https://nptel.ac.in/courses/106/105/106105077/

Course outcomes:

The Student will be able to:

1. Identify the AI based problems.
2. Apply AI techniques for representing the basic problem.
3. Apply Advanced AI techniques to solve the problem.
4. Analyze Learning and explain various learning techniques.
5. Illustrate the use of expert system.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	3
Average	**3.0**	**3.0**	**3.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**3.0**

<table>
<tr><td rowspan="1">AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year - I Sem</td></tr>
<tr><td>Course Code:
J31DA</td><td rowspan="2">BIG DATA ANALYTICS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Database Management Systems, Cloud Computing.

Course objectives:

The Student will:

1. Understand the basics of Big Data and Big data Platform
2. Attain the knowledge of Big Data analytics, Approaches and Tools
3. Describe Map Reduce fundamentals and HDFC File system
4. Differentiate between Hadoop and RDBMS concepts
5. Apply analytics on Structured and Unstructured Data.

Module 1:

Big Data Analytics: What is big data, History of Data Management ; Structuring Big Data ; Elements of Big Data ; Big Data Analytics; Distributed and Parallel Computing for Big Data;

Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools

Module 2:

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

Module 3:

Understanding MapReduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop

Introduction of HDFS: Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS

Module 4:

Big Data Technology Landscape and Hadoop : NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors;

HDFC (Hadoop Distributed File System): HDFC Daemons, read,write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN

Module 5:

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools

Text Books:

1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black Book™ , DreamTech Press, 2015 Edition.
3. BUSINESS ANALYTICS 5e , BY Albright |Winston

Reference Books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss,ShakuAtre, " Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, " Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

E - Resources:

1. https://www.coursera.org/learn/big-data-introduction
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. www.upgrad.com/Big-Data

4. https://www.javatpoint.com/what-is-big-data

5. https://www.edx.org/course/big-data-analytics-using-spark

Course Outcomes:

The Student will be able to:

1. Identify the basics of Big Data and its environment
2. Use Big Data analytics Tools and its Approaches
3. Define Map Reduce fundamentals and HDFC Architecture
4. Distinguish between Hadoop and RDBMS concepts
5. Illustrate analytics on Structured and Unstructured Data.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO3	1	2	2	1	2	-	-	-	-	-	1	-	2	2
CO4	1	-	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	-	1	1	-	-	-	-	-	-	-	-	-	-
Average	**1.0**	**1.5**	**1.3**	**1.0**	**2.5**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**2.0**	**2.0**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS III Year – I Sem**			
Course Code: J31AA	**Deep Learning**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Course Objectives:

The Student will :

1. Get introduced to various learning techniques of machine learning and understand differences between machine learning and deep learning
2. Understand and analyze optimization techniques and improvements in learning methods
3. Appreciate, understand and apply neural networks as tools for complete learning problems
4. Investigate and deploy/club multi layer neural networks for learning related to images, text and speech sequences.
5. Appreciate, understand and implement Deep learning in real world practical problems

Module-1 : Introduction to Deep Learning

Introduction to Deep Learning, Brief History of Deep Learning, AI, Machine Learning and Deep Learning, Statistical Learning,

Bayesian Learning, Decision Surfaces, Success stories of Deep Learning

Module-2 : Linear Classifiers

Linear Classifiers, Linear Machines with Hinge Loss, Optimization Techniques, Gradient Descent, Batch Optimization,

Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Module-3 : Neural Network

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Autoencoders, Convolutional Neural Network, Building blocks of CNN, Transfer Learning, LSTM Networks, NN in python

Module-4 : Deep Neural Net

Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization,

Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN, CNN in Python

Module-5: Practical areas of Deep Learning

Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection, Generative Modelling with Deep Learning,

Variational Autoencoder, Generative Adversarial Network, Object recognition with Python

TEXT BOOKS:

1. Deep Learning- Ian Goodfelllow, YoshuaBenjio, Aaron Courville, The MIT Press

2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

REFERENCE BOOK:

1. Deep Learning: A Practitioner's Approach by Josh Patterson & Adam Gibson, OReilly Press
2. Python Deep Learning: Exploring deep learning techniques and neural network architectures with PyTorch, Keras, and TensorFlow, 2nd Edition by Ivan Vasilev, Pakt Publication

Course Outcomes:

The student will be able to:

1. Identify tools of machine learning and deep learning, appropriate to any problems

2. Apply optimization techniques to improve the quality of various learning solutions.

3. Apply and investigate, neural network for complete learning problems.

4. Deploy deep learning methods in the area of multidimensional and sequential inputs.

5. Investigate the scope of implementation of various deep learning techniques in any real world problem.

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS III Year – I Sem**			
Course Code: J31M3	**Software Engineering**	**L**	**T**	**P**	**D**
Credits: 0		**2**	**0**	**0**	**0**

Course objectives:

The Student will:

1. Analyze basic Software engineering methods.
2. Describe software engineering layered technology and Process frame work.
3. Design software architecture and UML modeling
4. Recognize testing approaches such as unit testing and integration testing.
5. Demonstrate software evolution and related issues such as version and risk management.

Module 1:

Introduction to Software Engineering: The evolving role of Software, changing nature of Software, Software Myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

Module 2:

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document**.**

Requirements Engineering Process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System Analysis Models: Context models, behavioral models, data models, object models, structured methods

Module 3:

Design Engineering: Design process and Design quality, Design concepts, the design model.

Creating an architectural design: Software architecture, Data design, Introduction to UML, Importance of modeling, Principle of modeling, Concepts of modeling and architecture.

Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution.

Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

Module 4:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

Metrics for Process and Products: Software Measurement, Metrics for software quality.

Module 5:

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

Text Books:

1. Software Engineering A Practitioner's Approach, Roger S Pressman, 6th edition. McGraw-Hill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson education.

Reference Books:

1. The Unified Modeling Language, User Guide by Grady Booch, James Rambaugh, Ivar Jaccobson.
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://lecturenotes.in/subject/104/software-engineering-se
3. https://www2.cs.siu.edu/~mengxia/Courses%20PPT/435/435ppt.htm

Course outcomes:

The Student will be able to:

1. Compare and Analyze the different Process models
2. Analyze the Requirement Engineering process and System Modeling
3. Apply the systematic procedure for Software design and deployment
4. Compare the various testing and maintenance methods.
5. Evaluate Projects with various Quality standards

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	2	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	2	-	-	3	-	3
CO4	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	2	-	-	-	-	3
Average	**2.8**	**2.4**	-	-	-	-	-	-	**2.0**	-	-	**3.0**	**-**	**2.6**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year – I Sem			
Course Code: J3101	Employability Skills	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites: Nil

Course Objectives:

The Students will:

1. Understand the importance of Listening skills.
2. Learn how reading skills help an individual.
3. Obtain knowledge and practice session on speaking effectively.
4. Understand why proper writing skills are important.
5. Implement business Etiquette in day to day life.

Module 1:

Listening Skills:

The Listening Process, Hearing and Listening, Types of Listening-Superficial Listening-Appreciative Listening-Focused Listening-Evaluative Listening- Attentive Listening-Empathetic Listening, listening with a purpose, Barriers to Listening-Physical Barriers-Psychological Barriers-Linguistic Barriers-Cultural Barriers.

Improving Listening Comprehension

Listening comprehension-Effective Listening Strategies- Listening in Conversational Interaction-Listening to structured talks, Team Listening.

Module 2:

Speaking Skills:

The Speech process-The Message-The Audience- The Speech Style-Encoding- Feedback Conversations and Oral Skills-Body Language-Types of Conversations: Formal and Informal-Strategies for Good Conversation, Improving Fluency and Self-expression- Articulation, good pronunciation-Voice quality- Accent and Intonation Speaking Techniques- Body Language-Eye Contact-Facial Expression-Gesture- Posture and Body Movements.

Speaking Techniques

Techniques to Develop Effective Word Accent- Word Stress, Using Correct Stress -Patterns – Developing Voice Quality-Rhythm in Corrected speech and developing correct tone.

Module 3:

Writing Skills and Business Etiquettes:

Effective Resume writing, Letter writing skills.

Business Etiquettes: Personal Grooming & Behavioral Etiquettes – Event Based Learning Activity, -Facial - Introduction & Role-plays. Personal Values, Developing Values, Cultivating Habits – Real-life cases, Activities.

Reference Books:

1. Rizvi, Ashraf M. Effective Technical communication, New Delhi: Tata McGraw-Hill, 2005.
2. Influencer: The new science of leading change by Joseph Grenny, Kerry Patterson, David Maxfield, Ron McMillan and Al Switzler.
3. Skill with people by Les Gibli

E- Links:

1. https://www.youtube.com/watch?v=JIdPnUFr36g&ab_channel=LearnEnglishLab
2. https://www.youtube.com/watch?v=xrEq1UujOo&ab_channel=LearnEnglishLab
3. https://www.youtube.com/watch?v=srn5jgr9TZo&ab_channel=SimerjeetSingh
4. https://www.youtube.com/watch?v=O0qT4cKwtk&ab_channel=LearnEnglishLab
5. https://www.youtube.com/watch?v=p6qVJ1KhHek&ab_channel=LearnEnglishwithLet%27sTalk-FreeEnglishLessons.
6. https://www.youtube.com/watch?v=I4uL5mkcAJc&ab_channel=LearnEnglishwithLet%27sTalk-FreeEnglishLessonsLearnEnglishwithLet%27sTalk-FreeEnglishLessonsVerified

Course Objectives:

The Student will be able to:

1. Understand the importance of Listening skills.
2. Learn how reading skills help an individual.
3. Obtain knowledge and practice session on speaking effectively.
4. Understand why proper writing skills are important.
5. Implement business Etiquette in day to day life.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	3	-	-	-	-	3	3	-	3	3	-	-
CO2	-	-	2	-	-	-	-	3	3	-	3	3	-	-
CO3	-	-	2	-	-	-	-	3	2	-	3	2	-	-
CO4	-	-	2	-	-	-	-	2	2	-	3	2	-	-
CO5	-	-	2	-	-	-	-	2	2	-	2	1	-	-
Average	-	-	2.2	-	-	-	-	2.6	2.4	-	2.8	2.2	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year – I Sem			
Course Code: J31A1	Deep Learning Lab	L	T	P	D
Credits: 2		0	0	4	0

Pre-Requisites:

1. Python Programming
2. Mathematics for Machine Learning
3. Machine Learning

Course objectives:

The student will:

1. Design and analyze the performance of various deep learning architectures
2. Investigate and deploy/club multi-layer neural networks for learning related to image categorization, object detection and segmentation.
3. Understand how optimization techniques can be incorporated to improve performance of deep learning techniques
4. Visualize the results obtained in Intermediate/hidden layers of neural nets.
5. Familiarize with cloud-based computing tools like Google Collab.

Lab Experiments:

Experiment 1:

Basic image processing operations : Histogram equalization, thresholding, edge detection, data augmentation, morphological operations

Experiment 2:

Implement SVM/SoftMax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network

Experiment 3:

Study the effect of batch normalization and dropout in neural network classifier

Experiment 4:

Familiarization of image labelling tools for object detection, segmentation

Experiment 5:

Image segmentation using Mask RCNN, UNet, SegNet

Experiment 6:

Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)

Experiment 7:

Image Captioning with Vanilla RNNs

Experiment 8:

Image Captioning with LSTMs

Experiment 9:

Network Visualization: Saliency maps, Class Visualization

Experiment 10:

Generative Adversarial Networks

Experiment 11:

Chatbot using bi-directional LSTMs

Experiment 12:

Familiarization of cloud-based computing like Google colab

Course outcomes:

The student will be able to:

1. Implement and compare the performance metrics of various deep learning architectures.
2. Implement multi-layer neural networks for learning related to image categorization, object detection and segmentation.
3. Apply optimization techniques to improve performance of deep learning techniques
4. Interpret the results obtained in intermediate/hidden layers of neural nets.
5. Use google collab to accelerate training speed of deep learning algorithms.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	2	-	-	-	-	-	-	-	-	1	3
CO2	-	2	2	1	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	3	-	-	-	-	-	-	-	-	2	2
CO4	2	3	2	1	-	-	-	-	-	-	-	-	1	2
CO5	2	1	2	2	-	-	-	-	-	-	-	-	2	2
Average	**2.3**	**2.3**	**2.0**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**2.2**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS III Year - I Sem**

		L	T	P	D
CourseCode: J31D1	**Big Data Analytics Lab**	**L**	**T**	**P**	**D**
Credits: 2		**0**	**0**	**4**	**0**

Pre-Requisites:

1. Database Management Systems, Cloud Computing.

Course objectives:

The student will:

1. Know about the business decisions and create competitive advantage with Big data analytics
2. Study the java concepts required for developing map reduce programs.
3. Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
4. Recognize the programming tools PIG and HIVE in Hadoop eco system.
5. Analyze the best practices for Hadoop development.

List of Experiments

1. Installation of VMWare to setup the Hadoop environment and its ecosystems.
2. A) Perform setting up and Installing Hadoop in its three operating modes.

   i. Standalone. ii. Pseudo distributed. iii. Fully distributed.

   B) Use web based tools to monitor your Hadoop setup.
3. Implementing the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.
4. Implement the following file management tasks in Hadoop:

   i. Adding files and directories ii. Retrieving files iii. Deleting files
5. Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
6. Implement matrix multiplication with Hadoop Map Reduce
7. Installation of PIG.
8. Write Pig Latin scripts sort, group, join, project, and filter your data.

9. A) Run the Pig Latin Scripts to find Word Count.

   B) Run the Pig Latin Scripts to find a max temp for each and every year.

10. A) Installation of HIVE.

B) Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Case Study Experiment:

11. Write a Map Reduce program that mines weather data.

Reference Books:

1. Jay Liebowitz, ―Big Data and Business Analytics Laboratory, CRC Press.

Software And Hardware Requirements:

- SOFTWARE: JDK, VM Ware, Apache - Pig, Hive, Hadoop
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard diskwith Windows and Linux Operating Systems.

Course Outcomes:

The student will be able to:

1. Optimize business decisions and create competitive advantage with Big data analytics
2. Practice java concepts required for developing map reduce programs.
3. Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
4. Practice programming tools PIG and HIVE in Hadoop eco system.
5. Implement best practices for Hadoop development.

Pre-Requisites:

1. A course on "Computer Networks".
2. A course on "Operating Systems".
3. A course on "Data base management systems

At the end of the course, students will:

1. Acquaint students with a fundamental understanding of the Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

<table>
<tr><td rowspan="1">AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year / II Sem</td></tr>
<tr><td>Course Code:
J325L</td><td rowspan="2">CLOUD COMPUTING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td></td><td>0</td></tr>
</table>

Module 1:

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and Mapreduce.

Module 2:

Cloud Platforms in the Industry, Understanding Scientific Applications for Cloud Environments, cloud applications.

Healthcare and education, Scientific Applications, Business and Consumer Applications.

Module 3:

Virtualization, cloud virtualization technology, deep dive: cloud virtualization, migrating in to cloud computing.

Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems.

Module 4:

Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

Module 5:

Cloud management, Organizational Readiness and change management in the cloud age, Cloud Security, Data security in the cloud, Legal Issues in the Cloud , Achieving Production Readiness for the cloud Services.

Text Books:

1. Cloud Computing: Raj Kumar Buyya , James Broberg, andrzej Goscinski, 2013 Wiley.
2. Cloud computing: Dr Kumar Saurab Wiley India 2011.

Reference Books:

1. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-and-Paradigms.pdf
3. https://www.alljntuworld.in/download/cloud-computing-cc-materials-notes/
4. https://www.slideshare.net/jeetraj17/cloud-computing-it703-unit-1-5

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	1	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	**1.7**	-	-	-	-	-	-	-	**2.0**	**2.0**

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year – II Sem</td></tr>
<tr><td>Course Code: J326J</td><td rowspan="2" colspan="4">Automata and Compiler Design</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course objectives:

The students will:

1. Illustrate different phases of compilation.
2. Describe the steps and algorithms used by language translators and features.
3. Enumerate top down and bottom up parsing techniques used in compilation process.
4. Learn the syntax directed translation and type checking and learning the effectiveness of optimization.
5. Develop algorithms to generate code for a target machine.

Module 1:

Formal Language and Regular Expressions: Languages, Definition Language regular expressions, FiniteAutomata-DFA, NFA

Conversions: Conversion of regular expression to NFA, NFA to DFA, Epsilon NFA to NFA, Epsilon NFA to DFA, Phases of compilation, Lexical Analyzer generator(LEX).

Module 2:

Top down parsers: Context free grammars, derivation, parse trees, Ambiguity, LL (K) Grammars and LL (1) parsing.

Bottom up parsers: Bottom up parsing-SR parsing, LR Parsing-SLR,CLR and LALR Parsers, YACC tool.

Module 3:

Semantics analysis: Syntax directed translation, S-attributed and L-attributed grammars, and Intermediatecode forms-AST, Polish notation, three address codes.

Type checking: Type checking, type conversions, equivalence of type expressions,

Overloading of functions and operations. Context sensitive features- Chomsky hierarchy of languages and recognizers.

Module 4:

Symbol table: Symbol table format, organization of symbol table-Linear, hashing, tree.

Storage allocation: Activation record, Runtime stacks and heap allocation

Module 5:

Code optimization: Principal sources of optimization, basic blocks, flow graphs, data flow analysis of flow graphs, peephole optimization.

Code generation: Machine dependent code generation, object code forms, generic code

generation algorithm, register allocation and assignment using DAG representation of Block.

TEXT BOOKS:

1. Compilers Principles, Techniques & Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi and

Jeffery D. Ullman, Pearson Addison Wesley Education, Second Edition.

2. Modern Compiler Implementation in C, Andrew N. Appel, Cambridge University Press.

REFERENCE BOOKS:

1. Lex&yacc , John R. Levine, Tony Mason, Doug Brown, O‟reilly

2. Modern Compiler Design, Dick Grune, Henry E. BAL, Cariel T. H. Jacobs, Wiley dreamtech.

3. Engineering a Compiler, Cooper & Linda, Elsevier.

4. Compiler Construction, Louden, Thomson.

5. Systems Programming and Operating Systems, D

E - Resources:

1. www.tutorialpoint.com
2. www.greekforgreeks.com
3. https://www.javatpoint.com/compiler-tutorial

Course outcomes:

The Student will be able to:

1. Analyze phases of compilation, particularly lexical analysis, parsing, semantic

   analysis and code generation.

2. Construct parsing tables for different types of parsing techniques.
3. Classify the Semantic Analysis and Intermediate code generation phase.
4. Apply code optimization techniques to different programming languages.
5. Generate object code for natural language representations.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	1	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**3.0**	**2.0**	**1.0**	**1.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**-**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year – II Sem			
Course Code: J325M	Information Security	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Computer Networks.

Course objectives:

The Student will:

1. Define about security goals, security attacks, security services and security mechanism.
2. Describe conventional encryption algorithms& public-key encryption algorithms, digital Signature and issues of key Management
3. Explain authentication application & discuss how PGP and S/MIME can provide security services for e-mail.
4. Discuss IP security, Web Security.
5. Discuss system level security issues include threats, Intruders, Intrusion detection system and firewalls.

Module 1:

Introduction: Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs.

Understanding Attacks: Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

Module 2:

Symmetric Encryption and Message Authentication: Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution.

Public-Key Cryptography and Message Authentication: Approaches of Message Authentication, Secure Hash Functions and HMAC Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management.

Module 3:

Authentication Applications: Kerberos, X.509 Directory Authentication Service.

Electronic Mail Security: Pretty Good Privacy (PGP) and Secure /Multipurpose Internet Mail Extension (S/MIME)

Module 4:

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Module 5:

Network Management Security: Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3.

System Security: Intruders, Viruses and related threats. Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

Text Books:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech

Reference Books:

1. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson.

E - Resources:

1. WilliamStallings.com/Crypto3e.html
2. WilliamStallings.com/StudentSupport.html
3. https://nptel.ac.in/courses/106/106/106106129/
4. https://notes.specworld.in/information-security-pdf-notes-is-pdf-notes/

Course outcomes:

The Student will be able to:

1. Analyze the security goals, security attacks, security services and security mechanism, cryptography.
2. Compare how conventional encryption algorithms &public key cryptography can be used to ensure the Identity of the sender of an encrypted message.
3. Identify authentication application & discuss how PGP and S/MIME can provide security services for e-mail.
4. Identify IP security, Web security using Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).
5. Apply system level security includes threats, Intruders, Intrusion detection System and Firewalls.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	2	2	-	2	-	-	-	-	-	2
CO2	3	3	2	2	-	-	-	-	-	-	-	-	-	2
CO3	2	2	1	-	-	-	-	-	-	-	-	-	-	1
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	1
CO5	2	2	1	-	-	-	-	-	-	-	-	-	-	1
Average	**2.2**	**2.2**	**1.4**	**2.0**	**2.0**	**2.0**		**2.0**						**1.4**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year – II Sem			
Course Code: J32M2	**Cyber Security**	**L**	**T**	**P**	**D**
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites: Nil

Course objectives:

The Student will:

1. Recognize cybercrimes and how they are planned
2. Identify the vulnerabilities of mobile and wireless devices
3. Examine the crimes in mobile and wireless devices and Acts.
4. Understand about Computer Forensics
5. Explored to Cyber Security- Organizational Implications

Module 1:

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Module 2

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

Module 3:

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Module 4:

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Module 5:

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

E-Resources:

1. https://lecturenotes.in/subject/611/cyber-security .
2. https://www.slideshare.net/AvaniPatel61/ppt-on-cyber-security .
3. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

Course outcomes:

The Student will be able to:

1. Demonstrate cybercrimes and how they are planned
2. Develop a framework to secure Mobile and wireless devices
3. Interpret crimes and Acts related to mobile and wireless devices
4. Memorize Computer Forensics and its related matters
5. Identify Cyber Security-Organizational Implications

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	-	2	-	1	-	-	-	-	-	-	-	-
CO2	2	-	3	2	-	-	-	-	-	-	-	-	3	1
CO3	-	2	-	2	-	-	-	-	-	-	-	-	-	2
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5		2	-	-	-	2	-	-	-	-	-	-	-	-
Average	**2.0**	**2.3**	**3.0**	**2.0**	-	**1.5**	-	-	-	-	-	-	**3.0**	**1.5**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year - II Sem			
Course Code: J32D1	**Data Science Through Python Lab**	**L**	**T**	**P**	**D**
Credits: 1		**0**	**0**	**2**	**0**

Pre-Requisites:

Basic Programming Knowledge, Database Management system, Python Programming.

Course Objectives:

The Student will:

1. Study the need for data science and solve basic problems using Python built-in data types and their methods.
2. Know about the application with user-defined modules and packages using OOP concept
3. Identify the efficient storage and data operations using NumPy arrays.
4. Recognize the powerful data manipulations using Pandas.
5. Classify about data Preprocessing and visualization using Pandas

LIST OF EXPERIMENTS

1. Implement basic Python programs for reading input from console.
   a) Perform Creation, indexing, slicing, concatenation and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, Set
   b) Solve problems using decision and looping statements.
   c) Apply Python built-in data types: Strings, List, Tuples, Dictionary, Set and their methods to solve any given problem
   d) Handle numerical operations using math and random number functions
   e) Create user-defined functions with different types of function arguments.
2. Solve problems using Class declaration and Object creation & OOP concepts like Data hiding and abstraction.
3. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
4. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.

5. Computation on NumPy arrays using Universal Functions and Mathematical methods.
6. Import a CSV file and perform various Statistical and Comparison operations on rows/columns.
7. Load an image file and do crop and flip operation using NumPy Indexing.
8. Create Pandas Series and Data Frame from various inputs.

Case Study Experiments:

9. Import any CSV file to Pandas Data Frame and perform the following:

(a) Visualize the first and last 10 records

(b) Get the shape, index and column details

(c) Select/Delete the records(rows)/columns based on conditions.

(d) Perform ranking and sorting operations.

(e) Do required statistical operations on the given columns.

(f) Find the count and uniqueness of the given categorical values.

(g) Rename single/multiple columns.

10. Import any CSV file to Pandas Data Frame and perform the following:

(a) Handle missing data by detecting and dropping/ filling missing values.

(b) Transform data using apply() and map() method.

(c) Detect and filter outliers.

(d) Perform Vectorized String operations on Pandas Series.

(e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

Text Books:

1. Y. Daniel Liang, “Introduction to Programming using Python”, Pearson,2012.
2. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O’Reilly, 2nd Edition,2018.
3. Jake VanderPlas, “Python Data Science Handbook: Essential Tools for Working with Data”, O’Reilly, 2017.

Reference Books:

1. Wesley J. Chun, “Core Python Programming”, Prentice Hall,2006.
2. Mark Lutz, “Learning Python”, O’Reilly, 4th Edition, 2009.

Software And Hardware Requirements:

- SOFTWARE: Python pre-installed, Anaconda Navigator with all python libraries.
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard diskwith Windows System.

E - Resources:

1. **https://www.programmer-books.com/introducing-data-science-pdf/**
2. **https://www.edx.org/course/python-basics-for-data-science**
3. **https://www.edx.org/course/analyzing-data-with-python**
4. **https://www.coursera.org/learn/python-plotting?specialization=data-science-python**

Course Outcomes:

At the end of the course, Student will be able to:

1. Identify the need for data science and solve basic problems using Python built-in data types and their methods.
2. Design an application with user-defined modules and packages using OOP concept
3. Employ efficient storage and data operations using NumPy arrays.
4. Apply powerful data manipulations using Pandas.
5. Do data Preprocessing and visualization using Pandas

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	-	3	-	-	-	-	-	-	-	3	-
CO2	2	3	2	-	3	-	-	-	-	-	-	3	2	-
CO3	3	2	-	-	2	-	-	-	-	-	-	2	2	-
CO4	2	3	-	-	3	-	-	-	-	-	-	3	2	-
CO5	3	2	3	-	3	-	-	-	-	-	-	2	2	-
Average	**2.4**	**2.4**	**1.0**	**-**	**2.8**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.2**	**-**

<table>
<tr><td rowspan="1">AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year – II Sem</td></tr>
<tr><td>Course Code:
J3201</td><td rowspan="2">Life Skills & Professional Skills Lab</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 2</td><td>0</td><td>0</td><td>4</td><td>0</td></tr>
</table>

Pre requisites: Nil

Course Objectives:

Students will learn to:

1. Understand importance of self-assessment and awareness.
2. Recognize the emotional needs of themselves and others.
3. Define social skills and need of positive vibe.
4. Employ Leadership Traits and skills in day to day life.
5. Quantify the importance of Thinking out of Box, Creativity and Innovation.

Module 1:

Self-Introduction and Practice Session-Importance of Communication Skills-Advance communication skills needed for effective communication-Self-assessment and self-awareness with required tools and Activity based approach.

Module 2:

Empathy Practice Sessions & Role-plays -Assertive Behaviour-Emotional Intelligence-Conflict Resolution and Anger Management.

Module 3:

Social skills and how to handle criticism-Social Interaction Skills – Role-plays- Diversity & Social Responsibility- Positive Attitude- Power of Positive Energy.

Module 4:

Leadership-Traits & skill-Activities – Case Studies-Assessments - Team Building skills –Activities –Case studies on Interaction with industry people.

Module 5: Thinking Out-of-the Box – Case-study & Activity Based- Creativity & Innovation- Developing a Vision & Action-plan - Thinking Skills – Various Types of Thinking - Power of Questioning Skills– Practice Sessions & Role plays

Reference Books:

1. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.
2. Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
3. Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.

Course Outcomes:

On completion of the course, the students will be able to:

1. Recognize importance of self-awareness and assessment.
2. Translate the needs of others and themselves.
3. Practice being social and possess positive energy.
4. Employ leadership Traits and skills in day to day life.
5. Understand the importance of Thinking- out- of - the-Box.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1									2	3		3		
CO2									2	3		3		
CO3									2	3		3		
CO4									2	3		3		
CO5									2	3		3		
Average									2	3		3		

AY2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS IV Year– I Sem**			
Course Code: J41AA	**Reinforcement Learning**	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-Requisites:

Knowledge on Python, Calculus, Linear Algebra, Probability and Statistics and Foundations of Machine Learning.

Course Objectives:

The Student will:

1. Learn about Basics of Reinforcement Learning.
2. Achieve knowledge in Tabular based solutions.
3. Expand their knowledge in Function approximation solutions.
4. Familiar with Model based Reinforcement Learning.
5. Realize the Meta learning.

Module 1:Introduction to RL:

RL task formulation - action space, state space, environment definition

Module 2: Tabular based solutions:

Tabular based solutions - dynamic programming, Monte Carlo, temporal-difference

Module 3: Function approximation solutions

Function approximation solutions **-** Deep Q-networks**,** Policy gradient from basic –REINFORCE, towards advanced topics **-** proximal policy optimization, deep deterministic policy gradient, etc.

Module 4: Model-based reinforcement learning

Model-based reinforcement learning, Imitation learning - behavioral cloning, inverse RL, generative adversarial imitation learning.

Module 5: Meta-learning

Meta-learning, Multi-agent learning, partial observable environments

Reference Books:

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019

2. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).

3. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012): 3.

4. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach. "PearsonEducation Limited, 2016.

5. Goodfellow, Ian, YoshuaBengio, and Aaron Courville. "Deep learning." MIT press, 2016.

6. David Silver's course on Reinforcement Learning (link)

E-Resources:

1. https://www.geeksforgeeks.org/what-is-reinforcement-learning/

2. https://en.wikipedia.org/wiki/Reinforcement_learning

3. https://www.javatpoint.com/reinforcement-learning

4. https://deepsense.ai/what-is-reinforcement-learning-the-complete-guide/

Course Outcomes:

The Student will be able to:

1. Describe Reinforcement Learning concepts for solving different types of problems.

2. Relate Tabular based solutions for cracking glitches.

3. Utilize Function approximation solutions for resolving complications.

4. Use Model based RL to unravel variety of issues.

5. Apply Meta learning to work out distinctive varieties of set backs.

CO-PO/PSO Mapping Chart(3/2/1indicatesstrengthofcorrelation) 3–Strong; 2– Medium;1 -Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	2	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	2	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	2	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	2	-	-	2	2	2
CO5	3	3	3	3	3	-	-	-	2	-	-	2	2	2
Average	3.0	3.0	3.0	3.0	3.0	-	-	-	2.0	-	-	2.0	2.0	2.0

AY2020-21 onwards	**J.B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS IV Year– I Sem**			
Course Code: J41A1	**Reinforcement Learning Lab**	**L**	**T**	**P**	**D**
Credits:2		**0**	**0**	**4**	**0**

Pre-Requisites:

Knowledge on Machine Learning & Deep Learning.

Course Objectives:

The Student will:

1. Learn about Basics of Reinforcement Learning
2. Achieve knowledge in Reinforcement Learning
3. Expand their knowledge in Reinforcement Learning
4. Familiar with Automatic Parking Policies.
5. Realize the Automatic Parking Policies.

1. The Automatic Parking Policies: In this lab you will begin by running yourself in a simple automatic parking policies experiment to see how you approach the task. Then we will attempt to model our data using some simple reinforcement learning models.

Experiment 1:

Write a short summary, in words, of the strategy that you used? Did you notice anything about the task? How do you think the rewards were generated?

Experiment 2:

Using your own data (see above) inspect the data frame. What do you think the columns mean? Write a short markdown cell which summarizes it for you for future reference.

Experiment 3:

Make a plot of the reward values from automatic parking policies over time. These are stored in the columns called 'reward0' and so on.

Experiment 4:

Make a plot of the best resp for each trial of the task.

Experiment 5:

Make a plot showing if you choose the reward "maximizing" column on each trial of the experiment. This a 0/1 column labeled 'max'. You could also create this column by checking if the chosen option (choice) is the maximum of the reward0, reward1, etc. columns(they should be about the same).

Experiment 6:

Create a "smooth" version of the plots you made in the previous step. Adjust the window

until you feel you can see the main trends in the data. What can you see? What do you

know now about the design of the experiment?

Experiment 7:

Based on the way we analyzed the behavior of the Random Agent, make a similar plot for the Smarter Agent. How does it do? Why do you think the outputs look like they do? Write a few sentences describing your observations.

Experiment 8:

Below I provided a template for a Smarter Exploring Agent. This agent is similar to the one above but I have deleted the choose function and will ask you to implement that decision rule. Your code should use the parameter epsilon to decide to either choose randomly (see Random Agent) or choose the best option with the highest average reward (like Smarter Agent). After you implement it run it on the problem and see how it does. Remember you will need to provide the epsilon parameter to the choose() function in your code. You should make this number relatively small (like 0.01) but you can play with different numbers.

```
classSmarterExploringAgent():

def__init__(self, k):

self.num_actions= k

self.reward_history= [[0], [0], [0], [0]]

pass

defchoose(self, epsilon):

pass

deflearn(self, reward, action): # this agent doesn't learn

self.reward_history[action].append(reward)
```

Experiment 9:

Before we continue, let's get a little more experience with the prediction error. If you get a reward of 1, and the Q value is .6 (this is what you expect). Is this a positive or negative prediction error? What is the value of the prediction error?

Experiment 10:

Below I provided a template for a Smarter Exploring Incremental Agent. You should first implement the learn function. I have provided the first bit of code to help you update the value of the chose q_value. This should be 1 line of code and you are just putting the variables together like in the quation (self.q_values[action] = Q(s,a) in the equation, reward is r, and alpha is the alpha). Next you have to adapt the choice function from above to use the q-values.

classSmarterExploringIncrementalAgent():

def__init_(self**, k):**

self**.num_actions = k**

self**.q_values = np.zeros(**4**)**

pass

def choose(self**, epsilon):**

 # modify your choice rule from the previous agent to use the q_values

pass

def learn(self**, reward, action, alpha):** *# this agent doesn't learn*

 # replace this line here with the q-learning equation

self**.q_values[action] = reward**

Experiment11:

Copy the code from above to apply this agent to the task and evaluate its performance. How does it do? How does learning change when you move around the learning rate? What happens when the learning rate is 0? What happens when the learning rate (alpha) is 1? What about as it approaches 0 or 1?

Experiment 12:

You created a bunch of agents in this exercise, each trying to be more and more similar to humans. What aspect do you think these agents still lack compared to the way you solved the problem?

Reinforcement Learning Projects:

Implement anyone of the Interesting reinforcement learning projects:

1. CARLA 2. Deep Learning Flappy Bird 3. Ray or 4. Neurojs

Course Outcomes:

The Student will be able to:

1. Describe Basic Reinforcement Learning concepts for solving different types of problems.
2. Relate Reinforcement Learning for cracking glitches.
3. Utilize Reinforcement Learning for resolving complications.
4. Use the Automatic Parking Policies to unravel variety of issues.
5. Apply the Automatic Parking Policies to work out distinctive varieties of setbacks

CO-PO/PSO Mapping Chart(3/2/1indicatesstrengthofcorrelation) 3–Strong; 2– Medium;1 -Weak														
Course Outcomes(COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	3	-	-	-	2	-	-	3	2	2
CO2	3	3	3	3	3	-	-	-	2	-	-	3	2	2
CO3	3	3	3	3	3	-	-	-	2	-	-	3	2	2
CO4	3	3	3	3	3	-	-	-	2	-	-	3	2	2
CO5	3	3	3	3	3	-	-	-	2	-	-	3	2	2
Average	3.0	3.0	3.0	3.0	3.0	-	-	-	2.0	-	-	3.0	2.0	2.0

AY2020-21 onwards	**J.B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS IV Year– I Sem**			
Course Code: J41D1	**Computer Vision Lab**	**L**	**T**	**P**	**D**
Credits:2		**0**	**0**	**4**	**0**

Pre-Requisites:

1. Math: Linear Algebra, Calculus, Probability and Statistics
2. Data Structures
3. Python Programming

Course objectives:

The student will:

1. Review image processing techniques for computer vision.
2. Understand image rotation, translation and segmentation.
3. Understand the application of edge detection algorithms.
4. Understand Hough Transform and its applications to detect lines, circles, ellipses.
5. Understand the application of face detection and face recognition in computer vision tasks.

Lab Experiments:

1. Write a code to read, write and to display images in python
2. Write a code to change color spaces of the input image in python
3. Write a code to implement various interpolation and down sampling methods to resize the given input image using Opencv in python
4. Write a code to implement various image rotation and translation schemes for the given input image using Opencv in python
5. Implement the following functionalities using openCv a)Simple Image Thresholding b) Adaptive thresholding
6. Implement watershed algorithm for image segmentation using opencv in python
7. Implement bitwise operations on the given input image using Opencv in Python
8. Implement Canny Edge detection in python
9. Implement Gaussian Filter using Opencv in python to blur the given input image

10. Identify the contours in the given input image using OpenCV in Python
11. Implement Hough Transform for line detection in the given input image using OpenCV in python
12. Implement RANSAC for straight line detection in the given input image using OpenCV in python
13. Implement Generalized Hough Transform to identify the circles or ellipses in the input image using OpenCV in python
14. Implement a python code to detect a face from the given input image using OpenCV
15. Implement a python code to recognize face with eigenfaces through PCA

Course outcomes:

The student will be able to:

1. Implement fundamental image processing techniques required for computer vision.
2. Perform Image rotation, translation, segmentation
3. Apply state of art algorithms for edge detection in images.
4. Apply Hough Transform for line, circle, ellipse detections.
5. Implement a system to detect face and recognize the face using PCA.

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	3
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	3
Average	**2.8**	**2.0**	**2.3**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**2.0**	**2.8**

Professional Elective Course-I

AY 2020-21 onwards	J.B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS III Year – II Sem			
Course Code: J32D1	Design Thinking	L	T	P	D
Credits:3		3	0	0	0

Prerequisites:
Nil

Course Objectives

1. Expose students to the design process as a tool for innovation.
2. Develop students' professional skills in client management and communication.
3. Demonstrate the value of developing a local network and assist students in making lasting connections with the business community.
4. Students develop a portfolio of work to set them apart in the job market.
5. Provide an authentic opportunity for students to develop teamwork and leadership skills.

Module 1

Introduction to Design Thinking and Design Process

Intro to Design Thinking and Product Design, Creativity and Creative Confidence, Creative Techniques for Design Thinking, Design Thinking and Systems Thinking, Iterative properties of Design Thinking.

Design Process, Tools of persona, Journey Map and Empathy Map and Other Design Mapping tools, Design Thinking process planning, Divergent and Convergent Phases. Introduction to Synthesis phase of Design.

Module 2

Empathy: Identification of Real Requirement

Identifying insights and opportunities) of Product, How might we help and its iterations, Challenge findings, Identifying Target audience and its real needs.

Role of Leadership in Design Thinking, Feedback, visualizing ideas, Storytelling: Techniques and importance. Seen, perceived, thought, acted equilibrium.

Module 3

Ideation

Divergent phase of Ideation, Brain Storming, Various Brain storming Techniques, Tools for idea generation, TRIZ, SCAMPER, Case Study on Ideation.

Convergent phase of selection of few ideas for Prototype. Analysis for selection, Business Model Canvas for project.

Module 4

Prototype

Low Fidelity Prototype, Low fidelity techniques, Feedback collection process and iterative improvement, advantages, and disadvantages of low fidelity prototyping. Low Fidelity prototype in UI/UX design, Wireframe modelling.

High Fidelity Prototype, Cost vs benefit analysis for High Fidelity Prototype, Why High Fidelity protype is not preferred, Use areas of high-Fidelity prototype, Product Launch process.

Module 5

Test and Implementation

Final Test Process, Test tools, Prelaunch, Limited Launch and Actual Launch Process.

Feedback generation at Pre-launch and Limited Launch. Post implementation iterations.

Textbooks

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross, Berg Publication 2011

2. Creative Confidence: Unleashing the Creative Potential Within Us, By David Kelly and Tom Kelly, William Collins, 2013

Reference Books

1. Thinking Design by S. Balram, Sage Publication, 2011

2. Solving Problems with Design Thinking: Ten Stories of What Works by Jeanne Liedtka, Columbia Business School Publishing, 2013

Course Outcomes

1. Students develop a strong understanding of the Design Process using Journey Map, Empathy Map, and Persona and how it can be applied in a variety of business settings.
2. Students learn to research and understand the unique needs of a company around specific challenges.
3. Students learn to build empathy for target audiences from different “cultures”.
4. Students learn to develop and test innovative ideas through a rapid iteration cycle.
5. Students learn how to create physical prototypes / a visual representation of an idea and test it.

	CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium & 1-Weak													
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**-**	**2**	**-**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO2	**3**	**3**	**2**	**3**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO3	**3**	**-**	**2**	**-**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**-**	**2**	**-**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO5	**3**	**-**	**2**	**-**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
Average	**3.0**	**0.6**	**2.0**	**0.6**	**2.0**		**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**2.4**

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<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32D2</td><td rowspan="2">Predictive Analytics
(Professional Elective I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

Data mining, Machine Learning

Course objectives:

The student will:

1. Know the basics of predictive analytics and summarize Data, Categorize Models, and techniques
2. Know about the Decision tree, Support Vector Machine for Data Classification
3. Describe Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
4. Study the predictive models for various Real-Time Applications.
5. Study the Analysis and Visualized predictive Model's results using Data Visualization tools.

Module 1:

INTRODUCTION TO PREDICTIVE ANLAYTICS

Introduction – Predictive Analytics in the Wild – Exploring Data types and associated Techniques - Complexities of data - Applying Models: Models and simulation, Categorizing Models, Describing, summarizing data, and decisions – Identify similarities in Data: Data Clustering, converting Raw Data into a Matrix, Identify K-groups in Data.

Module 2:

DATA CLASSIFICATION – PART I

Background – Exploring Data classification process - Using Data Classification to predict the future: Decision tree, Algorithm for generating Decision Trees, Support Vector Machine.

Module 3:

DATA CLASSIFICATION – PART II

Ensemble Methods to Boost Prediction Accuracy: Naïve Bayes Classification Algorithm, The Markov Model, Linear Regression, Neural Networks – Deep learning.

Module 4:

DATA PREPARATION AND MODELLING

Adopt predictive analytics - Processing data: identifying, cleaning, generating, reducing dimensionality of data – Structuring Data – Build predictive model: develop and test the model.

Module 5:

DATA VISUALIZATION

Introduction to visualization tool – Evaluate the data – visualize Model's Analytical Results: hidden grouping, data classification results, outliers, decision trees, prediction – Novel visualization in Predictive Analytics.

Text Books:

1. Anasse Bari, Mohamed Chaouchi, Tommy Jung, "Predictive Analytics For Dummies", Wiley Publisher, 2nd Edition, 2016.

Reference Books:

1. Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling to solve all your data analysis problems, Pack Publisher, 2nd Edition, 2015.
2. Aurelien,"Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'Reilly Publisher, 5th Edition, 2017.
3. Max Kuhn, Kjell Johnson, " Applied Predictive Modeling" Springer, 2013.

E - Resources:

1. https://vuquangnguyen2016.files.wordpress.com/2018/03/applied-predictive-modeling-max-kuhn-kjell-johnson_1518.pdf
2. https://www.researchgate.net/publication/329873035_Prediction_Modeling_Methodology
3. https://www.coursera.org/learn/predictive-modeling-analytics
4. https://www.edx.org/course/predictive-analytics

Course Outcomes:

The student will be able to:

1. Understand the basics of predictive analytics and summarize Data, Categorize Models, and techniques
2. Apply Decision tree, Support Vector Machine for Data Classification
3. Apply Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
4. Develop predictive models for various Real-Time Applications.
5. Analyze and Visualize predictive Model's results using Data Visualization tools.

CO-PO/PSO Mapping Chart														
(3/2/1 indicates strength of correlation) **3 – Strong; 2 – Medium; 1 - Weak**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	3	-	-	-	-	-	-	-	2	2	-
CO2	3	2	2	2	3	-	-	-	2	-	-	2	2	-
CO3	3	3	2	2	3	-	-	-	3	-	-	2	2	-
CO4	3	2	3	2	3	-	-	-	3	-	-	2	2	-
CO5	3	2	2	2	3	-	-	-	2	-	-	3	2	-
Average	**3.0**	**2.4**	**2.2**	**2.2**	**2.4**	**-**	**-**	**-**	**2.0**	**-**	**-**	**2.2**	**2.0**	**-**

onwards	**(UGC Autonomous)**				
Course Code: **J325E**	**Object Oriented Analysis and Design** **(Professional Elective I)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Module 1:
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle

Module 2:
Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams

Module 3:

Basic Behavioral Modeling-I : Interactions, Interaction diagrams.
Basic Behavioral Modeling-II : Use cases, Use case Diagrams, Activity Diagrams

Module 4:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams

Module 5:
Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams

TEXT BOOKS

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

REFERENCE BOOKS

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.

Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS III Year – II Sem**			
Course Code: J32D3	**UI/UX (Professional Elective II)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Prerequisites

Research, Collaboration, Wire framing and prototyping, writing, Visual communication, User empathy, Interaction design, Coding, Analytics and Communication skills.

Course objectives:

The Student will:

1. To plunge scholars into the global innovation as a systematic process of involving in relevant design.
2. To provide technologies and process space for the discovery of innovation confronts and contend with the design of creative solutions such as, an innovation new ventures, value propositions, new products or services.
3. Make use of a practical approach to this UX process will facilitate the student in the drafting, conception and early advancement of a UX process for responsive website for Mobile and its challenge that is a critical input for this innovative course.
4. To augment their foresight and insight influences in the process of UX process for responsive website identification/creation opportunity.
5. Realize UI process for responsive website for Mobile and its innovative design of an original and feasible value proposition aligned with relevant markets by the adoption/adaptation of new technologies to streamline key processes or to sort out established markets or the competitive landscape collaborating with a growth trajectory or growth platform by Android & iOS Mobile App Design.

Module 1: Design:

Fundamentals of Design - Principles of Design - Visual Communication Empathy & User Study - Ethnography & People Design - Service Design - Design Thinking - Information & Data Study

Module 2: Technologies & Process:

UI Design - Interaction Design -Design for Rural India - Design for Futuristic Technologies - Imagin 6D UX Process

Module 3:UX process:

UX process for responsive website for Mobile - Stakeholder Interview, User Research, Competitor Analysis, Customer Journey, Creating User Personas, Making Empathy Map, Information Architecture, User Flowchart & User Journey by making low fidelity wireframes - usability testing for your App

Module 4: Redesign process:
Heuristic Usability & complete UX process for responsive website optimized for Mobile, Tab & Desktop - redesign process using Figma

Module 5: UI process:
UI process for responsive website for Mobile - Platform guidelines for Android & iOS Mobile App Design - Prototypes with medium & High fidelity -Portfolio Website - UI/UX Design Tools.

References:

1. A Project Guide to UX Design: for user experience designers in the field or in the making, Carolyn Chandler, 2012
2. Smashing UX Design: Foundations for Designing Online User Experiences, James Chudley and Jesmond Allen, 2012
3. Universal Principles of Design, William Lidwell, Jill Butler, and Kritina Holden, Rockport, 2003
4. UX Research: practical techniques for designing better products, Brad Nunnally, David Farkas, 2016
5. Measuring the User Experience: collecting, analyzing, and presenting usability metrics, Thomas Tullis, William Albert, 2013.
6. Just enough research, Erika Hall, 2013
7. The Design of Everyday Things, Don Norman, 2013.
8. The Mom Test: how to talk to customers & learn if your business is a good idea when everyone is lying to you, Rob Fitzpatrick, 2016
9. Don't Make Me Think, Steve Krug, ISBN: 0321344758
10. The Elements of User Experience: User-Centered Design for the Web, Jesse James Garret, ISBN: 0735712026
11. Designing for the Digital Age, by Kim Goodwin, ISBN: 0470229101
12. Clout: The Art and Science of Influential Web Content, Colleen Jones, ISBN: 0321733010
13. Usability Engineering: Process, Products, and Examples, Laura Leventhal and Julie Barnes, ISBN: 0131570080
14. Interaction Design: Beyond Human - Computer Interaction (3rd edition), Yvonne Rogers, Helen Sharp, and JennyPreece, ISBN: 0470665769

E - Resources:

1. https://course.ccs.neu.edu/cs5500sp17/09-UX.pdf
2. https://careerfoundry.com/en/blog/ux-design/the-difference-between-ux-and-ui-design-a-laymans-guide/
3. https://www.freecodecamp.org/news/ui-ux-design-guide/
4. https://aufaitux.com/blog/ui-ux-design-process/
5. https://www.fahmpartners.com/5-benefits-of-integrating-ui-ux-design-to-your-process/
6. https://webflow.com/blog/ui-ux-design-tools

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS III Year – II Sem**				
Course Code: J32D4	**Information Retrieval Systems**	**L**	**T**	**P**	**D**	
Credits: 3	(Professional Elective – II)	**3**	**0**	**0**	**0**	

Pre-Requisites:

1. Database Management system, Probability and statistics.

Course Objectives:

The Student will:

1. Describe the domain of Information Retrieval is concerned with the extraction of relevant information from large collections of documents.
2. Select applications to proprietary retrieval systems as well as www, digital libraries and commercial recommendation systems.
3. Understand the main principles and methods underlying the domain of Information retrieval.
4. Discuss recent developments in IR such as collaborative filtering and Latent Semantic Indexing.
5. Know the concepts Multimedia Information Retrieval, Libraries.

Module 1:

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses

Information Retrieval System Capabilities - Search, Browse, Miscellaneous.

Module 2:

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction,

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages.

Module 3:

Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext.

Module 4:

Information Visualization: Introduction, Cognition and perception, Information visualization technologies. **Text Search Algorithms**- Introduction, Software text search algorithms, Hardware text search systems.

Information System Evaluation: Introduction, Measures used in system evaluation, Measurement example – TREC results.

Module 5:

Multimedia Information Retrieval – Models and Languages – Data Modeling, Query Languages, Indexing and Searching.

Libraries: Libraries and Bibliographical systems, online IR system, OPACs, Digital Libraries.

Text Books:

1. Information Storage and Retrieval Systems: Theory and Implementation By Kowalski, Gerald, Mark T Maybury ,Springer.

2. Modern Information Retrival By Ricardo Baeza-Yates, Pearson Education, 2007.

3. Information Retrieval: Algorithms and Heuristics By David A Grossman and Ophir Frieder, 2nd Edition, Springer.

Reference Books:

1. Information Retrieval Data Structures and Algorithms By William B Frakes, Ricardo Baeza-Yates, Pearson Education, 1992.

2. Information Storage &Retieval By Robert Korfhage – John Wiley & Sons.

3. Introduction to Information Retrieval By Christopher D. Manning and Prabhakar Raghavan, Cambridge University Press, 2008.

4. Natural Language Processing and Information Retrieval,T.Siddiqui and U.S.Tiwary,Oxford Univ. Press.

E - Resources:

1. https://cse.iitkgp.sc.in/~pabitra/course/ir06/ir06.htm

2. https://www.coursera.org/courses?query=information%20retrieval

3. https://www.udemy.com/course/information-retrieval-and-mining-massive-data-sets/

4. https:// web.stanford.edu/class/cs276/

5. http://www.cs.ox.ac.uk/teaching/courses/2011-2012/information retrieval

Course Outcomes:

At the end of the course, Student will be able to:

1. Use different information retrieval techniques in various application areas.
2. Apply IR principles to locate relevant information large collections of data
3. Analyze performance of retrieval systems when dealing with unmanaged data sources
4. Choose retrieval systems for web search tasks.
5. Identify the concepts of Multimedia Information Retrieval and Libraries.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	2	-	-	-	3	2
CO2	-	-	2	2	-	-	-	-	-	-	-	-	-	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	2	2	2	2	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	2	-	-	-	-	-	-	-	-	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**2.0**

<table>
<tr><td rowspan="1">AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32D5</td><td rowspan="2">NoSQL Data Base
Professional Elective – II</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisites: Basic Knowledge about DBMS

Course Objectives:

CO1 : Explore the emergence, requirements and benefits of a NoSQL database

CO2 : Understand the basic architecture and data models of a NoSQL database

CO3: Understand Key/value NoSQL database using MongoDB

CO4: Understand Column-oriented NoSQL database

CO5 : Understand Key/Value NoSQL database using Riak

Module 1:

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases.

Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL Key Points.

Module 2:

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models.

Column - Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

Module 3:

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable UseCases, EventLogging.

Content Management Systems, Blogging Platforms, WebAnalytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

Module 4:

Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE.

Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

Module 5:

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences.

Shopping Cart Data, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

TEXTBOOKS:

1. Sadalage,P.&Fowler,*NoSQLDistilled:ABriefGuideto theEmergingWorldofPolyglotPersistence*,WileyPublications,1st Edition,2019.

WEBREFERENCES:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

Course Outcomes:

At the end of the Course the student will be able to

1. Understand and compare different types of NoSQL Databases
2. Compare and contrast RDBMS with different NoSQL databases.
3. Demonstrate the detailed architecture and performance tune of Document-oriented NoSQLdatabases.

4. Evaluate performance of Key-Value Pair NoSQL databases.
5. Apply NoSQL development tools on different types of NoSQL Databases.

PROFESSIONAL ELECTIVE COURSE-III

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS IV Year – I Sem		
Course Code: J417E	Internet Of Things (Open Elective – III)	L	T	P/D
Credits: 3		3	0	0

Pre-Requisites: Nill

Course Objectives:

Students will learn to

1. Understand the basic building blocks of IoT.
2. Analyze the difference between M2M and IoT along with IoT system Management
3. Extend the knowledge in Logical Design of IoT System using Python.
4. Acquire knowledge about IoT Physical Devices and End points.
5. Identify the IoT Physical Servers and cloud offerings.

Module 1:

Unit 1 Introduction to Internet of Things:

Definition and Characteristics of IoT, Physical Design of IoT –IoT Protocols, IoT communication models, IoT Communication APIs

Unit 2 IoT enabled Technologies:

Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Module 2:

Unit 1 IoT and M2M:

Software defined networks, network function virtualization, difference between SDN and NFV for IoT

Unit 2 Basics of IoT System:

Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Module 3:

Unit 1 Introduction to Python:

Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling.

Unit 2 Python packages:

JSON, XML, HTTPLib, URLLib, SMTPLib.

Module 4:

Unit 1 IoT Physical Devices and Endpoints:

Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming.

Unit 2 Python program with Raspberry PI-1:

Python program with Raspberry PI with focus of interfacing external gadgets, controlling

output, reading input from pins.

Module 5:

Unit 1 Python program with Raspberry PI-2:

Python program with Raspberry PI with focus of interfacing external gadgets.

Unit 2: Controlling output, reading input from pins.

Text Books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press,2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

References:

1. Internet of Things by Jeeva Bose 1st edition, Khanna publishing.

Course Outcomes:

Students will be able to

1. **Understand** the basic building blocks of IoT.
2. **Analyze** the difference between M2M and IoT along with IoT system Management
3. **Extend** the knowledge in Logical Design of IoT System using Python.
4. **Acquire** knowledge about IoT Physical Devices and End points.
5. **Identify** the IoT Physical Servers and cloud offerings

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	2
Average	**3.0**	**3.0**	**2.8**	-	-	-	-	-	-	-	-	-	**1.6**	**2.0**

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS IV Year – I Sem		
Course Code: J415D	**Computer Vision** Professional Elective – III	L	T	P/D
Credits: 3		3	0	0

Pre-Requisites:

1. Math: Linear Algebra, Calculus, Probability and Statistics
2. Data Structures
3. Python Programming

Course objectives:

The student will:

1. To review image processing techniques for computer vision.
2. To understand shape and region analysis.
3. To understand Hough Transform and its applications to detect lines, circles, ellipses.
4. To understand three-dimensional image analysis techniques.
5. To understand motion analysis and study some applications of computer vision algorithms.

Module 1

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques

Edge detection techniques – corner and interest point detection – mathematical morphology – texture.

Module 2

SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition –

Centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

Module 3

HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection

Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

Module 4

3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations

3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

Module 5

APPLICATIONS

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion

combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books:

1. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

Reference Book:

1. D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.
2. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.

Course outcomes:

The student will be able to:

1. Implement fundamental image processing techniques required for computer vision.
2. Perform shape analysis and Implement boundary tracking techniques.
3. Apply chain codes and other region descriptors.
4. Apply Hough Transform for line, circle, ellipse detections and 3D vision techniques.
5. Implement motion related techniques and applications using computer vision techniques.

AY2022-23 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B. Tech: AI&DS IV Year – I Sem**

Course Code: J415E	**INTELLIGENT ROBOTICS** Professional Elective – III	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-Requisites:

Knowledge on Mathematics.

Course objectives:

The Student will:

1. Learn about Statics and Dynamics of Robots Mechanics.
2. Achieve knowledge in Design of robot and their control systems.
3. Expand their knowledge In Programming of robots.
4. Familiar with Computational Intelligence methods.
5. Realize the real time systems.

Module 1:

Robot mechanics

Engineering mechanics, Electromechanics, Kinematics, statics and dynamics of robots.

Module 2:

Design of robot and their control systems

Project of robotic system, Robot end effectors, Electric drives, Applied electronics

Module 3:

Programming of robots

Microprocessor systems, Image processing and recognition, Control systems and programming of robots, Automation devices and systems, Mobile robots

Module 4:

Modeling and experimental analysis I

Modeling of robotised systems, Computational intelligence methods

Module 5:

Modeling and experimental analysis II

Real time systems, Automatic control theory

ReferenceBooks:

1. Francis X. Govers, Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, 30 August 2018
2. MajaMatarić, The Robotics Primer, The MIT Press, 2007.
3. Peter McKinnon, Robotics: Everything You Need to Know About Robotics from Beginner to Expert, CreateSpace Independent Publishing Platform, 28-Jan-2016.
4. A.K. Gupta, Jean Riescher Westcott, and Satish Kumar Arora, Industrial Automation and Robotics, Second Edition, Laxmi Publications pvt Ltd, 2013.
5. Leon S. Sterling, K Taveter, Ronald C. Arkin, The Art of Agent–Oriented Modeling, First Edition, MIT Press, 21 August 2009.
6. Roland Siegwart, Illah R. Nourbakhsh, and Davide Scaramuzza, Introduction to AutonomousMobile Robots, Second Edition, The MIT Press, 2011.

E-Resources:

1. https://www.pdfdrive.com/introduction-to-robotics-mechanics-and-control-e174968655.html
2. https://towardsdatascience.com/introduction-to-robotic-control-systems-9ec17c8ac24f
3. https://www.toptal.com/robotics/programming-a-robot-an-introductory-tutorial
4. https://www.gii.udc.es/img/gii/files/978-87-93237-03-2_Interior_Robotics.pdf

Course outcomes:

The Student will be able to:

1. Describe Statics and Dynamics of Robots Mechanics concepts for solving different types of problems.
2. Relate the Design of robot and their control systems for cracking glitches.
3. Apply Programming concepts of robots for resolving complications.
4. Use Computational Intelligence methods to unravel variety of issues.
5. Apply real time systems to workout distinctive varieties of setbacks.

CO-PO/PSO Mapping Chart (3/2/1indicatesstrengthofcorrelation) 3–Strong; 2– Medium;1 -Weak														
Course Outcomes(COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	3	-	-	-	2	-	-	-	2	2
CO2	3	3	3	3	3	-	-	-	2	-	-	-	2	2
CO3	3	3	3	3	3	-	-	-	2	-	-	-	2	2
CO4	3	3	3	3	3	-	-	-	2	-	-	-	2	2
CO5	3	3	3	3	3	-	-	-	2	-	-	-	2	2
Average	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	-	-	-	**2.0**	-	-	-	**2.0**	**2.0**

Professional Elective – IV

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS IV Year – I Sem			
Course Code: J415F	**Web Services** (Professional Elective – IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Basic understanding of XML.
2. Basic understanding of HTML.
3. Basic understanding of TCP/IP.

Course objectives:

The Student will:

1. Understand distributed computing and Core distributed computing technologies
2. Describe the architecture and characteristics of web service.
3. Describe xml document structure and Core fundamentals of SOAP.
4. Define Web services technologies: WSDL, UDDI.
5. Implement security mechanism and overview of .Net and J2EE,SOA.

Module 1:

Evolution emergence of Web Services -Evolution of distributed computing, Core distributed computing technologies–client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

Introduction to Web Services–The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

Module 2:

Web Service Architecture –Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services.

Describing Web Services –WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

Module 3:

Brief Over View of XML -XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation.

SOAP: Simple Object Access Protocol- Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures -SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

Module 4:

Registering and Discovering Services -The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification

Service Addressing and Notification-Referencing and addressing Web Services, Web Services Notification.

Module 5:

Securing SOA and Web Services: SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards,

Semantics and Web Services: The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE,SOA and Web Service Management: Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

Text Books:

1. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India
2. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.

Reference Books:

1. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.
2. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
3. Building web Services with Java, 2 nd Edition, S. Graham and others, Pearson Education.

E - Resources:

1. https://www.tutorialspoint.com/webservices/index.htm
2. https://www.oracle.com/technical-resources/articles/javase/soa.html
3. https://www.javatpoint.com/restful-web-services-architecture-of-web-services
4. https://www.w3schools.com/xml/xml_wsdl.asp
5. https://www.w3schools.com/xml/xml_tree.asp

6. https://docs.oracle.com/cd/A97335_02/integrate.102/a90297/overview.htm
7. https://www.cs.colorado.edu/~kena/classes/7818/f08/lectures/lecture_4_uddi.pdf

Course outcomes:

The Student will be able to:

1. Analyze the impact of e-commerce on business models and strategy.
2. Describe internet trading relationships including business-to-business, intra organizational.
3. Describe the infrastructure for E-Commerce.
4. Explain Web Services and service discovery mechanisms, UDDI.
5. Demonstrate Web Services Interoperability and Web Services Security

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	1	-	2	-	-	-	-	-	-	-	-	2
CO2	2	-	2	-	2	-	-	-	-	-	-	-	-	2
CO3	2	-	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	-	1	-	2	-	-	-	-	-	-	-	-	
CO5	2	-	2	-	2	-	-	-	-	-	-	-	-	2
Average	**2.0**	**-**	**1.6**	**-**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS IV Year – I Sem**			
Course Code: J41D6	**Knowledge Representation and Reasoning** (Professional Elective – IV)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Objectives:

1. To learn the concepts of First Order Logics.

2.To understand the concepts of Knowledge Engineering and Resolution.

3. To acquire the knowledge of Rules, Fames and Structured Description.

4. To familiarize the fundamentals of uncertainty and degrees of belief.

5. To understand the fundamental concepts of Planning.

Module -I INTRODUCTION

Introduction: The Key Concepts, Need for Knowledge Representation and Reasoning - The Role of Logic.

The Language of First-Order Logic: Introduction-The Syntax- The Semantics-The Semantics-Explicit and Implicit

Belief.(Text Book 1: Chapter 1 & 2)

Module-2 EXPRESSING KNOWLEDGE AND RESOLUTION

Expressing Knowledge: Knowledge Engineering – Vocabulary - Basic Facts -Complex Facts - Terminological Facts

Entailments- Other Sorts of Facts.

Resolution : The Propositional Case- Handling Variables and Quantifiers - Dealing

with Computational Intractability - Backward Chaining - Forward Chaining.(Text Book 1: Chapter 3, 4 & 5)

Module -3RULES, FRAMES AND STRUCTURED DESCRIPTION

Rules in Production System: Basic Operation, Working Memory, Production Rules and examples- Conflict

Resolution- Applications and Advantages. Frames: objects and frames - Basic frame formalism- Frame examples.

Structured Description: Descriptions- A Description Language- Meaning and Entailment- Computing Entailments Taxonomies and Classification. (Text Book 1: Chapter 7,8& 9)

Module 4UNCERTAINTY AND DEGREES OF BELIEF

Non-categorical Reasoning- Objective Probability- Subjective Probability- Vagueness**.**

Explanation and Diagnosis: Diagnosis- Explanation- A Circuit Example.(Text Book 1: Chapter 12& 13)

Module 5

PLANNING

Planning in the Situation Calculus - The STRIPS Representation- Planning as a Reasoning Task- Hierarchical

Planning - Conditional Planning. (Text Book 1: Chapter 15).

Course Outcomes:

On completion of the course, the students will be able to

1.Apply the concept of First Order Logic for knowledge representation.

2.Apply the concepts of unification and resolution to solve real time facts.

3. Integrate the concepts of rules and frames for real world phenomena.

4.Analyze the concept of uncertainty and degrees of belief to find the varying levels of knowledge and confidence

level of real time facts.

5. Explain the concepts of planning to find the difference between plan space and state space.

Text Books:

1 Ronald J. Brachman Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.

2 Deepak Khemani. A First Course in Artificial Intelligence , McGraw Hill Education (India), 2013

Web link: 1. https://www.cs.ox.ac.uk/people/james.worrell/lecture9-2015.pdf 2. https://www.section.io/engineering-education/forward-and-backward-chaining-in-ai/ 3.https://www.cpp.edu/~ftang/courses/CS420/notes/planning.pdf

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	-	-	-	-	-	1	1	2	1	1
CO2	3	2	1	1	1	-	-	-	-	-	1	1	2	1	1
CO3	2	1	1	1	1	-	-	-	-	-	1	1	2	1	1
CO4	3	2	1	1	1	-	-	-	-	-	1	1	2	1	1
CO5	3	2	1	1	1	-	-	-	-	-	1	1	2	1	1
Average	2.6	1.6	1	1	1	-	-	-	-	-	1	1	2	1	1

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS IV Year – I Sem			
Course Code: J416H	**Software Architecture And Design Pattern** (Professional Elective – IV)	L	T	P	D
Credits: 3		3	0	0	0

Course Objectives

The Student will :

1. To understand the concept of patterns and the Catalog.
2. To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation, and consistency.
3. To understand the variety of implemented bad practices related to the Business and Integration tiers.
4. To highlight the evolution of patterns.
5. To how to add functionality to designs while minimizing complexity

Module 1:

Envisioning Architecture The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating an Architecture Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

Module 2:

Analyzing Architectures Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many Software Product Lines, Building systems from off the shelf components, Software architecture in future.

Module 3:

Patterns Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage. Creational and Structural patterns Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, fly weight.

Module 4:

Behavioural patterns Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

Module 5:

Case Studies A-7E –A case study in utilizing architectural structures, The World Wide Web -a case study in interoperability, Air Traffic Control –a case study in designing for high availability, Celsius Tech –a case study in product line development.

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

REFERENCE BOOKS:

1. Software Architecture in Practice, Len Bass, Paul Clements, Rick Kazman.
2. Documenting Software Architectures: Views and Beyond Paul Clements, Felix Bachmann, Len Bass, David Garlen, James Ivers, Reed Little, Robert Nord, Judith Stafford

Course Outcomes

The student will be able to:

1. Apply a deeper knowledge of the principles of Object Oriented Design.
2. Show the knowledge of the design patterns that are common in software applications.
3. Illustrate the knowledge of these patterns that are related to object –oriented design.
4. Analyze various architectural patterns
5. Apply the Knowledge for developing a software.

Professional Elective Course - V

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: AI&DS IV Year – I Sem**				
Course Code: J415H	**DATABASE SECURITY** (Professional Elective – V)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. A course on "Database Management Systems"
2. A course on "Information Security"

Course Objectives:

The Student will:

1. Understand and implement security models and algorithms in database security.
2. Study the various security mechanisms.
3. Study different software design for data security
4. Learn the statistical database protection system.
5. Study the various protection models for new generation database systems.

Module 1:

Introduction

Introduction to Databases Security Problems in Databases Security Controls Conclusions

Security Models -1.

Introduction Access Matrix Model Take-Grant Model Action Model PN Model Hartson and Hsiao's Model Fernandez's Model Bussolati and Martella's Model for Distributed databases

Module 2:

Security Models -2

Bell and LaPadula's Model Biba's Model Dion's Model Sea View Model Jajodia and Sandhu's Model the Lattice Model for the Flow Control conclusion.

Security Mechanisms

Introduction User Identification/Authentication Memory Protection Resource Protection Control Flow Mechanisms Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria.

Module 3:

Security Software Design

Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design.

Module 4:

Statistical Database Protection & Intrusion Detection Systems

Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls Evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

Module 5:

Models for The Protection of New Generation Database Systems -1

Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-oriented, Systems SORION Model for the Protection of Object-Oriented Databases

Models for The Protection of New Generation Database Systems -2

A Model for the Protection of New Generation Database Systems: the Orion Model Jajodia and Kogan's Model A Model for the Protection of Active Databases Conclusions

Text Books:

1. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning,2009.
2. Database Security, Castano, Second edition, Pearson Education.

Reference Books:

1. Database security by alfredbasta, melissazgola, CENGAGE learning.

E - Resources:

1. http://ce.sharif.edu/courses/9495/1/ce7341/resources/root/Books/Database%20Security%20-%20Chapter16.pdf
2. https://docs.oracle.com/cd/B19306_01/server.102/b14220/security.htm
3. https://resources.infosecinstitute.com/database-security/
4. http://www.db-security.org/report/dbsc_guideline_ver2.0_e.pdf

Course Outcomes:
The student will be able to:

1. Demonstrate the knowledge gained through solving problems to define security models in database security.

2. Evaluate the different security mechanisms over operating system.
3. Apply various software designs for database security.
4. Implement statistical database protection system.
5. Describe the developing areas of new generation database system with different protection models.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	-	3	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	3	-	-	-	-	-	-	-	-	-
Average	**2.0**	**2.0**	**3.0**	**3.0**	**3.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**-**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS IV Year – I Sem			
Course Code: J415J	Data Modelling And Simulation (Professional Elective – V)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

Knowledge of Computer Architecture, DBMS, Data Mining and Data Warehousing, NoSQL, Mathematics.

Course objectives:

The Student will:

1. Learn about Data Modeling Concepts.
2. Achieve knowledge in Modeling.
3. Develop their knowledge in Normalization.
4. Familiar with NoSQL and New generation Databases.
5. Realize the Data Simulation Concepts.

Module 1:IntroductiontoData, and Data Modeling Concepts

Three phases of modeling, normalization, NoSQL concepts, newgeneration databases: key-value, wide column/ column, document and graph databases.

Basic Data Modeling, Advanced Data Modeling: Operational Data Models, Enterprise Data Models, Data Warehouses – Part 1, Part 2, & Part 3.

Model Classification: Formal versus Informal Models, Physical Models versus Abstract Models, Descriptive Models, Analytical Models, Hybrid Descriptive and Analytical Models, Domain-Specific Models, System Models, Simulation versus Model and Visualization

Module 2:Modeling

Conceptual Modeling: E-R Model, How to convert business requirements to E-R Diagrams, Entities, Relationships, Identifiers, PKs, Cardinality, FKs.

Relational Database Management Principles: Logical Modeling: Converting a conceptual model to logical model, Integrity constraints, Normalization.**Physical Modeling:** SQL practices.Integration of Models.

Module 3: Normalization

Transaction Management Concepts: Consistency issues, Databases for Decision Support,

Data warehousing Concepts, Architectures, Distributed Database Concepts.

Module 4:NoSQL and New generation Databases

Conceptual understanding of Big Data and NoSQL, New generation Databases (MongoDB, Cassandra), Key-value Databases, Wide column/ Column Databases, Document Databases, Graph Databases.

Module 5: Data Simulation:

Introduction to Simulation (data structures, algorithms, queueing simulations, languages, random numbers, static simulation, GAs, event-scheduled simulations, performance measures, etc.).

Basic probability review (events, conditional probability, discrete and continuous random variables, expectations, distributions, Bayes, data descriptors, etc.)

oriented simulation, Distributed simulation

Basic statistics for working with simulation data (means, variances, covariances, inequalities, standard normal distribution, approximations, polling, confidence intervals, etc.)

Independent Monte Carlo method, Discrete-event simulation, Variance reduction techniques, Markov-Chain Monte Carlo methods, Simulated annealing

Text Books:

1. Modern database management, Jeffrey A. Hoffer V Ramesh; HeikkiTopi 2013.
2. S. Ross, Simulation , Academic Press 2012, 5th edition.

E-Resources:

1. https://www.seas.upenn.edu/~zives/03f/cis550/codd.pdf
2. http://www.csulb.edu/~tebert/teaching/fall17/552/lectures.html

Course Outcomes:

The Student will be able to:

1. Describe the Data Modeling concepts for cracking different types of drawbacks.
2. Relate Modeling for solving problems.
3. Apply Normalization for resolving complications.
4. Use NoSQL and New generation Databases to unravel variety of issues.
5. Apply Data Simulation to workout unrelated categories of obstructions

CO-PO/PSO Mapping Chart(3/2/1indicatesstrengthofcorrelatio) 3–Strong; 2– Medium;1 -Weak														
Course Out comes(COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	3	-	-	-	-	-	-	-	-	2	2
CO2	3	3	-	3	-	-	-	-	-	-	-	-	2	2
CO3	3	3	-	3	-	-	-	-	-	-	-	-	2	2
CO4	3	3	-	3	-	-	-	-	-	-	-	-	2	2
CO5	3	3	3	3	-	-	-	-	-	-	-	-	2	2
Average	3.0	3.0	0.6	3.0	-	-	-	-	-	-	-	-	2.0	2.0

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS IV Year – I Sem			
Course Code: J416E	**QUANTUM COMPUTING** (Professional Elective-V)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Knowledge on "Machine Learning".
2. Knowledge on "Probability and Statistics".

Course objectives:
The Student will:

1. Interpret the fundamentals of quantum computing.
2. Know the how quantum Mechanics is applied in quantum computing.
3. Illustrate the Quantum information with architecture and algorithms.
4. Develop the quantum programming languages.
5. Explain the current status of quantum computing.

Module 1:

Introduction to Basic quantum Mathematics

Complex numbers and its geometrical representations, Complex vector spaces, inner products and Hilbert spaces, Hermitian and unitary matrices, Tensor products of vector spaces.

Module 2:

Basic Quantum Mechanics

Deterministic Systems, Probabilistic descriptions and Quantum systems, Basics of Quantum theory, Schrodinger's time dependent equation, Wave nature of Particles, state vector, operators, postulates of quantum mechanics, Dirac formalism, Stern-Gerlach experiment, electron spin, superposition of states, entanglement.

Module 3:

Quantum Information

Bits and Qubits, Classical gates versus quantum gates, Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Simon's periodicity algorithm, Grover's search algorithm, Shor's Factoring algorithm.

Module 4:

Quantum Programming

Quantum programming languages, Probabilistic and Quantum computations, introduction to quantum cryptography and quantum information theory.

Module 5:

Current Status of Quantum Computing

Multi Qubit Systems, why are qubits superior, Quantum computing and Security, Sycamore processors, IBM Quantum Computer, Quantum Simulations.

Text Books:

1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008.

Reference Books:

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008.
2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010.
3. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995.

E - Resources:

1. http://patrickjmt.com/
2. https://homepages.cwi.nl/~rdewolf/qcnotes.pdf
3. https://homes.cs.washington.edu/~oskin/quantum-notes.pdf
4. https://nptel.ac.in/courses/104/104/104104082/

Course outcomes:

The Student will be able to:

1. Understand the Basics of complex vector spaces.
2. Analyze Quantum mechanics as applied in Quantum computing.
3. Analyze the quantum information with Architecture and algorithms.
4. Apply the quantum programming languages.
5. Understand the current status of quantum computing.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-	3	-
CO3	3	-	-	3	3	-	-	-	-	-	-	-	-	3
CO4	-	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	3	-	-	-	-	-	-	-	-	-	3
Average	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**3.0**

Professional Elective-VI

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS
IV Year – II Sem</td></tr>
<tr><td>Course Code: J426D</td><td rowspan="2">BLOCKCHAIN TECHNOLOGY
(Professional Elective-VI)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Computer Networks
2. Cryptography
3. Linux commands.

Course objectives:

The Student will:

1. Learn the fundamentals of BlockChain Technology
2. Understand the History of Money and working with Bitcoin
3. Understand usage of cryptography in Block Chain Technology
4. Create smart account and decentralized Systems
5. Understand the applications of block chain technology.

Module 1:

Introduction: History, what is block chain, the structure of block chains, types of block chain, block chain applications, block chain lifecycle. Limitations and challenges of block chain.

Module 2:

Crypto currencies: Cryptography, the science behind crypto currencies, Symmetric key cryptography, cryptography hash functions, MAC and HMAC, asymmetric key cryptography Diffie-Hellman key exchange, symmetric vs asymmetric key cryptography, game theory Nash equilibrium, prisoners dilemma, byzantine Generals' problem, zero-sum games.

Module 3:

Bitcoin: History of Money, working with Bitcoins, the Bitcoin Block chain, Bitcoin network, bitcoin scripts, Full nodes vs SPVs, Bitcoin wallets.

Module 4:

Ethereum: Ethereum as Next-Gen Blockchain, Design Philosophy of Ethereum, Ethereum Blockchain, Ethereum Accounts, Trie Usage, RLP Encoding, Ethereum Transaction Message structure, Ethereum smart contracts, Ethereum Virtual Machine, Ethereum Eco System.

Module 5:

Block chain application development, Interacting with bitcoin blockchain, interacting programmatically with ethereum for sending transactions, creating smart account, executing smart contract functions, decentralized application structure. Building an ethereum Dapp.

Text Books:

1. Beginning Block chain: A Beginner's Guide to Building Block chain Solutions by Bikramaditya Singhal, Gautam Dhameja , Priyansu Sekhar Panda.
2. Block chain Technology Explained: The Ultimate Beginner's Guide About Block chain Wallet,Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash

Reference Books:

1. Block chain Technology: Introduction to Block chain Technology and its impact on Business Ecosystem
2. Block chain: Bitcoin, Ethereum & Block chain: Beginners Guide to Understanding the Technology Behind Bitcoin & Cryptocurrency.

E - Resources:

1. http://www.cs.tau.ac.il/~msagiv/courses/blockchain/overview.pdf
2. https://nvlpubs.nist.gov/nistpubs/ir/2018/NIST.IR.8202.pdf
3. https://nptel.ac.in/courses/106/104/106104220/

Course outcomes:

The Student will be able to:

1. Describe the block chain Technology and limitations
2. Analyze the history of money and working with Bitcoin and Bitcoin wallets
3. Use cryptography in bitcoin transactions
4. Explain the Design philosophy of Block Chain Technology and Virtual Machine
5. Develop Decentralized applications and Building ethereum Dapp

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	-	3	2	2	-	-	-	-	-		-	2	2
Average	**1.5**	**2.0**	**3.0**	**2.0**	**2.0**	-	-	-	-	-	**1.0**	-	**2.0**	**2.0**

AY 2020-21 onwards	J.B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS IV Year – II Sem			
Course Code: J42D7	ARTIFICIAL INTELLIGENCE FOR BUSINESS	L	T	P	D
Credits:3		3	0	0	0

Pre-Requisites: Nil.

Course Objectives:
The Student will:

1. Learn about AI and its Promises
2. Achieve knowledge in Designing and developing Safe and ethical AI.
3. Expand their knowledge in Building ML Models.
4. Familiar with AI for Enterprise Functions.
5. Realize the Ethics of Enterprise AI.

Module 1:
What Business Leaders Need To Know - Basic Terminology In Artificial Intelligence - The Machine Intelligence Continuum - The Promises Of Artificial Intelligence

Module 2:
The Challenges Of Artificial Intelligence - Designing Safe And Ethical Ai - How To Develop An Enterprise Ai Strategy - Build An Ai-Ready Culture

Module 3:
Invest In Technical Talent - Plan Your Implementation -Collect And Prepare Data - Build Machine Learning Models

Module 4:
Experiment And Iterate - Ai For Enterprise Functions - Obstacles And Opportunities - General And Administrative

Module 5:
Human Resources And Talent - Business Intelligence And Analytics - Software Development - Marketing - Sales - Customer Support - The Ethics Of Enterprise Ai

Text Book:

1. Applied Artificial Intelligence: A HANDBOOK FOR BUSINESS LEADERS, Mariya Yao, Marlene Jia, and Adelyn Zhou, 2018 by TOPBOTS Inc.

Reference Books:

1. Artificial Intelligence Business Applications, Bob Mather, 2021.
2. Artificial Intelligence for Business, Doug Rose, 2nd Edition, 2020.

E-Resources:

1. https://hbr.org/2018/01/artificial-intelligence-for-the-real-world
2. https://www.simplilearn.com/how-ai-has-evolved-as-the-most-important-tool-in-business-article
3. https://www.nibusinessinfo.co.uk/content/examples-artificial-intelligence-use-business
4. https://aibusiness.com/archives.asp?section_id=778

Course Outcomes:

The Student will be able to:

1. Describe AI and its promises for solving different types of problems.
2. Relate- Designing and developing Safe and ethical AI for cracking glitches.
3. Apply Building ML Models for resolving complications.
4. Use AI for Enterprise Functions to unravel variety of issues.
5. Apply Ethics of Enterprise AI to workout Distinctive varieties of setbacks.

CO-PO/PSO Mapping Chart(3/2/1indicatesstrengthofcorrelation) 3–Strong; 2– Medium;1 -Weak														
Course Out comes(COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	2	-	-	-	-	1	-	-	2	3	2
CO2	-	-	3	-	-	-	3	3	1	-	-	2	3	2
CO3	2	2	2	2	2	-	-	-	-	-	-	2	3	2
CO4	-	3	-	2	2	-	-	-	-	-	-	2	3	2
CO5	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Average	1.0	1.6	1.0	1.2	0.8	-	0.6	1.2	0.4	-	-	1.6	2.4	1.6

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS
IV Year – II Sem</td></tr>
<tr><td>Course Code: J425N</td><td rowspan="2">ANDROID APPLICATION DEVELOPMENT
(Professional Elective-VI)
(Common to CSE & IT)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Programming language JAVA.
2. Knowledge on SQL.
3. Knowledge on XML

Course objectives:
The Student will:

1. Understand Android platform and its architecture.
2. Learn activity creation and Android UI designing.
3. Familiarize with Intent, Broadcast receivers and Internet services.
4. Know how to work with SQLite Database and content providers.
5. Integrate multimedia, camera and Location based services in Android Application.

Module 1:

Introduction to Android Operating System: Android OS design and Features–Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

Module 2:

Android User Interface: Measurements–Device and pixel density independent measuring units Layouts–Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

Module 3:

Intents and Broadcasts: Intent–Using intents to launch Activities, explicitly starting new Activity, Implicit Intents, passing data to Intents, getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity, Notifications – Creating and Displaying notifications, Displaying Toasts

Module 4:

Persistent Storage: Files–Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

Module 5:

Advanced Topics: Alarms–Creating and using alarms Using Internet Resources – Connecting to internet resource, using download manager

Location Based Services – Finding Current Location and showing location on the Map, updating location

Text Books:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

Reference Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	1	3	1	-	-	-	-	-	-	-	1	-	-
CO2	2	2	2	1	2	-	-	-	-	-	-	1	2	1
CO3	1	2	2	1	2	-	-	-	-	-	-	1	-	-
CO4	2	2	2	2	2	-	-	-	-	-	-	1	2	1
CO5	1	2	2	1	2	-	-	-	-	-	-	1	1	1
Average	**1.4**	**1.8**	**2.2**	**1.2**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**1.7**	**1.0**

Open Elective

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS IV Year – II Sem			
Course Code:	INTRODUCTION TO DATA SCIENCE (Open Elective 1)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite:

Database Management Systems, Data Structures

Course Objectives:

This course will enable students to:

- Know about the fundamental concepts and technologies of Data Science.
- Explore the various Data collection and storage methods.
- Understand the Data Analysis, statistics and various machine learning algorithms.
- Investigate about the visualization of data and apply coding techniques to data for securing the data.
- Study the Applications of Data Science, Technologies for visualization Handling of variables using Python

MODULE-1

Introduction to Data Science

Introduction to core concepts and technologies: Introduction, Terminology,

Data science Process, data science toolkit, Types of data, Example applications

MODULE-2

Data collection and management:

Introduction, Sources of data, Data collection and APIs, Exploring and fixing data.

Data storage and management, using multiple data sources

MODULE-3

Data analysis:

Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT.

Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

MODULE-4

Data visualization:

Introduction, Types of data visualization, Data for visualization:

Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

MODULE-5

Practices and Case Studies in Data Science:

Applications of Data Science, Technologies for visualization, Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods used in data science.

Demonstrate some case studies like Marketing, Finance, HR, Manufacturing, Healthcare etc

Text Books:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.

2. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v 2.1, Cambridge University Press, 2014.

Reference Books:

1. Joel Grus, "Data Science from scratch", O'Reilly, 2015.
2. Gupta, S.C. and Kapoor, V.K.: "Fundamentals of Mathematical Statistics", Sultan & Chand & Sons, New Delhi, 11th Ed, 2002.
3. Hastie, Trevor, et al. "The elements of Statistical Learning", Springer, 2009.
4. Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media, 2012

Course Outcomes:

At the end of the course the student will be able to

- Understand the basic concepts of data science and identify the types of data.
- Understand about how to collect the data, manage the data, explore the data, store the data.
- Understand the basic measures of central tendency and classify the data using SVM and navie Bayesian.
- Familiarize about the visualization of data and apply coding techniques to data for securing the data.
- Understand the various concepts of data science and can be able to handle simple applications of data science using python.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	3	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	3	-
CO3	3	2	3	-	2	-	-	-	-	-	-	-	3	-
CO4	3	2	2	-	3	-	-	-	-	-	-	-	3	-
CO5	3	3	2	-	2	-	-	-	-	-	-	-	2	-

Average	3.0	2.2	2.2	-	2.0	-	-	-	-	-	-	-	2.6	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS			
Course Code:	Business Data Analytics (Open Elective II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite:

DatabaseManagementSystems

Course Objectives:

This course will enable students to:

- Understand the essentials of BI & data analytics and the corresponding terminologies
- Analyze the steps involved in the BI - Analytics process
- Illustrate competently on the topic of analytics
- Understand & Implement the K-Means Clustering with Iris Dataset
- Demonstrate the real time scenario (Case study) by using BI & Analytics techniques

Module-1 **(9Lectures)**

BUSINESS INTELLIGENCE – INTRODUCTION

Introduction - History and Evolution: Effective and Timely decisions, Data Information and Knowledge, Architectural Representation, Role of mathematical Models, Real Time Business Intelligent System.

MODULE-2 **(9Lectures)**

BI – DATA MINING & WAREHOUSING

Data Mining - Introduction to Data Mining, Architecture of Data Mining and How Data mining works(Process) , Functionalities & Classifications of Data Mining, Representation of Input Data, Analysis Methodologies. Data Warehousing - Introduction to Data Warehousing, Data Mart, Online Analytical Processing (OLAP) – Tools, Data Modelling, Difference between OLAP and OLTP, Schema – Star and Snowflake Schemas, ETL Process – Role of ETL

MODULE-3 **(9Lectures)**

BI – DATA PREPARTTION

Data Validation - Introduction to Data Validation, Data Transformation – Standardization and Feature Extraction, Data Reduction – Sampling, Selection, PCA, Data Discretization

MODULE-4 **(9Lectures)**

BI – DATA ANALYTICS PROCESS

ANALYTICS PROCESS - Introduction to analytics process, Types of Analytical Techniques in BI – Descriptive, Predictive, Perspective, Social Media Analytics, Behavioral, Iris Datasets

MODULE-5 **(9Lectures)**

IMPLEMENTATION OF BI – ANALYTICS PROCESS

Operational Intelligence: Technological – Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis.

Text Books

1. Carlo-Vercellis, "Business Intelligence Data Mining and Optimization for Decision-Making", First Edition
2. Drew Bentely, "Business Intelligence and Analytics" ,@2017 Library Pres., ISBN: 978-1-9789-2136-8
3. Larissa T. Moss & Shaku Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle For Decision-Support Applications", First Edition, Addison-Wesley Professional,2003
4. Kimball, R., Ross, M., Thornthwaite, W., Mundy, J., and Becker, B. John, "The Data Warehouse Lifecycle Toolkit: Practical Techniques for Building Data Warehouse and Business Intelligence Systems", Second Edition, Wiley & Sons, 2008.

Reference Books

1. Cindi Howson, "Successful Business Intelligence", Second Edition, McGraw-Hill Education, 2013.

Web References

1. https://bit.ly/2YcuLHK
2. https://www.coursera.org/learn/business-intelligence-data-analytics

Course Outcomes:

At the end of the course the student will be able to

- Understand the fundamentals of Big Data and data architectures.
- Understand HDFS file structure and Map Reduce frameworks, and use them to solve complex problems, which require massive computation power.
- Implementing the data with Unix tools and various APIs.
- Instigating with Map Reduce concepts and its applications.
- Use relational data in a Hadoop environment, using Hive and Hbase tools of the Hadoop Ecosystem.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO3	1	2	2	1	2	-	-	-	-	-	1	-	2	2

CO4	1	-	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	-	1	1	-	-	-	-	-	-	-	-	-	-
Average	**1.0**	**1.5**	**1.3**	**1.0**	**2.5**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**2.0**	**2.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS			
Course Code:	**INTRODUCTION TO CLOUD COMPUTING** (Open Elective-III)	L	T	P	D
Credits: 3		3	0	0	0

Course objectives:

At the end of the course, students will :

1. Acquaint students with a fundamental understanding of the Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

Course outcomes:

At the end of the course, students will be able to:

1. Understand the basic concepts of Cloud Computing and different elements.
2. Analyze and apply the concepts of cloud.
3. Examine the essential processes of an Cloud Computing system.
4. Analyze the impact of Cloud Computing on organizations and strategy.
5. Understands the infrastructure and multimedia concepts.

MODULE-I

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, introduction to Hadoop and Mapreduce.

MODULE-II

Cloud Platforms in the Industry, Understanding Scientific Applications for Cloud Environments, cloud applications.

Healthcare and education, Scientific Applications, Business and Consumer Applications.

MODULE-III

Virtualization, cloud virtualization technology, cloud virtualization, Migrating in to cloud computing.

Virtual Machines Provisioning and Virtual Machine Migration Services.

MODULE-IV

Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing.

MODULE-V

Cloud management, Organizational Readiness and change management in the cl oud age, Cloud

Security, Data security in the cloud, Legal Issues in the Cloud.

TEXT BOOKS:

3. Cloud Computing: Raj Kumar Buyya , James Broberg, andrzej Goscinski, 2013 Wiley.
4. Cloud computing: Dr Kumar Saurab Wiley India 2011.

REFERENCE BOOKS:

3. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
4. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	1	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	**1.7**	-	-	-	-	-	-	-	**2.0**	**2.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS			
Course Code:	Introduction to Big Data (Open Elective IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite:

Database Management Systems, Object Oriented Programming Through Java.

Course Objectives:

This course will enable students to:

- Understand the fundamental concepts of Big Data, cloud and laysa strong foundation of Apache Hadoop(Big data framework).
- Know about the HDFS filesystem, Map Reduce frame works are studied in detail.
- Analyzing data with Unix tools and various APIs.
- Familiar with Map Reduce concepts.
- Gain knowledge in Hadoop tools like Hive, and Hbase.

MODULE-I (12Lectures)

Introduction Big Data. What is Big Data. Why BigDataisImportant.MeetHadoop.Data.DataStorageand Analysis.Comparisonwithothersystems.GridComputing.AbriefhistoryofHadoop.ApacheHadoopandtheHadoopEcosystem.Linuxrefresher;VMWareInstallationofHadoop.

MODULE-II

(12Lectures)

The design ofHDFS.HDFS concepts.Commandline interface toHDFS.Hadoop File systems.Interfaces.Java Interface to Hadoop.Anatomyofafileread.Anatomyofafilewrite.ReplicaplacementandCoherency Model. Parallel copying with distcp, Keeping an HDFSclusterbalanced.

MODULE-III (12Lectures)

Introduction.AnalyzingdatawithUnixtools.AnalyzingdatawithHadoop.JavaMapReduceclasses(newAPI).Dataflow,combinerfunctions,RunningadistributedMapReduceJob.

ConfigurationAPI.Settingupthedevelopmentenvironment.Managingconfiguration.WritingaunittestwithMRUnit.Runningajobinlocaljob runner.Running on a cluster.Launching a job.The MapReduceWebUI.

MODULE-IV (12Lectures)

ClassicMapReduce.Jobsubmission.JobInitialization.TaskAssignment.Taskexecution. Progressandstatusupdates.JobCompletion.ShuffleandsortonMapandreducerside.Configurationtuning.MapReduceTypes.Inputformats.Outputformats,Sorting.MapsideandReducesidejoins.

MODULE-V (12Lectures)

TheHiveShell.Hiveservices.Hiveclients.Themetastore.Comparisonwithtraditionaldatabases.HiveQl. Hbasics.Concepts.Implementation.JavaandMapReduceclients.Loadingdata,webqueries.

Text Books

5. TomWhite,Hadoop,“TheDefinitiveGuide”,3rd Edition,O’ReillyPublications,2012.
6. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos,TomDeutsch,“UnderstandingBigData:AnalyticsforEnterprise Class Hadoop and Streaming Data”, McGraw-HillOsborneMedia;1edition,2011

Web References

1. http://www.cloudera.com/content/cloudera-content/cloudera-docs/HadoopTutorial/CDH4/Hadoop-Tutorial.html
2. https://www.ibm.com/developerworks/community/blogs/Susan Visser Editionntry / flashbook understanding big data analytics for enterprise class hadoop and streaming data? langen

Course Outcomes:

At the end of the course the student will be able to

- Understand the fundamentals of Big Data anddataarchitectures.
- UnderstandHDFSfilestructureandMapReduceframeworks,anduse them to solve complex problems, which require massivecomputationpower.
- Implementing the data with Unixtools and various APIs.
- Instigating withMapReduceconcepts and its applications.
- UserelationaldatainaHadoopenvironment,usingHiveandHbasetoolsoftheHadoopEcosystem.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO3	1	2	2	1	2	-	-	-	-	-	1	-	2	2
CO4	1	-	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	-	1	1	-	-	-	-	-	-	-	-	-	-
Average	**1.0**	**1.5**	**1.3**	**1.0**	**2.5**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**2.0**	**2.0**

OPEN ELECTIVE-I

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS			
Course Code: J31OA	**ELEMENTS OF CIVIL ENGINEERING** (Open Elective-I)	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study the basic requirements of civil engineering components.
2. Study the basic concepts of surveying.
3. Study the different types of building materials and components.
4. Study to deal with fire risk prevention and control.
5. Study about Highway development in India, Necessity for Highway planning, different road development plans

Module-1:
Unit-1: Introduction:
History of the civil engineering, sub – disciplines of civil engineering.

Module-2:
Unit-1: Surveying
Introduction, divisions of surveying, classification of surveying, principles of surveying.Linear measurements and errors–introduction, methods of linear measurements, chaining instruments, types of error and correction. Compass surveying – introduction, angular measurement using compass, whole circle bearing and reduced bearing, fore bearing, and back bearing. Traverse surveying –introduction, chain, and compass traversing, closing error and adjustments. Levelling– introduction, types of levelling instruments, dumpy level, adjustment of level, levelling staff

Module-3:
Unit-1: Building Materials and Construction
Materials**:** Introduction to construction materials like ferrous and nonferrous metals, alloys, Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete, and bitumen. Construction: Types of building, different loads considered in building design, types of foundation in building, other developments, and constructions of buildings

Module-4:
Unit-1: Fire and Earthquake Protection in Building:
Introduction, fire protection in building, structural and architectural safety requirements of

resistive structures, fire resistive properties of building materials, fire exit requirements, force and acceleration on building due to earthquake, building response characteristics, building drift.

Module-5:

Unit-1: Water Supply, Sanitary and Electrical Works in Building:

Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

Unit-2: Highway Engineering:

Introduction, historical background of road or highway, classification of roads, pavements and roads, traffic control mechanism.

TEXTBOOKS:

1. “Elements of Civil Engineering’’ by Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, PHI Learning Private Limited New Delhi.
2. “Elements of Civil Engineering’’ by Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education, India Pvt. Ltd.
3. “Surveying Vol. I’’ by Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain16th Edition Publisher: Laxmi Publication Delhi.
4. “Building drawing”byM.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.

REFERENCES:

1. “Surveying Theory and Practice” by James M Anderson and Edward M Mikhail McGraw Hill Education, India Pvt. Ltd. (7th Edition).
2. “Surveying and Leveling” by R. Subramanian, Oxford University.
3. “Building drawing” by M.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.
4. “Civil Engg. Drawing” by S. C. Rangwala, Charotar Pub. House Anand.

E-Resources:

1. https://nptel.ac.in/courses/105/106/105106201/

Course outcomes:

On completion of the course, students will be able to:

1. **Explain**the basic requirements of civil engineering components.
2. **Evaluate** area for irregular shaped bodies.
3. **Explain** the various building materials.
4. **Plan** the building against the fire.
5. **Discuss** the highway development in India.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO5	2	1	-	-	-	1	-	-	-	-	-	-	-	-
Average	2	1	-	-	-	1	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code:
J31OB</td><td rowspan="2">ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Environmental Science.

Course Objectives:

This course will enable students to:

1. Study the need of environmental impact assessment.
2. Study the role of EIA and different methodologies of EIA.
3. Discuss the guidelines of EIA for the project.
4. Study the different approaches to mitigate the adverse impact on environment.
5. Identify the EIA for specific case studies.

Module 1:

Unit-1: Impact of developmental projects – sustainable development – Need for Environmental Impact Assessment (EIA), Rapid and Comprehensive EIA, Environmental Impact statement (EIS) – EIA capability and limitations – Legal provisions on EIA – stages of EIA.

Module 2:

Unit-1: Role of NEPA in EIA, CEQ, Environmental documents. EIA/ EIS& FONSI relationship, processing of EIA/EIS, Environmental attributes.

Methodologies: Criteria to be considered for the selection of EIA methodologies, Adhoc, overlays, Check lists – Matrices – Networks – Cost-benefit analysis with their advantages and limitations.

Module 3:

Unit-1: EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

Prediction and Assessment: Assessment of Impact on land, water, air, and noise. Social and cultural activities and on flora and fauna – mathematical models – public participation. Forest act 1980.

Module 4:

Unit-1: Environment management plan:

Plan for mitigation of adverse impact on Environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to project affected people. Post project monitoring. ISO 9000, 14000 & 18000.

Module 5:

Unit-1:

EIA for Water resource developmental projects, Highway projects: Nuclear Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

Text Books

1. "Environmental Impact Assessment" by S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye, I k international house publishing, pvt ltd. 1st addition Sep 2019.
2. "Environmental Impact Assessment" by Barthwell, R. R. New Age International Publications. 3rd addition Oct 2017.

Reference Books

1. "Environmental Impact Analysis" by Jain R.K.-Van Nostrand Reinhold Co, H K E S international publication, 3rd addition oct 2014.
2. "Environment Impact Assessment" by Anjaneyulu, B S Publication, 2nd addition Jan 2010

Web Resources

1. https://nptel.ac.in/courses/120/108/120108004/

Course Outcomes

On completion of the course, the students will be able to:

1. **Explain** the stages and need for environmental impact assessment.
2. **Discuss** different methodologies for environmental impact prediction and assessment.
3. **Evaluate** the environmental management plans.
4. **Solve** the problems associated with adverse impact on environment.
5. **Apply** the knowledge of EIA on different construction projects.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	2	-	-	-	1	2	3	-	-	-	-	2	1
CO2	-	-	-	-	-	2	3	1	-	-	-	-	1	1
CO3	-	-	-	-	-	2	2	3	-	-	-	-	2	1
CO4	-	2	-	-	-	1	2	3	-	-	-	-	1	3
CO5	-	-	-	-	-	1	3	2	-	-	-	-	2	2
Average	-	0.8	-	-	-	1.4	2.4	2.4	-	-	-	-	1.6	1.6

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OC</td><td rowspan="2">ENERGY ENGINEERING
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisites: Nil

Course Objectives:
This course will enable students to:
1. To provide basic knowledge about various types of energy resources.
2. To familiarize the students about conventional energy systems.
3. To understand the practical significance of hydro-electric technology, wind, solar and biomass energy technologies.
4. Illustrate how biomass is currently used as a source of energy, its Future potential both in providing energy and in producing alternative fuels.
5. To familiarize energy conservation and management.

MODULE-I: INTRODUCTION TO ENERGY RESOURCES
World Energy status – Indian scenario, Energy resources – conventional and renewable, fuel cells, hydrogen energy, small hydro resources; Need for energy storage, energy storage methods; Environmental aspects of energy – Economics.

MODULE-II: CONVENTIONAL ENERGY SYSTEMS
Unit-I: Coal fired steam thermal power plant – layout, working, T-S diagram of water and steam, rankine cycle for steam turbine, efficiency.
Unit-II: Gas turbine power plant – various options, layout, working and T-S diagram for simple and combined cycle power plant, comparison, efficiency.
Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, nuclear waste management.

MODULE-III: HYDRO ELECTRIC TECHNOLOGY
Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects – Hydro-Thermal coordination. Ocean Energy Technology, Wave and tidal energy - fundamentals - energy converters - power plant - limitations.

MODULE-IV: WIND, SOLAR AND BIOMASS ENERGY TECHNOLOGIES
Unit-I: Wind turbine types and construction – power equation – wind energy conversion systems grid connection - environmental aspects.
Unit-II: Solar energy basics – energy from the sun, solar constant, solar spectrum, clarity index, V-I characteristics of a solar cell – solar module –Solar PV plant – hybrid systems.

Biomass energy resources – conversion technologies – urban waste to energy conversion – Biogas plant.

MODULE-V: ENERGY CONSERVATION AND MANAGEMENT

Unit-I: Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities.

Unit-I: Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager. Energy Audit: Type and Methodology, Energy audit reporting format, Understanding Energy Costs, Fuel and Energy Substitution, Energy Audit Instruments.

TEXT BOOKS

1. S.Rao and Dr.B.B.parulekar, "Energy Technology", Khanna pub., Third edition, 1999.
2. Non-conventional energy resources by B.H.Khan, TMH, 2006.
3. Desai,AV, "Energy Demand: Analysis, Management and Conservation", WileyEastern Limited, 1990.

REFERENCE BOOKS

1. G.D.Rai, "Non-conventional energy sources", Khanna pub. Fourth Edition, 2002.
2. Pulfrey, D.L., Photovoltaic Power Generation, Van Nostrand Co., 1983.
3. Abbasik "Renewable Energy Sources and their Environment", PHI, 2008.
4. B.Mohanty, R.S.Liu, U.V Krishna Mohan Rao, "Energy Audit Management for theIndian Industry", Directorate the Institute of Charted Accountants of India, New Delhi,2001.
5. Encyclopedia of Energy – McGraw Hill Publication.
6. Energy Management Handbook, John Wiley & Sons, Wayne C.Turner.
7. Kothari et al. "Renewable Energy Sources and Emerging Technologies", PHI, 2008.

E-Resources:

1. http://nptel.ac.in/courses/112105051/
2. https://www.youtube.com/watch?v=Ota2_LUuar0
3. https://www.youtube.com/watch?v=Ota2_LUuar0
4. https://www.youtube.com/watch?v=3dJAtHaSQ98
5. https://www.youtube.com/watch?v=xokHLFE96h8
6. http://www.tatapower.com/businesses/renewable-energy.aspx
7. http://www.cleanlineenergy.com/technology/wind-and-solar

Course Outcomes:

On completion of the course, the students will be able to:

1. **Provide** basic knowledge about various types of energy resources.
2. **Familiarize** the students about conventional energy systems.

3. **Understand** the practical significance of hydro-electric technology, wind, solar and biomass energy technologies.
4. **Know** how biomass is currently used as a source of energy, its Future potential both in providing energy and in producing alternative fuels.
5. **Familiarize** energy conservation and management.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	2	-	-	3	2	3	-	-	-	-	-	2
CO2	-	-	3	-	-	2	3	2	-	-	-	-	-	3
CO3	-	-	3	-	-	3	3	3	-	-	-	-	-	2
CO4	-	-	3	-	-	3	3	2	-	-	-	-	-	3
CO5	-	-	3	-	-	2	3	3	-	-	-	-	-	2
Average	-	-	2.8	-	-	2.6	2.8	2.6	-	-	-	-	-	2.4

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS			
Course Code: J31OD	**SENSORS AND TRANSDUCERS** (Open Elective-I)	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Pre-requisites: Nil

Course Objectives:

1. To make students familiar with the constructions and working principle of different types of sensors and transducers
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.
3. To make students familiar with the Potentiometer, Loading effect, Strain gauge
4. To make students aware about Linear Variable Differential Transformer, LVDT Accelerometer
5. To make students aware piezoelectric and pyro-electric transducers

MODULE – I

Measurements and Instrumentation of Transducers: Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

MODULE – II

Characteristics of Transducers: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

MODULE– III

Resistive Transducers: Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

MODULE – IV

Inductive and Capacitive Transducer: Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

MODULE – V

Miscellaneous Transducers: Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS:

1. Sawhney. A.K, “A Course in Electrical and Electronics Measurements and Instrumentation”, 18th Edition, DhanpatRai& Company Private Limited, 2007.
2. Patranabis. D, “Sensors and Transducers”, Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Renganathan. S, “Transducer Engineering”, Allied Publishers, Chennai, 2003.
2. Doebelin. E.A, “Measurement Systems – Applications and Design”, Tata McGrawHill, New York, 2000.
3. John. P, Bentley, “Principles of Measurement Systems”, IIIEdition, PearsonEducation, 2000.
4. Murthy. D. V. S, “Transducers and Instrumentation”, Prentice Hall of India, 2001.
5. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
6. Instrument Transducers – An Introduction to their Performance and design – byHerman K. P. Neubrat, Oxford University Press.

E-Resources:

1. http://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf

Course Outcomes:

On completion of the course, the students will be able to:

1. **Concept** behind working of measurement systems and different types of sensors and transducers.
2. **Sensor** to measure various physical parameters used in Industry and normal measurement applications
3. **Working** principle of resistive, inductive and capacitive transducers and their applications.
4. **Understanding** of digital and proximity sensors and their applications.
5. **Understanding** of thermocouples, piezoelectric and pyro-electric transducers and their applications.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	1	-	-	-	-		-	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	1	1	-	-	-	1	-	-	-	2	1
CO4	2	-	-	-	1	-	2	-	-	-	-	-	2	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-
Average	1.6	1.5	1	1	1	1	2		1	-	-	-	1.6	1

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OE</td><td rowspan="2">AUTOMOTIVE TECHNOLOGY
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Chemistry, Engineering Physics.

Course Objectives:
This course will enable students to:
1. Provide an overview on automobile engineering
2. Learn different fuels and advanced control systems
3. Study the concepts and drive train configurations of electric and hybrid electric vehicles
4. Understand use of intelligent vehicle technologies like navigation in automobiles
5. Provide awareness of safety security and regulations

Module 1
Unit-1: Structural systems of automobile– chassis and body, power unit, transmission system, Steering System, Suspension System, Braking System.
Unit-2: Other systems of automobile- Ignition systems, Fuel System, Cooling System, Electrical System.

Module 2
Unit-1: Fuels: Types of Fuels-Gasoline fuels, CNG, Biofuels, advantages and limitations.
Unit-2: Advanced Engine Controls: Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi-point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control.

Module 3
Unit-1: Fuel Cell and Solar Vehicles: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.
Unit-2: Electric and Hybrid Vehicles: Electric vehicles - Layout of an electric vehicle, performance, energy consumption, advantage and limitations. Hybrid electric vehicles - Concepts, types of hybrid drive train architecture, merits and demerits.

Module 4
Unit-1: Telematics Systems: Global positioning system, geographical information systems, navigation system.
Unit-2: Comfort Systems: Automotive vision system, adaptive cruise control system, active suspension system, power steering and power windows.

Module 5

Unit-1: Safety and Security Systems: Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti-lock braking systems, traction control system, electronic immobilizers, remote keyless entry, smart card system, number plate coding.

Unit-2: Emission and noise control regulations- Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

Text Books:

1. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn, 1998.
2. MehrdadEhsani, YiminGao, Sebastien E. Gay and Ali Emadi, "Modern Electric,Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2005.
3. Kripal Singh, "Automobile Engineering", Standard Publishers, Vol. 1 & 2, 2007

Reference Books:

1. Automotive Hand Book" Robert Bosch, SAE, 5th edition, 2000.
2. LjuboVlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
3. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
4. "Navigation and Intelligent Transportation Systems – Progress in Technology", Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998.

E - Resources:

1. https://rb.gy/zm8le8
2. https://rb.gy/ceck4k
3. https://nptel.ac.in/courses/107/106/107106088/
4. https://nptel.ac.in/courses/108/102/108102121/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Outline** the overview of automobile engineering
2. **Identify** the different fuels and advanced control systems
3. **Develop** the concepts and drive train configurations of electric and hybrid electric vehicles
4. **Apply** the use of intelligent vehicle technologies like navigation in automobiles
5. **Aware** of safety security and regulations

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	3	3	3	-	-	-	-	-	-	2		
CO2	3	-	3	3	3	-	-	-	-	-	-	2		
CO3	3	-	3	3	3	-	-	-	-	-	-	2		
CO4	3	-	3	3	3	-	-	-	-	-	-	2		
CO5	3	-	3	3	3	-	-	-	-	-	-	2		
Average	3	-	3	3	3	-	-	-	-	-	-	2		

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4" style="text-align:center">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OG</td><td rowspan="2">PRINCIPLES OF SENSORS AND THEIR APPLICATIONS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre - requisite: Nil

Course Objectives:
This course will enable students to:
1. To understand the concepts of measurement technology.
2. To learn the different sensors used to measure various physical parameters.
3. To Acquire knowledge on Optical sensors.
4. To understand the concepts Acoustic sensors.
5. To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

Module 1:
Unit 1: INTRODUCTION
Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers .
Unit 2: Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

Module 2:
Unit 1:MOTION, PROXIMITY ANDRANGINGSENSORS
Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive.
Unit 2:LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

Module 3:
Unit 1: FORCE, MAGNETIC AND HEADINGSENSORS
Strain Gage, Load Cell, Magnetic Sensors–types, principle, requirement and advantages:
Unit 2: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

Module 4:
Unit 1: OPTICAL, PRESSURE ANDTEMPERATURE SENSORS9
Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD.

Unit 2: Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors
Film sensor, MEMS & Nano Sensors, LASER sensors.

Module 5 :
Unit 1: SIGNAL CONDITIONING andDAQSYSTEMS9
Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition .
Unit 2: Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and PuneetSawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, DhanpatRai& Co, New Delhi,2013.

REFERENCES

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi,2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications,1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

E-RESOURCES:

1. https://www.sciencelearn.org.nz/resources/1602-electricity-and-sensors
2. https://predictabledesigns.com/introduction-to-electronic-sensors/

OUTCOMES:
The students will be able to

1. **Expertise** in various calibration techniques and signal types for sensors.
2. **Apply** the various sensors in the Automotive and Mechatronics applications
3. **Study** the basic principles of various smart sensors.
4. **Apply** Optical and Acoustic sensors in Home Appliances.
5. **Implement** the DAQ systems with different sensors for real time applications

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**2.5**	**2.67**										

<table>
<tr><td>2020-21</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code:
J31OH</td><td rowspan="2">PRINCIPLES OF COMMUNICATIONS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Communication systems

Course Objectives:

The Student will

1. provide the basic concepts of communication systems.
2. gain knowledge about Amplitude modulation and Angle Modulation.
3. study sampling and pulse modulation methods.
4. study and compare different binary digital modulation techniques.
5. understand the basic concepts of information theory.

Module 1: Introduction

Unit 1: Block diagram of Electrical communication system, Radio communication: Types of communications, Analog, pulse and digital types of signals,

Unit 2: Noise – Types of noise, sources of noise, calculation of noise in Linear systems and noise figure.

Module 2: Amplitude Modulation

Unit 1: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM: Diode detector, Product demodulation for DSB SC & SSB SC.

Unit 2: Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

Module 3: Pulse Modulations

Unit 1: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM.

Unit 2: Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

Module 4: Digital Communication

Unit 1: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

Unit 2: Digital Modulation: ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

Module 5: Information Theory

Unit 1: Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding

Unit 2: Error control coding: Introduction, Error detection and correction codes, block codes, convolution codes

TEXT BOOKS :

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCES:

1. Electronic Communication Systems – Kennedy and Davis, TMH , 4th edition, 2004.
2. Communication Systems Engineering -John. G. Proakis and MasoudSalehi, PHS, 2nd ed.2004.

E - Resources:

1. https://nptel.ac.in/courses/Nanoelectronics/ IIT Madras/ab1011/102/111102111/

Course Outcomes:

The student will be able to:

1. **Illustrate** the main concepts of analoge and digital communication systems.
2. **Analyze** and design an am and fm modulator/demodulator.
3. **Explain**, discuss, and compare different binary digital modulation techniques.
4. **Distinguish** different types of noise and explain the effects of noise on communication system.
5. **Use** the basic concepts of information theory.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2	2	1	-	-	-	-	-	-	-	-	1	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code:J31OI</td><td colspan="4" rowspan="2">FUNDAMENTALS OF DATA BASE MANAGEMENT SYSTEM
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: A course on "Data Structures"

Course objectives:
The Student will
1. Understanding of the architecture and functioning of database management systems.
2. Understand and apply the principles of data modeling using relational model and develop a good database design.
3. Understand the use of structured query language (SQL) and its syntax.
4. Apply normalization techniques to normalize a database.
5. Understand the need of database processing and learn techniques for controlling the Consequences of concurrent data access.

Module 1:
Introduction to Data Base Systems
Data base System Applications, data base System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML.
Database Access for applications Programs
data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor.

Module 2:
Introduction to the Relational Model
Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.
Relational Algebra
Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus.

Module 3:
Form of Basic SQL Query
Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values.

Schema refinement

Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

Module 4:

Transaction Concept

Transaction State- Implementation of Atomicity and Durability – Concurrent Executions – Serializability- Recoverability– Implementation of Isolation – Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols.

Recovery and Atomicity

Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

Module 5:

Data on External Storage

-File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM).

Advanced Database Management System

Introduction to Distributed Database-Reference Architecture, fragmentation, Allocation, Joins.

Text Books:

1. Data Base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

Reference Books:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, ElmasriNavrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education.

E - Resources:

1. http://www.iran-lms.com/images/images/Books/PDF/Fundamentals-of-Database-Systems-Pearson-2015-Ramez-Elmasri-Shamkant-B.-Navathe.pdf
2. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcs.gmu.edu%2F~aobaidi%2Ffall_05%2Findex_files%2FLectures%2FENCh10.ppt
3. https://www.youtube.com/watch?v=T7AxM7Vqvaw
4. https://cs.ulb.ac.be/public/_media/teaching/infoh303/dbmsnotes.pdf

5. https://www.w3schools.in/dbms/intro/

Course outcomes:

The Student will be able to

1. **Identify** the underlying concepts of database technologies.
2. **Design** a database schema for a given problem domain.
3. **Formulate** SQL queries and integrity constraints over relations.
4. **Apply** normalization on database for eliminating redundancy.
5. **Summarize** transaction properties, concurrency control and recovery techniques and learn various data storage and security mechanisms.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	-	1	-	-	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	2
CO4	3	2	3	3	2	-	-	-	-	-	-	-	-	3
CO5	2	2	3	1	3	-	-	-	-	-	-	-	-	1
Average	**2.8**	**2.6**	**2.6**	**2.0**	**2.0**	-	-	-	-	-	-	-	-	**2.0**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OJ</td><td rowspan="2">PRINCIPLES OF OPERATING SYSTEMS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:
1. Programming for Problem solving, Data structures and Algorithms (not mandatory).
2. Computer Organization.

Course objectives:

The Student will
1. Understand the basic concepts and functions of computer operating systems.
2. Apply the concurrency control among the operating system programs execution.
3. Demonstrate the techniques used to manage the memory during program execution.
4. Explain the various storage management methods and functions of operating systems.
5. Design the security features against attacks on operating system.

Module 1:

Background

Overview: Basic Elements, Evolution of the Microprocessor, Instruction Execution, Interrupts, Cache Memory, Direct Access Memory.

System Structures: Computer Systems Organization, Computer System Architecture, Operating System Architecture, Systems Calls, Operating System structure, Building and Booting an Operating System.

Module 2:

Process Management

Process Concepts: Introduction, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Critical-Section Problem, Peterson’s Solution, Synchronization Hardware, Semaphores, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization.

Deadlock: Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Module 3:

Main Memory: Background, Contiguous Memory Allocation, Paging, Page-Table Structure, Swapping, Segmentation.

Virtual Memory: Background, Demand Paging, Page Replacement Algorithms, Frames Allocation, Thrashing.

Module 4:

Mass-Storage Structure: Overview, Disk Structure, Disk Attachment, Disk Scheduling, Swap-Space Management, RAID Structure.

File system Management: File Concepts, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management.

Module 5:

Mass-Storage Structure: Overview, Disk Structure, Disk Attachment, Disk Scheduling, Swap-Space Management, RAID Structure.

File system Management: File Concepts, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management.

Text Books:

1. Operating System Concepts-A. Silberschatz, Peter B. Galvin, Greg Gagne, 10th Edition, John Wiley& Sons inc.
2. Operating Systems Internals and Design Principles – William Stallings, 7th Edition, Prentice Hall.

Reference Books:

1. Principles of Operating Systems-NareshChauhan, Oxford Higher Education.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems-Andrew S Tanenbaum, 2nd Edition Pearson, PHI.

E - Resources:

1. https: // www.tutorialspoint .com/operating_system/
2. https: // www.studytonight.com/operating-system/
3. https: // learn.saylor.com/course/view.php?id=948&sectioned=967
4. https: //nptel.ac.in/courses/106/105/106105214/
5. https://www.edx.org/course/computer-hardware-and-operating-systems

Course outcomes:

The Student will be able to

1. **Compare** differing structures of operating systems including process management.
2. **Apply** different CPU scheduling algorithms and various Memory management techniques.
3. **Illustrate** the use of Bankers algorithm for deadlock avoidance and File system organization.
4. **Demonstrate** various mass storage management techniques
5. **Analyze** different aspects of protection and security concepts

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	3
CO3	3	2	3	-	-	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	2
Average	**2.8**	**2.2**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J31OK	INTRODUCTION TO DATA STRUCTURES through PYTHON (Open Elective-I)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Programming in C

Course Objectives:

This course will enable students to:

1. Understand fundamentals of programming.
2. Adapt Basic taxonomy of python.
3. Familiarize with OOP.
4. Understand Data Structure in Python.
5. Design Solutions with OOP Paradigm.

Module I: Introduction

Unit 1:

Relationship between computers and programs, Basic principles of computers, Fundamentals of Programming and File systems,

Unit 2:

Using the Python interpreter, Introduction to binary computation, Input / Output.

Module II: Data types and control structures

Unit 1:

Keywords, Operators (unary, arithmetic, etc.), Data types, variables, expressions, and statements, Assignment statements, Strings and string operations.

Unit 2:

Control Structures: loops and decision

Module III: Modularization and Classes

Unit 1:

Standard modules, Packages and using of Packages.

Unit 2:

Defining Classes, Defining functions, Functions and arguments.

Module IV: Data Structures and Exceptions

Unit 1:

Data Structures (array, List, Tuples and Dictionary).

Unit 2:

Error processing, Exception Raising and Handling.

Module V: Object oriented design
Unit 1:
Programming types, Object Oriented Programming, Object Oriented Design.
Unit 2:
Inheritance and Polymorphism.

Text Books:
1. Data Structures and Algorithms in Python. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, Wiley, 2013.Reference Books:

Reference Books:
1. Data Structures and Algorithms Using Python Rance D. Necaise, JOHN WILEY & SONs.

E - Resources:
1. https://www.my-mooc.com/en/mooc/introduction-to-python-programming/

Course Outcomes:
On completion of the course, the students will be able to:
1. **Recall** fundamentals of programming.
2. **summarize** Basic taxonomy of python.
3. **Get** Familiarity with OOP.
4. **Apply** Data Structure in Python.
5. **Solve** Problems with OOP Paradigm.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	1	-	-	-	-	-	-	-	-	2	1
CO2	1	2	2	1	-	-	-	-	-	-	-	-	1	2
CO3	2	2	2	2	-	-	-	-	-	-	-	-	1	1
CO4	2	2	2	2	-	-	-	-	-	-	-	-	2	2
CO5	1	2	2	2	-	-	-	-	-	-	-	-	2	1
Average	1.6	2	1.8	1.6	-	-	-	-	-	-	-	-	1.6	1.4

<table>
<tr><td rowspan="2">AY 2020-21 onwards</td><td rowspan="2">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4" rowspan="2">B. Tech: AI&DS</td></tr>
<tr></tr>
<tr><td>Course Code: J31OL</td><td rowspan="2">INTRODUCTION TO WEB DESIGN
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Know regarding internet related technologies.
2. Understanding of the current industry support for web technologies.
3. Explain the basic concepts of CSS.
4. Visualize the basic concepts of PHP.
5. Understanding PHP functions and Methods

Module I:

UNIT-I: Basics in Web Design: Brief History of Internet, what is World Wide Web, why create a web site, Web Standards, Audience requirement.
UNIT -II: Web Design Principles: Basic principles involved in developing a web site,Planning process, Five Golden rules of web designing, Designing navigation bar page design,Home Page Layout, Design Concept.

Module II:
UNIT-I: What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags, HTML Tables, HTML Forms.
UNIT II: Introduction to elements of HTML, working with Text Working with Lists, Tables and Frames, working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

Module III:
UNIT-I: Concept of CSS, Creating Style Sheet and types of CSS, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties).
UNIT-II: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Colors, Creating page Layout and Site Designs.

Module IV:
UNIT-I: Downloading, installing, configuring PHP, The anatomy of a PHP Page. Basic

Security Guidelines, Variables, Data Types, Operators and Expressions, Constants, Flow Control Functions; Switching Flow, Loops.

UNIT II: Code Blocks and Browser Output, Objects, Strings Processing, Form processing, connecting to database, using cookies, dynamic contents.

Module V:
UNIT I: Creating the Web Site, Saving the site, working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Text Books:

1. Dietel and Dietel : ―Internet and World Wide Web - How to Program‖, 5th Edition, PHI/Pearson Education,2011
2. Web Technologies: HTML,CSS, XML,PhpBlackBook.

Reference Books:

1. Chris Bates, ―Web Programming, building internet applications‖, 2ndEdition, WILEY, Dreamtech,2008.
2. HTML 5 in simple steps Kogent Learning Solutions Inc, DreamtechPress.
3. Beginning CSS: Cascading Style Sheets for Web Design Ian Pouncey, ichard York Wiley India

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105084/
2. http://www.nptelvideos.in/2012/11/internet-technologies.html
3. http://www.nptelvideos.com/php/php_video_tutorials.php

Course Outcomes:
At the end of the course , students will be able to

1. **Develop** the application of the HTML for document structure.
2. **Develop** the skills in analyzing the usable of a website.
3. **Create** dynamic webpage, using PHP.
4. **Using** PHP to manipulate Files.
5. **Develop** the concept of web publishing.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3
Average	3	2.4	3	-	-	-	-	-	-	-	-	-	3	3

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="3">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="3">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OM</td><td colspan="3" rowspan="2">BASICS OF OBJECT ORIENTED PROGRAMMING
(Open Elective-I)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Knowledge of C and C++

Course Objectives:
The Students will
1. Familiar with concepts of OOP
2. Explain inheritance and polymorphism
3. Familiar with packages and interfaces
4. Familiar with exception handling and multithreading
5. Familiar with applet programming and event handling.

Module I:
Unit 1: Introduction: Concepts of Object Oriented Programming, Encapsulation and Polymorphism, history of Java.
Unit 2 : Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program.

Module II:
Unit 1: Classes and Objects: Concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion. String handling.
Unit 2 :Inheritance 1: Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Module III:
Unit 1: Interfaces 2: Defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.
Unit 2 : Packages: Defining, creating and accessing a package, importing packages, access control, exploring package - java.io.

Module IV:
Unit 1 : Exception handling: Concepts of exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw,throws and finally, built in exceptions, creating own exception sub classes.
Unit 2 : Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Module V:

Unit 1: Applets: Concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.

Unit 2: Event Handling: Events, event sources, event classes, event listeners, delegation event model, handling mouse and key board events, adapter classes. The AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists

Text Books:

1. Java The complete reference, 8th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, up dated edition, T.Budd, Pears on education.

Reference Books:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, Pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.

E-Resources:

1. www.javasoft.com
2. www.w3schools.com
3. www.tutorialpoint.com
4. www.oracle.com
5. https://www.youtube.com/watch?v=-HafzawNlUo&ab_channel=SundeepSaradhiKanthety.
6. https://www.youtube.com/watch?v=7WhnYwoBY24&list=PLlhM4lkb2sEhf5NlWeYh_gdcN49pHjVP0&ab_channel=SmartProgramming.
7. https://www.youtube.com/watch?v=G_t6BbZeyUU&ab_channel=VoidRealms

Course Outcomes:

Students will be able to

1. **Familiar** with constructors and string handling
2. **Understand** inheritance and polymorphism
3. **Understand** packages and interfaces
4. **Understand** exception handling and multithreading
5. **Understand** applet programming

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**											**Program Specific Outcomes***		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O 1**	**PS O 2**
CO1	-	3	-	3	3	-	3	-	-	2	-	-	3	-
CO2	-	-	2	-	-	3	-	3	-	-	3	-	-	3
CO3	3	-	-	3	-	2	-	-	3	-	-	3	-	-
CO4	3	-	-	-	3	-	-	3	3	3	-	-	3	-
CO5	-	3	-	-	-	-	2	-	-	-	3	-	-	3
Average	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**2.5**	**2.5**	**3.0**	**3.0**	**2.5**	**3.0**	**3.0**	**3.0**	**3.0**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31ON</td><td rowspan="2">FUNDAMENTALS OF DIGITAL LOGIC DESIGN
(Open Elective-I)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basics of Boolean algebra

Course Objectives:
Students will learn to

1. Understand basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. Understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. Implement simple logical operations using combinational logic circuits.
4. Design combinational logic circuits, sequential logic circuits.
5. Impart the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Module I:
Unit 1: Binary systems : digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, binary storage and registers, binary logic.

Module II:
Unit 1: Boolean algebra and logic gates : basic definitions, axiomatic definition of boolean algebra, basic theorems and properties of boolean algebra, boolean functions canonical and standard forms, other logic operations, digital logic gages, integrated circuits.

Module III:
Unit 1: Gate – level minimization: the map method, four-variable map, five-variable map, product of sums simplification don’t-care conditions, nand and nor implementationother two-level implementnations, exclusive – or function, hardward description language (hdl).

Module IV:
Unit 1 : Combinational logic : combinational circuits, analysis procedure design procedure, binary adder-subtractor decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers, hdl for combinational circuits.

Module V:
Unit 1: Registers, shift registers, ripple counters synchronous counters, other counters, hdl for registers and counters.

Text Books:

1. Digital design – third edition ,m.morrismano, pearson education/phi.
2. Fundamentals of logic design, roth, 5th edition,thomson.

Reference Books:

1. Switching and finite automata theory by zvi. Kohavi, tatamcgraw hill.
2. Switching and logic design, c.v.s. rao, pearson education
3. Digital principles and design – donaldd.givone, tatamcgraw hill, edition.
4. Fundamentals of digital logic & micro computer design , 5th edition, m. Rafiquzzaman john wiley

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105185/
2. https://www.coursera.org/learn/digital-systems

Course Outcomes:

Students will be able to

1. **Manipulate** numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
2. **Build** Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. **Design** and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. **Analyze** small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.
5. **Construct** digital systems by Algorithmic State Machine Charts

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1									2	2	
CO2	3	2			1							2	1	2
CO3	3		2	2	1								2	2
CO4	3	2	2	2	1								2	
CO5	2	2	2	1	1									2
Average	2.4	2	1.75	1.67	1								1.75	2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OP</td><td rowspan="2">INTRODUCTION TO MINING TECHNOLOGY
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course objectives:

1. To introduce the distribution of mineral deposits in India
2. To acquaint with different stages of mining process
3. To get idea about Drilling and its machinery
4. To get idea about Explosives and blasting in mines
5. To know about shaft sinking methods, precaution & lining during shaft sinking

Module 1

Unit - I: Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology

Module 2

Unit - I: Stages in the life of the mine - prospecting, exploration, development, exploitation, and reclamation.

Unit - II: Access to mineral deposit- selection, location, size, and shape (incline, shaft and Adit), brief overview of underground and surface mining methods.

Module 3

Unit - I: Drilling: Types of drills, drilling methods, electric, pneumatic, and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

Module 4

Unit - I: Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.

Unit - II: Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

Module 5

Unit - I: Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

Textbooks:

1. R. P. Pal, Rock blasting effect and operation, A. A. Balkema, 1st Ed, 2005.
2. D. J. Deshmukh, Elements of mining technology, Vol. 1, Central techno, 7th Ed, 2001.

Reference books:

1. C. P. Chugh, Drilling technology handbook, Oxford and IBH, 1st Ed, 1977.
2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

E-resources:

1. https://www.cienciaviva.pt/img/upload/Introduction%20to%20mining.pdf
2. https://www.researchgate.net/publication/282572490_Basic_concept_of_mining_technology

Course outcomes:

The student will be able to:

1. **Learn** about distribution of mineral deposits in India
2. **Learn** about stages on mining process
3. **Learn** about drilling and its machinery
4. **Understand** about explosives, blasting and blasting mechanism
5. **Understand** about shaft sinking methods, precautions, and lining of shafts

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OR</td><td rowspan="2">NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS
(Common to EEE,ECE, CSE, IT&ECM)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To solve algebraic, transcendental equations and system of linear equation by various methods and find Eigen value by iteration method.
2. To Interpolate and approximate equal and unequal intervals by various formulae.
3. To discuss approximation of numerical differentiation and integration(single &double).
4. To solve Ordinary Differential Equations (ODEs) in Initial value Problems (IVPs) by various methods.
5. To solving ODEs & Partial Differential Equations (PDEs) in boundary value Problems(IVPs) by various methods

Module 1: Solution of Equations and Eigen value Problems

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method –Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

Module 2 : Interpolation and Approximation

Interpolation with unequal intervals - Lagrange's interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

Module 3: Numerical Differentiation and Integration

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Romberg’s method - Two point and three point Gaussian quadrature formulae Evaluation of double integrals by Trapezoidal and Simpson’s 1/3rules.

Module 4 : Initial Value Problems for Ordinary Differential Equations

Single Step methods - Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne’s and AdamsBash forth predictor corrector methods for solving first order equations**.**

Module 5 :Boundary Value Problems in Ordinary Differential Equations

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method**.**

Text Books:

1. "Higher Engineering Mathematics", B.S. Grewal ,Khanna Publications, 2017
2. "Numerical Methods for Engineers", Chapra. S.C., and Canale.R.P., Tata McGraw Hill, 5 th Edition, New Delhi,2007.

Reference Books:

1. "Advanced Engineering Mathematics", R.K.Jain& S.R.K. Iyengar, Narosa Publications, 5th Edition, 2015.
2. "Higher Engineering Mathematics", Ramana B.V., Tata McGraw Hill New Delhi,11thReprint, 2010

E - Resources:

1. http://www.brainkart.com/article/Solution-of-Equations-and-Eigenvalue-Problems_6462/
2. http://www.cs.nthu.edu.tw/~cchen/CS3331/ch6.pdf
3. http://www.vbspu.ac.in/wp-content/uploads/2016/02/Differentiation-and-Integration.pdf
4. https://link.springer.com/chapter/10.1007/978-1-4612-6390-6_4
5. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_FREE_DIFFEQ_II.PDF

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** the basic knowledge on solution of Eigenvalues
2. **Use** interpolation and approximation to solve engineering problems.
3. **Discuss** the numerical differentiation and integration.
4. **Apply** initial value problems for solving first order differential equation.
5. **Apply** the boundary value problems in ordinary and partial differential equations.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OR</td><td rowspan="2">NUMBER THEORY & CRYPTOGRAPHY
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. The basic definitions and theorems in number theory
2. The concept of a congruence and use various results related to congruence's including the Chinese Remainder Theorem
3. Number theory algorithms and procedures to basic problems.
4. The fundamentals of Cryptography how number theory is related to and used in cryptograph

Module 1 : Divisibility Theory And Canonical Decompositions

Division algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

Module 2 : Diophantine Equations And Congruence's

Linear Diophantine equations – Congruence‘s – Linear Congruence‘s – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.

Module 3: Classical Theorems And Multiplicative Functions :

Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phifunctions**.**

Module 4: Classical Encryption Techniques

Classical encryption techniques: Symmetric chipper model – Substitution techniques – Transposition techniques – Steganography.

Module 5: Block Chippers and Public Key Encryption

Block chipper principles – block chipper modes and operations – advanced encryption standards (AES) – Public key cryptography – Principles of public key cryptosystem – The RSA algorithm – Elliptic curve arithmetic – Elliptic curve cryptosystem.

Text Books:

1. "Course on Number Theory and Cryptography", Koblitz, N. Springer Verlag, 1986
2. "Handbook of Applied Cryptography", Menezes, A, et.al. CRC Press,1996

Reference Books:

1. "An Introduction to the Theoryof Numbers", Ivan Niven, Herbert S. Zukerman, Hugh L. Montgomery.

E - Resources:

1. https://people.maths.bris.ac.uk/~mazag/nt/lecture1.pdf
2. https://www.diva-portal.org/smash/get/diva2:530204/FULLTEXT01.pdf
3. https://en.wikipedia.org/wiki/Multiplicative_function
4. https://www.slideshare.net/PrachiGulihar/elementary-cryptography
5. https://en.wikipedia.org/wiki/Public-key_cryptography

Course Outcomes:

On completion of the course, the students will be able to:

1. **Ability** to think and reason about abstract mathematics
2. **Analyze** the vulnerabilities in any computing system and hence be able to design a security solution
3. **Evaluate** security mechanisms using rigorous approaches, including theoretical
4. **Solve** problems in elementary number theory
5. **Apply** elementary number theory to cryptograpy

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO2	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO3	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO4	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO5	3	2	3	3	-	-	-	-	-	-	-	2	-	-
Average	3	2	3	3	-	-	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OR</td><td rowspan="2">NANOMATERIALS
(Common to CE, EEE, ME, ECE, CSE, IT& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. To familiarize about the various properties of nanostructures.
2. Utilizing the different physical and chemical methods in preparing nanomaterials.
3. Provide different methods of synthesis of Nano materials.
4. Bring out the distinct Quantum Structure properties of nanostructures.
5. Find out the particle size of a crystal by XRD technique.

Module 1: Introduction to Nanomaterials
Introduction to nanotechnology and materials, Nano materials, Introduction to nano sizes and properties comparison with the bulk materials, Different Shapes and Sizes and Morphology.Classification of nanomaterials.Fullerene, carbon, Nanotubes (CNT's), Nanoparticles.Physical, Chemical,Electrical, Optical, Magnetic and mechanical properties of nanomaterials.

Module 2:
Unit-1: Physical Methods: Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, and electro deposition.
Unit - 2: Chemical Methods: Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

Module 3: Synthesis of Nanomaterials
Thermolysis route – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method, PVD method.

Module 4: Properties of Nanomaterials
Quantum Structure: 3D-Pontential Wells (Spherical & Rectangular Parallelepiped), 2D (Circular & Square, Quantum Corrals), 1D (Quantum Wires), 0D (Quantum Dots)

Module-5: X-RAY Characterization techniques
X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA), SEM and TEM method.

Text Books:

1. "The chemistry of Nano materials: Synthesis, Properties and Applications", C N R Rao, A Muller and A K Cheetham , John Wiley, First Edition, 2004
2. "Nano structured Materials and Nanotechnology", Hari Singh Nalwa, Academic Press, First Edition, 2002.

Reference Books:

1. "Introduction to Nanotechnology", Charles P Poole Jr, John Willey & Sons, 1st Edition, 2003
2. Nanoscience: "Nanotechnologies and Nano physics", C Dupas, P Houdy, M Lahmani, Springer-Verlag Berlin Heidelberg, 1st Edition, 2007.

E - Resources:

1. http://nptel.ac.in/courses/103103033/module9/lecture1.pdf
   http://courses.washington.edu/overney/NME498_Material/NME498_Periods/Lect Lect ure4-Overney- NP-Synthesis.pdf.
3. http://www.materialstoday.com/nanomaterials/journals/
4. https://www.journals.elsevier.com/nanoimpact
5. http://www.springer.com/materials/nanotechnology/journal/12274
6. http://nptel.ac.in/courses/118104008/
7. http://nptel.ac.in/courses/118102003/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** the properties of Nano-structured materials.
2. **Get** the knowledge of different physical and chemical methods of synthesis of Nano materials.
3. **Develop** basic knowledge on the properties and applications of few nanomaterials.
4. **Understand** different thermal methods of synthesis of nano materials and to learn different surface characterization techniques.
5. **Acquire** the different compositional and structural characterization techniques.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	2	-	2	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-	1	-
Average	2.6	1.4	2	-	2	-	-	-	-	-	-	--	1	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OT</td><td rowspan="2">CHEMISTRY OF ENGINEERING MATERIALS
(Common to CE, EEE, ME, ECE, CSE, IT& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to

1. Learn the concept of phase rule and alloys, phase diagrams of different systems.
2. Gain the knowledge on abrasives, glass, ceramics, and adhesives.
3. Understand the basic concepts of chemistry to develop futuristic materials for high-tech. applications in the area of engineering.
4. Know the concepts of glass, ceramics and Refractories.
5. Analyze the different types of solutions.

Module 1: Phase Rule and alloys:
Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

Module 2: Composites, Abrasives and Adhesives:
Composites: Basics of composites, composition and characteristics-types of composites – particle and fiber reinforced composites and their applications. Abrasives- natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives- classification - action of adhesives- factors influencing adhesive action development of adhesive strength.

Module 3: Cement and Concrete:
Introduction-Classification of cement-natural-chemical composition of cement-Portland cement-chemical reactions involved in setting and hardening of cement-additives for cement-mortars and concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete, constructions-testing and decaying of cement- prevention of cement decay.

Module 4: Glass, Ceramics and Refractories:
Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays.Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

Module-5: Colloids and surfactants:

Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids (Dialysis, Electro dialysis and Ultrafiltration).Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

Text Books:

1. "A text Book of Engineering Chemistry", P.C.Jain and Monica Jain, DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. "Text Book of Engineering chemistry", B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, Cengage Learning India Pvt. Ltd, 2016.
3. "Colloids and Interfaces with Surfactants and Polymers", J. Goodwin, 2nd Edition 2009.

Reference Books:

1. "Principles of Physical Chemistry", B.R.Puri, L.R.SharmaandM.S.Pathania, S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.
2. "Engineering Chemistry",M.ThirumalaChary and E.Laxminarayana, SciTech publications(INDIA) PVT Ltd, Third Edition,2016

E - Resources:

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials-science.html
2. https://www.sciencedirect.com/science/article/pii/S1369702110701875
3. https://engineering.purdue.edu/MSE/aboutus/whatsmaterials
4. https://www.engineergirl.org/32721/Difference-between-chemical-and-materials-engineering
5. https://www.webpages.uidaho.edu/catalog/2013/chemical-and-materials-engineering.htm

Course Outcomes:

On completion of the course, the students will be able to:

1. **Interpret** the vitality of phase rule in metallurgy and application of phase rule to one and two component systems.
2. **Understand** the concepts of abrasives, adhesives and liquid.
3. **Know** the importance of basic constructional material, Portland cement in Civil Engineering works.
4. **Acquire** the knowledge about properties and applications of glass, ceramics and refractories.
5. **Understand** the relationships between macroscopic material properties and microscopic structures.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	2	1	-	-	-	-	-	-	-	2	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	2	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	1	-	-
CO5	2	2	-	-	1	-	-	-	-	-	-	2	-	-
Average	2.4	1.4	1	1	-	-	-	-	-	-	-	1.8	-	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J31OU</td><td rowspan="2">TECHNICAL COMMUNICATION SKILLS
(COMMON TO ALL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives:
The students will
1. Understand the role of language as a communication
2. Employ the role of presentation skills in public speaking
3. Know the importance of body language
4. Examine the role of group discussion for getting jobs
5. Understand the importance of interview skills for getting jobs

Module -I Language as a Communication
Introduction-definition-the process of communication-types of communication-barriers of communication; language and communication-properties of language.

Module -II Presentation Skills
Nature and importance of oral presentation-planning the presentation-preparing the presentation-organizing the presentation-rehearsing the presentation and checklist for making oral presentation

Module -III Body Language
Introduction-definition-eye contact- facial expressions-gesture and posture.

Module -IV Group Discussion
Nature of GD- Characteristics and Strategies of GD-Techniques for Individual Contribution-Group Interaction Strategies.

Module -V Interview Skills
The Interview Process-Characteristics of Interview-Pre-interview preparation Techniques-interview questions-FAQ- Projecting a Positive Image and Alternative Interview Format.

References:

1) Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
2) Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.

E-Resources:
1. https://www.ilstranslations.com/blog/language-vs-communication-theyre-not-the-same-

thing/#:~:text=Language%20is%20a%20system%20of,is%20a%20tool%20of%20communication.

Course outcomes:

The students will be able to

1. Use the language skills in order to better communication
2. Learn the presentation skills and use them in conferences and seminars
3. Identify the role of presentation skills in expressing our feelings and emotions
4. Understand the role of group discussion for getting jobs
5. Know the importance of interview skills for getting jobs

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Total	-	-	-	-	-	-	-	-	2	3	-	3	-	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J31OV	ENTREPRENEURSHIP (Open Elective - I)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objective:

The students will

1. To implore an understanding of the dimensions and traits required to become an entrepreneur.
2. To understand the Entrepreneurial process and also inspire them to be Entrepreneurs
3. To understand the Entrepreneurship and its role in the society
4. To understand the process of Entrepreneurship & preparing business plans
5. To gain knowledge about the Entrepreneurship Development Institutions of Government

Module 1:

UNIT - I:

Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- Theevolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs.

UNIT - II:

Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.

Module 2:

UNIT - I:

The individual entrepreneurial mind-set and Personality- The entrepreneurial journey- Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations- Motivational cycle – Entrepreneurial motivational behavior – Entrepreneurial competencies.

UNIT - II:

Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

Module 3:

UNIT - I:

Launching Entrepreneurial Ventures - opportunities identification- Finding gaps in themarket place – techniques for generating ideas- entrepreneurial Imagination and Creativity- the nature of the creativity process - Innovation and entrepreneurship.

UNIT - II:

Methods to initiate Ventures- Creating new ventures-Acquiring an Establishedentrepreneurial venture- Franchising- advantage and disadvantages of Franchising.

Module 4:
UNIT - I:
Legal challenges of Entrepreneurship - Intellectual property protection - Patents,Copyrights - Trademarks and Trade secrets - Avoiding trademark pitfalls
Feasibility Analysis - Industry and competitor analysis –
UNIT - II:
Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process.

Module 5:
UNIT - I:
Strategic perspectives in entrepreneurship - Strategic planning - Strategic actions-strategic positioning- Business stabilization - Building the adaptive firms - Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growing ventures.
UNIT - II:
Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship -T-hub, J-hub

Text Books:

1. D F Kuratko and T V Rao, Entrepreneurship- A South-Asian Perspective, Cengage Learning, 2012.
2. Bruce R. Barringer/ R. Duane Ireland, Entrepreneurship Successfully launching new ventures, 4e, Pearson, 2015
3. S. S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

Reference Books:

1. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012
2. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013
3. MadhurimaLalShikhaSahai – Entrepreneurship, Excel Books.
4. S.K Mohanthy, Fundamentals of Entrepreneurship, Prentice Hall of India, New Delhi.

E-Resources:
1. Entrepreneur.com
2. BusinessOwnersToolKit.com
3. YourStory.com
4. ASmartBear.com

Course outcomes:
Upon successful completion of the course, the students should be able to
1. Understand the need and significance of Entrepreneurship in the Economy
2. Develop Entrepreneurial Competencies

3. Develop Business Plan with the required contents.
4. Understand contribution of family business and Social Entrepreneurship in the Economy.
5. Plan Strategic perspectives in entrepreneurship

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Total	-	-	-	-	-	-	-	-	2	3	-	3	-	-

OPEN ELECTIVE-2

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OA</td><td rowspan="2">CONSTRUCTION MANAGEMENT, CONTRACTS AND VALUATION
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Construction Technology and Project Management, Estimation and Costing.

Course Objectives:

This course will enable students to:

1. Study the different tools and techniques for project management.
2. Explain the various types of organization and their impact on and suitability to construction projects.
3. Study the various safety concepts and requirements applied to construction industry.
4. Differentiate the different types of contracts.
5. Study purpose of valuation and types of valuation.

Module 1:

Unit 1: Concept of a Project

Characteristic features – Project Life cycle – Phases – Project Management – tools and techniques for project management – role of project managers.

Module 2:

Unit 1: Project Management Plan and Objectives

Programming – scheduling – project organization – organization and project team – role of communication in project management – controlling systems.

Module 3:

Unit 1: Safety Management Function

Importance of safety in construction industry, Line versus staff authority, Safetyresponsibility and accountability in construction industry, Safety organizations, Role of various parties, duties, responsibilities of top management, site managers, supervisors etc., Role of safety officers, Responsibilities of general employees, Safety administration.

Module 4:

Unit 1: Types of contract documents

Essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents, and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

Module 5:

Unit 1: Valuation

Types of value, purposes of valuation factors affecting value. Different methods of valuation for different types of assets such as land and building, horticulture, historical places. Valuation Report, contents, standard formats, Case study of any one Report.

Text Books:

1. "Construction Technology" by Subira K. Sarkar, SubhajitSaraswathi / Oxford University Press, 3rd edition, Apr 2009.
2. "Project management- strategic Financial Planning, Evaluation and Control" by B M Patel, Vikas Publishing House Pvt. Ltd. New Delhi, 2nd edition oct 2000.

Reference Books:

1. "Total Construction Project Management" by George J.Ritz , McGraw-Hill Inc, 2nd edition Jan 2013.
2. "Construction Project Management Planning, Scheduling and Control" by K KChitkara

E-Resources:

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/103/105103023/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the different approaches for successful handling of the project.
2. **Apply** different plans and schedules for the development of the project.
3. **Describe** the importance of safety management in construction industry.
4. **List** out the different tenders and contract document for a construction project.
5. **Evaluate** the different types of reports for different construction projects.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	-	2	1	-	-	2	-	3	1	1	-
CO2	2	1	2	-	-	-	-	-	-	-	2	2	2	-
CO3	2	1	-	-	-	3	-	-	-	-	-	1	1	-
CO4	2	1	-	-	-	2	-	-	-	-	3	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	2	-	1	-
Average	2	1.4	0.4	-	0.4	1.2	-	-	0.4	-	2	0.8	1.4	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OB</td><td rowspan="2">ENERGY AUDIT & GREEN BUILDINGS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study the various energy scenarios and energy auditing methodology.
2. Explain various renewable and non-renewable sources of energy.
3. Describe the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.
4. Explain the efficient use of waste materials in construction industry
5. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems.

Module 1:
Unit 1: Energy Scenarios:
Energy Conservation-Energy Audit-Energy Consumption-Energy Security-Energy Strategy-Clean Development Mechanism.
Unit 2: Types of Energy Audits and Energy-Audit Methodology:
Definition of Energy Audit-Place of Audit-Energy- Audit Methodology-Financial Analysis-Sensitivity Analysis-Project Financing Options-Energy Monitoring and Training.

Module 2:
Unit 1: Environmental Audit:
Environmental Audit; Introduction-Necessity-Norms. Types: Objectives-Bases types; Liabilities Audit-Management Audit-Activities Audit-Client drive and types; regulatory external audits-independent external audit-internal environmental audit-third party audit.
Unit 2: Environmental Impact Assessment:
Introduction-EIA regulations-Steps in Environmental impact assessment process-benefits of EIA-limitations of EIA-Environmental Clearance for Civil Engineering Projects.

Module 3:
Unit 1: Energy Sources:
Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards.

Unit 2: Energy Conservation:
Introduction-Specific objectives-need of energy conservation-LEED India rating system and Energy Efficiency.

Module 4:

Unit 1: Green Building:

Introduction-Definition-Benefits-Principles; Planning concept of Green Building-Salient features of Green Building-Environmental Design-Strategies for Building Construction-Process; Improvement in Environmental Quality in Civil Structure. Materials; Bamboo, Rice Husk Ash, Concrete, Plastic Bricks-Reuse of waste materials- Plastic, Rubber, News Paper, Wood, Non-Toxic paint, Green roofing.

Module 5:

Unit 1: Rating system for Green Building:

Leadership in Energy and Environmental Design (LEED) Criteria-Indian Green Building Council (IGBC) Green Rating-Green Rating for Integrated Habitat Assessment (GRIHA) criteria-HVAC unit in Green Building-Certification Programs (including GEM and ECBC Certifications).

Text Books:

1. "Sustainable construction: Green Building design and delivery" by Kibert, C.J(John Wiley Hoboken, New Jersey).
2. "Non-Conventional Energy resources" by Chauhan, D S Sreevasthava, S K (New Age International Publishers, New Delhi).
3. "Alternative Building Materials and Technologies" by Jagadeesh, K S, Reddy Venkatta Rama, NanjundaRao K S (New Age International Publishers, New Delhi).
4. "Green Buildings" by Gevorkian (McGraw hill publication).

Reference Books:

1. "Handbook of Green Building Design and Construction" by Sam Kubba (Butterworth-Heinemann).
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design.
3. Energy Conservation Building Code 2017.

E-Resources:

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce06
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

Course Outcomes:

On completion of the course, the students will be able to:

1. **Differentiate** and select best of various energy scenarios and energy auditing methodology.
2. **Identify** various Renewable and Non-renewable sources of energy.
3. **Justify** others to use the waste materials efficiently and effectively.
4. **Explain** the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. **Discuss** the building codes, relevant legislation governing the consumption of resources.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	2	1	1	-	1	2	-	-	-	-	-	1	1
CO2	1	2	1	1	-	2	2	-	-	-	-	-	1	-
CO3	2	1	2	1	-	1	2	-	-	-	-	-	-	1
CO4	1	1	1	1	-	2	2	-	-	-	-	-	1	1
CO5	-	1	1	1	-	1	2	-	-	-	-	-	1	-
Average	1	1.4	1.2	1	-	1.4	2	-	-	-	-	-	0.8	0.6

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OC</td><td rowspan="2">HYBRID ELECTRIC VEHICLES
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Understand working of different configurations of electric vehicles, and its components
2. Understand hybrid vehicle configuration and performance analysis.
3. Introduce the transmission configuration and its analyze the characteristics
4. Analyze the different speed control techniques
5. Design and evaluate the sizing of components in hybrid vehicles.

MODULE -I: History of hybrid and electric vehicles – social and environmental importance of hybrid and electric vehicles – impact of modern drive-trains on energy supplies – Basics of vehicle performance, vehicle power source characterization transmission characteristics – Mathematical models to describe vehicle performance.

MODULE -II: Basic concept of hybrid traction – Introduction to various hybrid drive train topologies – power flow control in hybrid drive – train topologies-Fuel efficiency analysis.

MODULE -III: Introduction to electric components used in hybrid and electric vehicles-Configuration and control of DC motor drives-Configuration and control of introduction motor drive configuration and control of permanent magnet motor drives configuration and control of switch reluctance- motor drives, drive system efficiency.

MODULE -IV: Matching the electric machine and the internal combustion engine (ICE) Sizing the propulsion-motor, sizing the power electronics selection the energy storage technology – Communications, supporting subsystems.

MODULE -V: Introduction to energy management and their strategies used in hybrid and electric vehicle-Classification of different energy management strategies comparison of different energy management strategies implementation issues of energy strategies.

TEXT BOOKS:

1. Iqbal Husain, "Electric and Hybrid Electric Vehicles", CRC Press, 2011.
2. Wei Liu, "Hybrid Electric Vehicle System Modeling and Control", Second Edition, WILEY, 2017.
3. Sira – Raminez ,R.SilvaOrtigoza, control Design techniques in power electronics Devices, Springer.
4. Siew – Chong tan, Yuk-Ming lai Chi Kong Tse, “Sliding mode control of switching

power Converters”.

REFERENCE BOOKS:

1. James Larminie and John Lowry, "Electric Vehicle Technology Explained", Second Edition 2012.
2. Christopher D Rahn, Chao-Yang Wang, "Battery Systems Engineering", Wiley, 2013.

E - Resources:

1. https://nptel.ac.in/courses/108/103/108103009/

Course Outcomes:

The students will be able to

1. **Understand** the working of different configurations of electric vehicles, hybrid vehicles and its components.
2. **Apply**the basic conceptsofbatteriesandMotorsinthedesignofElectricandHybrid Vehicles.
3. **Differentiate** the modes of operation of Hybrid Vehicles.
4. **Analyze** the performance of hybrid vehicles.
5. **Design** the basic parameters of Electric and Hybrid Electric Vehicles.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		2	-	-	-	2	-	-	-	-	-	3	2
CO2	3	2	3	2	-	-	2	-	-	-	-	-	2	2
CO3	3	2	3	-	-	-	-	-	-	-	-	2	2	2
CO4	2	3	2	-	-	-	-	-	-	-	-	2	3	3
CO5	2	3	3	-	-	-		2	-	-	-		2	2
Average	2.6	2.5	2.6	-	-	-	2	2	-	-	-	2	2.4	2..2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OD</td><td rowspan="2">ENERGY AUDITING CONSERVATION AND MANAGEMENTS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
1. To understand the need of Energy Audit and Energy Conservation Schemes.
2. To know the necessity of conservation of energy.
3. To generalize the methods of energy management.
4. To illustrate the factors to increase the efficiency of electrical equipment.
5. To detect the benefits of carrying out energy audits.

MODULE -I: Basic Principles of Energy Audit: Energy Audit-

Unit-I: Definitions, Concept, Types of audit, Energy index, Cost index, Pie charts, Sankey diagrams.

Unit-II: Load profiles, Energy conservation schemes- Energy audit of industries- Energy saving potential, Building energy audit.

MODULE -II: Energy Management

Principles of energy management, organizing energy management program, Initiating, Planning, Controlling, Promoting, Monitoring, Reporting, Energy manger, Qualities and functions, Language, Questionnaire – Check list for top management.

MODULE -III: Energy Efficient Motors

Energy efficient motors, Factors affecting efficiency, Loss distribution, Constructional details, Characteristics - Variable speed, Variable duty cycle systems, RMS HP- Voltage variation-Voltage unbalance- Over motoring- Motor energy audit.

MODULE -IV: Power Factor Improvement, Lighting and Energy Instruments

Unit-I: Power factor – Methods of improvement, Location of capacitors, Pf with non-linear loads, Effect of harmonics on power factor.

Unit-II: Power factor motor controllers - Good lighting system design and practice, Lighting control , Lighting energy audit - Energy instruments- Wattmeter, Data loggers, Thermocouples, Pyrometers, Lux meters, Tongue testers ,Application of PLC's.

MODULE -V: Economic Aspects and Analysis

Economics analysis-Depreciation methods, Time value of money, Rate of return, Present worth method, Replacement analysis, Life cycle costing analysis- Energy efficient motors-Calculation of simple payback method, Net present worth method- Power factor correction, Lighting -Applications of life cycle costing analysis, Return on investment.

TEXT BOOKS

1. W.R. Murphy & G. Mckay, “Energy Management”, Butter worth, Heinemann Publications, Second Edition, 2009.
2. Paul o’ Callaghan, “Energy Management”, Tata Mc-Graw Hill Book Company- First Edition, 1998.
3. W.C.Turner, “Energy Management Hand Book”, CRC Press, First Edition, 2004.

REFERENCE BOOKS

1. John .C. Andreas, “Energy Efficient Electric Motors”, CRC Press, Third Edition, 1992.
2. Great Britain, “Energy Management and Good Lighting Practice: Fuel Efficiency- Booklet Volume 12-EEO, 1989.

E-Resources:

1. www.beeindia.gov.in

Course Outcomes:

On completion of the course, the students will be able to:

1. **Tell** energy audit of industries.
2. **Predict** management of energy systems.
3. **Sequence** the methods of improving efficiency of electric motor.
4. **Analyze** the power factor and to design a good illumination system.
5. **Determine** pay back periods for energy saving equipment.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	3	3	-	3	-	-	2	-	-
CO2		-	-	-	-	2	2	-	3	-	3	3	3	-
CO3	2	-	-	-	-	-	2	-	2	-	3		2	-
CO4	3	-	-	-	-	-	3	-		-	2	2	2	-
CO5	3	-	-	-	-	-	-	-	2	-	2	3	3	-
Average	2.2	-	-	-	-	1.2	2	-	2	-	2	2	2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td>B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OE</td><td rowspan="2">FUNDAMENTALS OF OPERATIONS RESEARCH
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mathematics

Course Objectives:
This course will enable students to

1. Get the basic knowledge of Linear Programming and its applications to engineering problems and able to formulate a problem in LP model, and solve it using graphical method and Simplex method.
2. Be taught about the variants of the LP problem such as Transportation, Assignment, and Sequencing problems
3. Learn to find the optimal replacement time of capital cost equipment, and application of Group Replacement strategy
4. Learn the importance of maintaining optimal inventory in any industry, and be familiarized with the intricacies of waiting line models faced in real world situations
5. Understand the basics of Network analysis (CPM and PERT) and Project Cost Analysis; Learn Simulation and its applications.

Module 1
Unit 1: Introduction: Development – Definition – Scope, Characteristics and Phases – Types of Operations Research models – applications.
Unit 2: Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

Module 2
Unit 1: Transportation Models: Formulation – Optimal solution, unbalanced transportation problem – Degeneracy
Unit 2: Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

Module 3
Unit 1: Sequencing: Introduction – Flow-Shop sequencing – ‘n’ jobs through two machines – ‘n’ jobs through three machines – Job-shop sequencing – two jobs through ‘m’ machines
Unit 2: Replacement: Introduction – Replacement of capital cost items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail suddenly and completely- Group Replacement.

Module 4

Unit 1: Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks – inventory models with and without shortage cost. Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

Unit 2: Waiting lines: Introduction – Terminology - Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models.

Module 5

Unit 1: Network analysis (CPM and PERT): Basic Concepts of Network Analysis - Network diagram - Critical Path Method - Terminology in CPM 804 – Float – Limitations of CPM - PERT - Project Cost Analysis - Comparison between CPM and PERT.

Unit 2: Simulation: Definition – types of simulation models- applications, advantages and disadvantages - Brief introduction of simulation languages – simple problems on inventory and queuing using random numbers.

Text Books:

1. J. K. Sharma, "Operations Research", MacMillan Publishers India Ltd, 4th Edition 2009.
2. A.C.S. Kumar, "Operations Research (Quantitative Analysis for Business Decisions)", Yes Dee Publishers, 1st Edition, 2015.

Reference Books:

1. Maurice Saseini, ArhurYaspan, and Lawrence Friedman, "Operations Research: Methods and Problems", Literary Licensing Publisher, 2013
2. A. M. Natarajan, P. BalaSubramani and A. Tamilarasi "Operations Research" Pearson Education, 4th Edition, 2009.
3. Wagner H. M, "Principles of Operations Research", PHI Publications, 2nd Edition, 2006.
4. Hillier / Libermann "Introduction to Operations Research", MacMillan Publishers, 10th Edition, 2017.

E - Resources:

1. https://rb.gy/1ckbxh
2. https://rb.gy/gev0g5
3. https://nptel.ac.in/courses/112/106/112106134/
4. https://nptel.ac.in/courses/111/107/111107128/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Allocate** optimally the resources in any industry to maximize the overall effectiveness parameter, determine the number of each item to be produced
2. **Find** the optimal number of units to be transported such that the total transportation cost will be minimum, and Assign the required men / machines to perform the given tasks in an optimal way

3. **Schedule** and sequence production runs by proper allocation of machines and men to get maximum gain and Compute the economic order quantity. Find the optimal replacement period for capital cost items
4. **Decide** the optimal inventory to be maintained under different situations involving different types of demand and inventory costs, find how to strike a balance between the waiting time cost and service facility cost for different waiting line models
5. **Apply** the techniques of Network Analysis like CPM and Pert for Project CostAnalysis. Apply Simulation methods to inventory and queuing problems

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2	-	-	2	-	-	-	-	-	2		
CO2	3	3	3	-	-	2	-	-	-	-	-	2		
CO3	2	3	2	-	-	1	-	-	-	-	-	2		
CO4	3	3	2	-	-	2	-	-	-	-	-	2		
CO5	2	3	1	-	-	1	-	-	-	-	-	2		
Average	2.4	3	2	-	-	1.6	-	-	-	-	-	2		

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OG</td><td rowspan="2">SOFTWARE DEFINED RADIO
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Digital Signal Processing, TCP / IP

Course Objectives:

The objectives of this course is

1. To provide fundamentals and state of the art concepts in software defined radio.
2. To Analyze the analog RF components as front end block in implementation of SDR.
3. To Visualize digital hardware architectures and development methods.
4. To Understand the radio recourse management in heterogeneous networks.
5. To Remember the object oriented representation of radio and network resources.

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Module -I:

Unit-1

Introduction: The Need for Software Radios, what is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues the Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design**Unit-2**

RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DACDistortion.

Module -II:

Unit-1

Profile and Radio Resource Management: Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile, Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure

Unit-2

XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, CommunicationClass marks, Dynamic Class marks for Reconfigurable Terminals,Compression and Coding, Meta Profile Data

Module -III:

Unit-1

Radio Resource Management in Heterogeneous Networks: Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks

Unit-2

Measuring Gain in the Upper Bound Due to JRRM, Circuit Switched System, Packet- Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems

Module -IV:

Unit-1

Reconfiguration of the Network Elements: Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks

Unit-2

Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer, Optimized Reconfiguration, Optimization Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals

Module -V:

Unit-1

Object – Oriented Representation of Radios and Network Resources: Networks- Object-oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

Unit-2

Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAKeasy-JTRS, Wireless Information Transfer System, SDR-3000 Digital TransceiverSubsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, KambizMadani, WILEY 2003
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, WileyPublications.

REFERENCE BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEAPublication.
2. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger,KambizMadani, Nancy Alonistioti, 2003, Wiley.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Engineering– Joseph Mitola, III, 2000, John Wiley & Sons.

Course Outcomes:

On completion of this course, the students:

1. **Understand** the design principles of software defined radio.
2. **Analyze** the analog RF components as front end block in implementation of SDR.
3. **Visualize** digital hardware architectures and development methods.
4. **Understand** the radio recourse management in heterogeneous networks.
5. **Remember** the object oriented representation of radio and network resources.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	-	-	-	-	-	-	-	-	-	2	-	1
CO2	3	2	1	1	-	-	-	-	-	2	2	2	-	2
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	1
CO4	2	2	2	-	-	2	-	-	-	-	2	3	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	1
Average	2	1.4	0.6	0.2	-	0.4	-	-	-	0.4	0.8	2.2	-	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J32OH</td><td rowspan="2">BASICS OF IC TECHNOLOGY
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Electronic devices and circuits Switching Theory & Logic Design, Pulse & Digital Circuits

Course Objectives:

The students will

1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non – linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To introduce the concepts of waveform generation and introduce some special function ICs.
5. To understand and implement the working of basic digital circuits

MODULE 1:

Unit 1: Introduction to Linear Integrated Circuits

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting.

Unit 2: Non-Linear Applications of OP-AMP

Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator.

MODULE 2:

Unit 1: Introduction to Filters

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters

Unit 2: wave form generators

Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer -Functional Diagram, Monostable, and Astable Operations.

MODULE 3:

Unit 1: Converters of DAC

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC

Unit 2: Converters of ADC

Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

MODULE 4:

Unit 1: Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications.

Unit 2: Applications of Digital ICs

Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers.

MODULE 5:

Unit 1: Combinational Circuits Using TTL 74XX ICS

Familiarity with commonly available 74XX &CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters.

Unit 2: Memories

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILL EDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E - Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20Notes.pdf.
3. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20LDIC(Linear%20 and%20Digital%20IC%20Applications).pdf
4. http://crectirupati.com/sites/default/files/lecture_notes/LDICA%20Lecture%20notes%20y% 20A.Mounika.pdf
5. http://www.springer.com/engineering/electronics/journal/10470.
6. https://www.journals.elsevier.com/microelectronics-journal
7. http://nptel.ac.in/courses/117107094/
8. https://www.youtube.com/watch?v=NVj_Eu3sJL4
9. http://freevideolectures.com/Course/2915/Linear-Integrated-Circuits
10. Analog Electronic Circuits: https://swayam.gov.in/nd1_noc19_ee38/preview

11. Op-amp practical Applications: Design, Simulation and Implementation: https://onlinecourses.nptel.ac.in/noc18_ee10/preview
12. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understanding** of operational amplifiers with linear integrated circuits.
2. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
3. **Analyze** the functioning of various design circuits using operational amplifiers for various applications.
4. **Design** various techniques to develop a/d and d/a convertors.
5. **Acquire** hands-on laboratory experience on IC based project kits in above areas according to specifications.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	2	2	2
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	-	2	-	-	-	-	-	-	-	2	2	-
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO5	2	-	2		-	-	-	-	-	-	-	-	2	-
Average	2.2	2	2	2	-	-	-	-	-	-	-	2	2	2

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J32OI</td><td rowspan="2">FUNDAMENTALS OF COMPUTER NETWORKS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Knowledge on “Digital Logic Design”.
2. Knowledge on “Computer Organization”.

Course objectives:

The Student will:

1. Recognize various layering approaches for networking and understand the functionalities of physical layer.
2. Identify the data link layer protocols, multi access protocols and various internetworking devices.
3. Examine design issues of network layer, services provided to above layer and routing, and congestion control protocols.
4. Examine IP protocol, addressing, various protocols like CIDR, ICMP, ARP andRARP of internet Layer and examination of transport layer services.
5. Examine Transport layer protocols like TCP, UDP and various congestion controlling mechanisms, including application layer services, protocols like HTTP, FTP, E-Mail etc.

Module 1:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Connecting Devices: Repeaters, Hubs, Switches, Gateways and Bridges.

Module 2:

Data Link Layer: Design issues, Framing, Error Detection and Error Correction, Hamming Distance, CRC, Flow control and error Control.

Protocols: Noiseless Channels, Noisy Channels,

Multi Access protocols- Random access - ALOHA, CSMA, CSMA/CD and CSMA/CA, Controlled access, Channelization.

Module 3:

Network Layer: Network layer design issues, Store and forward packet switching, connection less and connection oriented network services.

Internetworking: Protocols-IPV4 and IPV6**,** Logical Addressing-IPV4, IPV6, Tunneling and Packet Fragmentation.

Address Mapping: ARP, RARP, DHCP, ICMP and IGMP.

Routing Algorithms: Shortest Path Finding and Distance Vector Routing Algorithms.

Module 4:
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), The TCP Connection Establishment, The TCP Connection Release, The TCP sliding window, The TCP congestion control

Module 5:
Application Layer: Introduction, services, Application layer paradigms.
Applications: DNS, WWW, HTTP, FTP, E-MAIL, TELNET, SNMP, SSH.

Text Books:
1. ComputerNetworks,5E,Peterson,Davie,Elsevier
2. Introduction to Computer Networks and CyberSecurity, Chawan -HwaWu, Irwin, CRC Publications.
3. Computer Networks and Internets with Internet Applications, Comer .

Reference Books:
1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education

E - Resources:
1. https://lecturenotes.in/subject/2234/Computer_Network
2. http://nptel.ac.in/courses/106102234/
3. https://www.iitg.ernet.in/dgoswami/CN-Notes.pdf
4. http://www.coursera.org/http://ocw.mit.edu/index.htm.

Course outcomes:
The Student will be able to
1. **Demonstrate** the networking concepts, various Layering approaches and their functionalities.
2. **Understand** the protocols of Data Link layer, how a medium can be shared among multiple devices and internetworking devices used.
3. **Work** on fragmentation, assigning of logical address and judge on routing, congestion.
4. **Demonstrate** the working of IP Protocol, other protocols of internet layer and services of transport layer.
5. **Explain** the transport layer and application layer protocols, their working

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	2	2
Average	**2.4**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.0**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OJ</td><td rowspan="2">INTRODUCTION TO JAVA PROGRAMMING
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Knowledge on Programming Language.

Course objectives:

The Student will:

1. Familiar with constructors and string handling functions
2. Explain inheritance and polymorphism
3. Familiar with packages and interfaces
4. Familiar with exception handling and multithreading
5. Familiar with applet programming and event handling.

Module 1:

Introduction: OOP concepts, history of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program.

Classes and Objects: concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion.

String handling: String, String Buffer, String Tokenize.

Module 2:

Inheritance: base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.

Packages: Defining, creating and accessing a package, importing packages, access control, exploring package - java.io

Module 3:

Exception handling: concepts of exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

Module 4:

Multithreading: differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Applets: concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.

Module 5:

Event Handling: events, event sources, event classes, event listeners, delegation event model, handling mouse and key board events, adapter classes. The AWT class hierarchy, userinterface components-labels, buttons, canvas, scrollbars, text components, checkbox,checkbox groups, choices, lists

Text Books:

1. Java The complete reference, 8th editon, Herbert Schildt, TMH.
2. Under tanding OOP with Java, up dated edition, T.Budd, Pears on education.

Reference Books:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.

E- Resources:

1. www.javasoft.com
2. www.w3schools.com
3. www.tutorialpoint.com
4. www.oracle.com

Course outcomes:

At the end of the course, students will be able to

1. **Familiar** with constructors and string handling
2. **Understand** inheritance and polymorphism
3. **Understand** packages and interfaces
4. **Understand** exception handling and multithreading
5. **Understand** applet programming

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	3	-	3	3	-	3	-	-	2	-	-	3	-
CO2	-	-	2	-	-	3	-	3	-	-	3	-	-	3
CO3	3	-	-	3	-	2	-	-	3	-	-	3	-	-
CO4	3	-	-	-	3	-	-	3	3	3	-	-	3	-
CO5	-	3	-	-	-	-	2	-	-	-	3	-	-	3
Average	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**2.5**	**2.5**	**3.0**	**3.0**	**2.5**	**3.0**	**3.0**	**3.0**	**3.0**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OK</td><td rowspan="2">COMPUTER ORGANIZATION
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite:NIL

Course Objectives:
This course will enable students to:
1. To understand the basic operations of the computer system.
2. To know the functioning of CPU and the control unit.
3. To Analyze various algorithms for arithmetic operations in the computer.
4. To understand different hierarchical memory systems including cache memory and virtual memory.
5. Recognize different ways of communicating with input/output devices and standard I/O interfaces.

Module I
Unit 1: Basic structures of Computers
Computer Types, Functional unit, Basic operational concepts, Bus structures, software, Performance, multiprocessors and multi computers.
Unit 2: Data Representation
Fixed point representation, Floating point representation, Error detection codes.

Module II:
Unit 1: Register Transfer and Micro operations
Register transfer language, Register transfer, Bus and memory transfers, Arithmetic micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Unit 2: Basic computer organization and Design
Instruction codes, computer registers, computer instructions, Timing and control, instruction cycle

Module III:
Unit 1: Computer Arithmetic
Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point arithmetic operations, Decimal arithmetic unit, Decimal arithmetic operations.

Module IV:
Unit 1: The Memory System
Basic concepts, Semiconductor RAM memories, Read-Only memories, speed, Size and Cost, Cache memories, performance considerations, Virtual memories, Secondary storage.

Module V:

Unit 1: Input/output Organization

Accessing I/O Devices Interrupts, Interrupt hardware, Enabling and disabling interrupts, Direct memory access, Buses, interface circuits, Standard I/O interfaces.

Text Books:

1. Computer Organization-Carl Hamacher, ZvonkoVranesic, SafwatZaky, Vth Edition, McGraw Hill.
2. Computer System Architecture-M.MorisMano,IIIrdEdition,Pearson/PHI

Reference Books:

1. Computer Organization and Architecture-William Stallings, SixthEdition, Pearson/PHI
2. Structures Computer Organization-Andrew S.Tanebaum,4th Edition PHI/Pearson.

E - Resources:

1. https://nptel.ac.in/courses/106/103/106103180/
2. https://nptel.ac.in/courses/117/105/117105078/
3. https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Illustrate** basic operations of the computer system.
2. **Apply** knowledge of CPU and the control unit.
3. **Apply** various algorithms for arithmetic operations in the computer.
4. **classify** different memory systems.
5. **Produce** knowledge on input/output organization.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-	-	-
Average	3.0	2.0	2.5	2.0	-	-	-	-	-	-	-	-	2.5	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td>B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OL</td><td rowspan="2">FUNDAMENTALS OF
HUMAN COMPUTER INTERACTION
(Open Elective-II))</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: GUI(Windows) Working Knowledge

Course Objectives:
This course will enable students to:
1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Design, implement and evaluate effective and usable graphical computer interfaces.
3. Describe and apply core theories, models and methodologies from the field of HCI.
4. Able to apply HCI principles, guidelines, methods, and techniques for human-centred information systems development.
5. Use the information sources available and be aware of the methodologies and technologies supporting advances in HCI.

Module I:
Unit 1:
Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.
Unit 2:
The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Module II:
Unit 1:
Design process – Human interaction with computers, importance of human characteristics human consideration.
Unit 2:
Human interaction speeds, understanding business junctions

Module III:
Unit 1:
Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition.

Unit 2:
Amount of information – focus and emphasis, presentation of information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Module IV:
Unit 1:
Windows – New and Navigation schemes selection of window, selection of devices basedand screen based controls Components – text and messages, Icons and increases.

Unit 2:
Multimedia, colors, uses problems, choosing colors.

Module V:
Unit 1:
Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices.
Unit 2:
speech recognition digitization and generation – image and video displays – drivers.

Text Books:
1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.

Reference Books:
1. Human – Computer Interaction. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.

E - Resources:
1. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/human-computer-interaction-brief-intro
2. https://www.interaction-design.org/literature/topics/human-computer-interaction
3. https://www.udacity.com/course/human-computer-interaction--ud400

Course Outcomes:
On completion of the course, the students will be able to:
1. **Explain** the human computer components functions regarding interaction with computer.
2. **Describe** the key design principles for user interfaces.
3. **Apply** an interactive design process and universal design principles to designing HCI systems.
4. **Use** Paradigms, HCI in the software process.
5. **Implement** Interaction design basics.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	2	2	-	1	-	-	-	-	-	1	-
CO2	1	1	2	2	2	-	1	-	-	-	-	-	2	-
CO3	1	3	3	3	3	-	2	-	-	-	-	-	2	-
CO4	-	2	2	2	1	-	1	-	-	-	-	-	-	-
CO5	1	2	1	1	1	-	1	-	-	-	-	-	2	-
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS		
Course Code: J32OM	INTRODUCTION TO MICROPROCESSORS AND MICRO CONTROLLERS	L	T	P/D
Credits: 3	(Open Elective-II)	3	0	0

Pre-requisite: Basic Knowledge in IC **'s**

Course Objectives:

Students will learn to:

1. Study the Architecture of 8085&8086 microprocessor
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study the Architecture of 8051 microcontroller

Module 1:

Unit 1: 8086 Introduction: 8086 Architecture Functional diagrams, Register organization, memory segmentation, programming model, memory addresses, physical memory organization

Unit 2: 8086 Architecture: Architecture of 8086,signal descriptions of 8086-common function signals, Timing diagrams, interrupts of 8086.

Module 2:

Unit 1: Instruction set of 8086: Instruction formats, addressing modes, instruction set, assembler directives, macros.

Unit 2: Assembly language programming of 8086: Simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Module 3:

Unit 1: I/O Interface: 8255 PPI, Various modes of operation and interfacing to 8086, interfacing keyboard, Display, D/A and A/D converter.

Unit 2: Interfacing with advanced devices: Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

Module 4:

Unit 1: Introduction to Microcontrollers: Overview of 8051 microcontrollers, architecture, I/O ports, memory organization.

Unit 2: Addressing Modes: Addressing modes and instruction set of 8051, simple programs.

Module 5:

Unit 1: 8051 Real Time control 1: Programming Time Interrupts, Programming External Hardware Interrupts.

Unit 2: 8051 Real Time control 2: Programming the serial communication interrupts, programming 8051 Timers and counters

Text Books:

1. D.V.Hall, Microprocessors and interfacing,TMGH,2 Edition 2006.

2. Kenneth.J.Ayala, The8051Microcontroler,3rdEd., C engage Learning.

Reference Books:

1. Advanced Microprocessors and Peripherals-A. K. Rayand K.M Bhurchandi, TMH, 2nd Edition 2006.
2. The 8051Microcontrollers.Architecture and programming and applications-K.UmaRao, AndhePallavi,Pearson, 2009.
3. Microcomputer system 8086/8088 family architecture. Programming and design- Du and GA Gibson, PHI 2nd Edition.

E-Resources:

1. https://nptel.ac.in/courses/106/108/106108100/
2. https://www.youtube.com/watch?v=o6W0opScrKY&list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3
3. https://www.youtube.com/watch?v=liRPtvj7bFU&list=PL0E131A78ABFBFDD0

Course Outcomes:

Students will be able to:

1. **Design** programs on 8085 microprocessors.
2. **Implement** programs on 8086 microprocessors.
3. **Design** interfacing circuits with 8086.
4. **Design** and implement 8051 microcontroller based systems
5. **Understand** the concepts related to I/O and memory interfacing

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak													
Course Outcomes (COs)	**Program Outcomes (POs)**											**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	1	-	-	-	-	-	-	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	1	1	-	-	2
CO4	2	-		2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	2	1	-	-	-	-	-	-	-	-	-	-
Average	**2**	**2**	**2**	**1.5**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**2**

<table>
<tr><td>AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32ON</td><td rowspan="2">INTERNET OF THINGS
(Open Elective – II)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nill

Course Objectives:

Students will learn to

1. Understand the basic building blocks of IoT.
2. Analyze the difference between M2M and IoT along with IoT system Management
3. Extend the knowledge in Logical Design of IoT System using Python.
4. Acquire knowledge about IoT Physical Devices and End points.
5. Identify the IoT Physical Servers and cloud offerings.

Module 1:

Unit 1 Introduction to Internet of Things:

Definition and Characteristics of IoT, Physical Design of IoT –IoT Protocols, IoT communication models, IoT Communication APIs

Unit 2 IoT enabled Technologies:

Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Module 2:

Unit 1 IoT and M2M:

Software defined networks, network function virtualization, difference between SDN and NFV for IoT

Unit 2 Basics of IoT System:

Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Module 3:

Unit 1 Introduction to Python:

Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling.

Unit 2 Python packages:

JSON, XML, HTTPLib, URLLib, SMTPLib.

Module 4:

Unit 1 IoT Physical Devices and Endpoints:

Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming.

Unit 2 Python program with Raspberry PI-1:
Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Module 5:
Unit 1 Python program with Raspberry PI-2:
Python program with Raspberry PI with focus of interfacing external gadgets.
Unit 2: Controllingoutput, reading input from pins.

Text Books:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

References:

1. Internet of Things by Jeeva Bose 1st edition, Khanna publishing.

Course Outcomes:
Students will be able to

1. **Understand** the basic building blocks of IoT.
2. **Analyze** the difference between M2M and IoT along with IoT system Management
3. **Extend** the knowledge in Logical Design of IoT System using Python.
4. **Acquire** knowledge about IoT Physical Devices and End points.
5. **Identify** the IoT Physical Servers and cloud offerings

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	2
Average	**3.0**	**3.0**	**2.8**	-	-	-	-	-	-	-	-	-	**1.6**	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OP</td><td rowspan="2">INTRODUCTION TO SURFACE MINING
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
1. To introduce surface mining terms and applicable conditions
2. To acquaint with different machinery used in surface mining
3. To get idea about Drilling and blasting of surface ore bodies.
4. To get idea about lighting, dust, and slopes in surface mines.
5. To know about ore and waste transportation.

Module 1
Unit - 1: Definition, Terminology, Applicability and limitations of surface mining, Classification, Advantages, and dis-advantages of surface mining.

Module 2
Unit - 1: Introduction to surface mining machinery:Equipment selection; Working withrippers, shovels, draglines, shovel-dragline combination; bucket wheel excavator. Disposal of OB/waste material

Module 3
Unit - 1: Drilling & blasting**:** Drilling mechanism, drilling patters, Drill bits Explosives, Blasting accessories, Bulk explosives, problems in blasting.

Module 4
Unit -1: Basics of Mine lighting, Sources of dust in surface mining, dust control, and slope stabilization

Module 5
Unit - 1: Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator. Impacts on environment due to surface mining

Textbooks:

1. D.J. Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001.
2. Principles & Practices of Coal Mining, R.D. Singh

Reference Books:

1. Surface Mining Technology, by Prof S.K. Das, Lovely Prakashan, Dhanbad

E-Resources:

1. https://www.researchgate.net/publication/282572490_Basic_concept_of_mining_technology
2. http://www.eolss.net/sample-chapters/c05/e6-37-06-01.pdf

Course Outcomes:

The student will be able to:

1. **Understand** about surface mining terms and conditions of applicability
2. **Learn** about different machinery used in surface mining
3. **Learn** drilling and blasting in surface mining
4. **Understand** mine lighting, dust, and slopes in surface mining
5. **Understand** the transportation of ore and waste in surface mining.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J32OR	NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (Common to CE, EEE,ME,ECE,CSE,IT, ECM& MIE) (Open Elective-II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Solve large number of algebraic linear equation by various methods
2. Solve one dimensional parabolic equations by numerical methods.
3. Solve two dimensional parabolic equations by numerical methods.
4. Solve hyperbolic equations by numerical methods by using various methods.
5. Solve elliptic equations by numerical methods by various methods

Module 1 :Linear Systems of Equations
Iterative methods for solving large linear systems of algebraic equations: Jacobi, Gauss-seidel and S.O.R methods - Conditions for convergence of them - Methods for accelerating convergence: Lyusternite's& Aitken's methods - Optimum acceleration parameter for S.O.R method.
.
Module 2 :One Dimensional Parabolic Equations
Explicit and Crank-Nicolson Schemes for - Weighted average approximation - Derivative boundary conditions - Truncation errors - Consistency, Stability and convergence - Lax Equivalence theorem

Module 3: Matrix Norms & Two Dimensional Parabolic Equation
Vector and matrix norms - Eigenvalues of a common tridiagonal matrix - Gerischgorin's theorems- Stability by matrix and Fourier-series methods - A.D.I. methods.

Module 4: Hyperbolic Equations
First order quasi-linear equations and characteristics - Numerical integration along a characteristic - Lax- Wendroff explicit method - Second order quasi-linear hyperbolic equation - Characteristics - Solution by the method of characteristics.

Module 5: Elliptic Equations
Solution of Laplace and Poisson equations in a rectangular region - Finite difference in Polar coordinate Formulas for derivatives near a curved boundary when using a square mesh - Discretisation error - Mixed Boundary value problems.

Text Books:

1. "Numerical Methods for Engineers", Chapra. S.C., and Canale.R.P., Tata McGraw Hill, 5 th Edition, New Delhi,2007.

2. “The Finite Difference Methods in Partial Differential Equations”, Mitchel A.R. and Griffiths S.D.F., John Wiley and sons, New York,1980.

Reference Books:

1. “Numerical Solutions of Partial Differential Equations”, Morton K.W., Mayers, D.F., Cambridge University Press, Cambridge,2002.
2. “Numerical Solution of P.D.E.”,SmithG.D., Oxford University Press, New 2. York,1995.
3. “A first course in the Numerical Analysis of Differential Equations”, Iserles A., Cambridge University press, New Delhi, 2010. xx t u u

E - Resources:

1. https://www.purplemath.com/modules/systlin1.htm
2. https://nptel.ac.in/courses/111/107/111107063/
3. https://www.researchgate.net/publication/227760098_Numerical_solution_of_two-dimensional_parabolic_equation_subject_to_nonstandard_boundary_specifications_using_the_pseudospectral_Legendre_method
4. https://link.springer.com/chapter/10.1007/978-3-662-09207-1_2
5. https://www.researchgate.net/publication/310744390_Numerical_Solutions_of_Elliptic_Partial_Differential_Equations_by_Using_Finite_Volume_Method

Course Outcomes:

On completion of the course, the students will be able to:

1. Know the knowledge of solving large number of algebraic linear equation.
2. Understand the knowledge of solving one dimensional parabolic equations by numerical methods
3. Recognize the knowledge of solving two dimensional parabolic equations by numerical methods.
4. Apply and understand the knowledge of solving hyperbolic equation by numerical methods.
5. Know the knowledge of solving elliptic equations by numerical methods.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	3	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OS</td><td rowspan="2">ADVANCED PHYSICS FOR ENGINEERS
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering.
2. To understand the importance of hologram.
3. To introduce the fundamental concepts of film deposition.
4. To make the students acquainted with the concepts of photonic crystals.
5. To understand the fundamental concepts of Solar cell Physics.

Module 1: Special Theory of Relativity
Introduction, Concept of theory of relativity, Frames of reference-Inertial, noinertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module 2: Holography
Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

Module 3: Thin films Synthesis
Introduction, Deposition techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

.

Module 4: Photonic Crystals
Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module-5: Solar cell Physics

Single, poly and amorphous silicon, GaAs, CdS, Cu_2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

Text Books:

1. "Engineering Physics" ,R K Gaur and SL Gupta, DhanpatRai Publications, 8th revised Edition, 2006.
2. "Engineering Physics",B K Pandey and S Chaturvedi, Cengage Learning India, Revised Edition, 2014.

Reference Books:

1. "Hand Book of Technologies for Films and coating",R F Bun shah, Noyes publishers,1st Edition, 1996.
2. "Fundamentals of Photonics",B E A Saleh and A C Tech, John Wiley and Sons, New York, 1st Edition, 1993.

E - Resources:

1. http://physics.mq.edu.au/~jcresser/Phys378/LectureNotes/SpecialRelativityNotes. pdf
2. http://www.kfupm.edu.sa/centers/CENT/AnalyticsReports/KFUPM-TFSCDec20.pdf
3. https://www.journals.elsevier.com/solar-energy-materials-and-solar-cells
4. https://www.journals.elsevier.com/journal-of-alloys-and-compounds/
5. http://aip.scitation.org/journal/apl
6. http://nptel.ac.in/courses/115101011/
7. http://nptel.ac.in/courses/117103066/11.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** special theory of relativity and apply its concepts in various fields of physics and engineering.
2. **Analyze** the basic concepts of Holography and applications.
3. **Identify** different concepts of film deposition.
4. **Develop** basic knowledge on the photonic crystals.
5. **Apply** the basic concepts of solar cell physics.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	3	1	1	-	1	1	-	-	-	-	-	-	1	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	1	-	3	2	2	-	-	-	-	-	2	-
Average	2.6	1.6	1	-	2	1.5	2	-	-	-	-	--	1.25	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OT</td><td rowspan="2">GREEN CHEMISTRY
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Acquire knowledge of issues in sustainability as they relate to business and industry internationally and nationally.
2. Examine and evaluate case studies of sustainable practices in business and industry.
3. Knowledge on Non-conventional energy sources.
4. Study the Green synthetic method.
5. Understand and Analyze the interconnectivity of global concerns.

Module 1: Green Chemistry - An Overview:
Introduction: Definition, the twelve basic principles of green chemistry. Green synthetic methods.

Module 2: Materials for green chemistry and technology:
Catalysis, environmental friendly catalysts, Biocatalysis, biodegradable polymers, alternative solvents, ionic liquids.

Module 3: Nonconventional energy sources:
Thermo-chemical conversion; direct combustion, gasification, pyrolysis and liquefaction, Bioenergy, Bio photolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications.
.

Module 4:Green Synthetic Methods & Catalysis:
The design and development of environmentally friendly chemical pathways, Microwave synthesis, electro-organic synthesis, Supercritical fluids (SCFs): examples and properties, Extraction with SCFS.

Module-5: Green Chemistry & Sustainable development:
Green chemistry in batteries, production and recycling, Fuel cell and electric vehicles, Solar energy and hydrogen production, biodiesel, bio-hydrogen, Anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Best practices in Green Chemistry for sustainable development with suitable examples.

Text Books:

1. “Green Chemistry an Introductory Text”, Lancaster, M., Royal Society of Chemistry, Cambridge, UK 2002.
2. “Real World Cases in Green Chemistry”, Cann M.C.; Connelly, M.E. American Chemical Society: Washington DC. 2000.

Reference Books:

1. “Green Chemistry: Theory and Practice”, Anastas, P.; Warner, J. Oxford University Press: London, 1998.
2. “The 12 Principles of Green Engineering as a Foundation for Sustainability" in Sustainability Science and Engineering: Principles. Zimmerman, J.B.; Anastas, P.T. Ed. Martin Abraham, Elsevier Science. available 2005.
3. “Design through the Twelve Principles of Green Engineering," Anastas, P.; Zimmerman, J. Environmental Science and Technology, 37, 94A - 101A, 2003.
4. “Green Chemistry Challenging Perspectives” ,Tundro, P.; Anastas, P., Oxford Press, Oxford, 2000.
5. “Introduction to Green Chemistry”, Matlack, A.S., Marcel Dekker, Inc., New York, 2001.

E - Resources:

1. https://pubs.rsc.org/en/journals/journalissues/gc#!recentarticles&adv
2. https://www.sciencedirect.com/topics/chemistry/green-chemistry
3. https://www.intechopen.com/books/green-chemistry/introductory-chapter-principles-of-green-chemistry
4. https://www.sigmaaldrich.com/chemistry/greener-alternatives/green-chemistry.html
5. https://science.sciencemag.org/content/367/6476/397

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** of Green Chemistry & Green Eng. Principles.
2. **Know** the applications of green routes for synthesis of chemicals.
3. **Use** better awareness about global environmental concerns and green remedies to address these concerns.
4. **Appraise** about tenets of sustainable development and its integration with Green practices.
5. **Realise** about reflections of Green Chemistry on sustainable development initiatives.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	-	1	-	-	-	-	-	-	-	2	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	1	1	-	-	-	-	-	-	-	-	-	2	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	2	-	1	-	-	-	-	-	-	-	-	2	2	-
Average	1.6	1.2	1	1	-	-	-	-	-	-	-	1.2	1.25	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J32OU</td><td rowspan="2">TECHNICAL WRITING SKILLS
(COMMON TO ALL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives:
The students will
1. Know the elements of effective writing
2. Understand the letter writing and resume writing
3. Classify the types and styles of report writing
4. Understand the proposal writings
5. Examine the research papers and research articles

Module-I Elements of Effective Writing
Introduction-Characteristics of Good Writing-words, phrases, sentences and developing effective paragraphs.

Module -II Academic Writing
Letter writing and Job Application: Introduction-types of letter writing-the seven C's of letter writing- significance- purpose-structure-layout-principles-planning a letter and cover letter.
Resume writing: Introduction-Resume design- parts of a Resume-Resume Styles and final tips.

Module -III Technical Report Writing
Introduction-importance of Reports-Objectives of Reports-Categories of Reports-Formats-prewriting-structures of reports-types of reports- short reports- long reports-research and writing the report-first draft-revising, editing, and proofreading.

Module -IV Technical Proposals
Introduction-definition and purpose-types-characteristics-structure of proposals-style and appearance-evaluation of proposals.

Module -V Writing Research Papers and Articles
Introduction-writing strategies-nature and significance-types of research papers and articles-journal articles-conference papers-review and research articles and elements of articles.

References:

1. Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
2. Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.

3. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.
4. Cooper, Donald R. Pamela S Schindler. Business Research Methods. New Delhi: Tata McGraw-Hill, 2006.

E-Resources:

1. https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/

Course outcomes:

At the end of this course students will be able to

1. Use the characteristics of good writing like words, phrases, sentences and paragraphs.
2. Understand the role of letters and resumes getting jobs.
3. Utilize the report writing skills in business environment
4. Define the style, appearance, and evaluation of proposals.
5. Write the academic and research papers and articles

CO-Articulation Matrix													
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low													
Course Outcomes (COs)	**Program Outcomes (POs)**											**Program Specific Outcomes***	
	PO 1	**PO 2**	**P O3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO1 2**	**PS O1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Total	-	-	-	-	-	-	-	-	**2**	**3**	-	3	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J32OV	RESEARCH METHODOLOGY (Open Elective - II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives: To Understand the

1. Concept / fundamentals of research and their types
2. Practical application of various research techniques
3. Importance of measurement techniques and sampling techniques
4. Importance of coding, editing, tabulation and analysis in doing research
5. Applying the concept of statistical analysis which includes various parametric test and non-parametric test and ANOVA technique and understand technique of report writing

Module 1:
Research— concepts – research methodology – approaches to business research – scientific methods – types of research – research design.

Module 2:
Formulation and planning of research - selection of research problem – literature review - setting of objectives - formulation of hypotheses – measurement of variables – research plan — conducting the research

Module 3:
Data collection– methods and techniques of primary data & secondary data – interviews – surveys – census and sample surveys – Editing, classification and codification of data – using computer packages.

Module 4:
Data Analysis – qualitative data analysis – descriptive quantitative data analysis – tests of measurement and quality – using computer packages

Module 5:
Writing and presenting the report—planning report writing —report format – footnotes and bibliography - references and citations presentation

Text Books:

1. Mathew David & Carole D. Sutton, Social Research: The Basics, Sage Publications, New Delhi
2. O.R. Krishnaswami, Methodology of Research in Social Sciences, Himalaya Publishing House, Mumbai.

3. Ajai S. Gaur and Sanjaya S. Gaur: Statistical methods for practice and Research, Sage Publishers.
4. Deepak Chawla&NeenaSondhi, Research Methodology, Vikas Publishers, 2011

Reference Books:

1. Naval Bajpai, Business Research Methods, Pearson, 2013
2. CR Kothari, Research Methods and Techniques, New Age International, New Delhi.

E-Resources:

1. https://nptel.ac.in/courses/121/106/121106007/

Course outcomes:

Students should be able to

1. **Gain** Knowledge of concept / fundamentals for different types of research
2. **Apply** relevant research techniques
3. **Basics** of Research Methodology and Research Design
4. **Apply**Data Collection methods and the tools for analysis and interpretation
5. **Know** the importance of presentation of data analysis and report writing including referencing style.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 – Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Average	-	-	-	-	-	-	-	-	2	3	-	3	-	-

OPEN ELECTIVE-3

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J41OA</td><td rowspan="2">WASTE MANAGEMENT
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study about handling of solid waste from cradle to grave.
2. Explain the design and construction of the solid waste treatment system.
3. Study the residue disposed of in an environmentally sound way.
4. Study the design and maintenance of different techniques
5. Discuss about waste minimization.

Module 1:
Unit-1 Introduction
Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes Municipal waste, industrial waste, plastic waste, electronic waste, bio-medical waste and hazardous waste - Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Module 2:
Unit 1: Functional Elements of Solid Waste Management
Waste generation and handling at source-onsite storage-Collection of solid wastes Collection methods and services-storage of solid waste- guidelines for collection route layout.

Module 3:
Unit 1: Transfer and Transport of Wastes
Transfer station-types of vehicles used for transportation of solid waste-Processing and segregation of the solid waste- various methods of material segregation. Processing and Transformation of Solid Wastes. Recycling and recovery principles of waste
Unit 2: Management- Composting: definition methods of composting-advantages of composting- Incineration: Definition, methods of Incineration, advantages and disadvantages of incineration.

Module 4:
Unit 1: Treatment and Disposal of Solid Waste
Volume reduction, Open dumping, land filling techniques, Landfills: Classification, Design and Operation of landfills, Land Farming, Deep well injection.

Module 5:

Unit 1: **Waste Minimization**

Introduction to waste minimization, waste minimization techniques-5R (refuse, reduce, reuse, recover, recycle), municipal waste minimization.

Text Books

1. "Integrated Solid Waste Management" by Tchobanognous, Theissen& Vigil
2. McGraw Hill Publication, 3rd Edition, 2014.
3. "Solid and hazardous waste management" by M.N.Rao and Razia sultana, BS publications.
4. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

Reference Books

1. Environmental engineering by Y.Anjaneyulu, B.Spublication.
2. Environmental Pollution Control Engineering by C.S. Rao; Wiley Eastern Ltd.,New Delhi.
3. Environmental engineering by GeradKiley, Tata McGrawHill

E-Resources

1. https://nptel.ac.in/courses/105/105/105105160/
2. https://nptel.ac.in/courses/105/106/105106056/
3. https://nptel.ac.in/courses/105/103/105103205/

Course Outcomes

On completion of the course, the students will be able to:

1. **Recall** the components of solid waste management and the laws governing it
2. **Discuss** design, operation and maintenance of landfills, incinerators and composting units.
3. **Explain** the waste minimization.
4. **Discuss** the Reuse of materials as practicable.
5. **Discuss** about Recycle of waste that cannot be used and recovery of resources.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	2	2	3	-	-	-	-	2	1
CO2	-	3	3	-	-	-	2	1	-	-	-	-	2	1
CO3	-	-	-	-	-	2	3	2	-	-	-	-	1	1
CO4	-	-	-	-	-	2	3	2	-	-	-	-	2	2
CO5	-	1	-	-	-	3	2	1	-	-	-	-	2	2
Average	-	0.6	0.6	-	-	1.8	1.2	1.8	-	-	-	-	1.8	1.4

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OB</td><td rowspan="2">ROAD SAFETY ENGINEERING
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the Fundamentals of Traffic Engineering
2. Explain the Accident Situations
3. Discuss Statistical measures of accident data
4. Explain different parameters responsible for providing road safety
5. Study about Accident prevention.

Module 1:

Unit-1: Fundamentals of Traffic Engineering

Road User Characteristics, Vehicular Characteristics, Applications of Traffic Control Devices, Traffic signs, Road Marking,

Module 2:

Unit-1: Introduction to Road Safety:

Accident Situation in India, International Comparison of Accident Data, Standard Definitions by IRC, Collection of Accident Data, Collision and Condition Diagrams,

Module 3:

Unit-1: Statistical Methods and Analysis of Accident Data:

Methods in Analysis of accident Data, Regression Method, Poisson Distribution, Chi-Squared Distribution, Statistical Comparisons, Black Spot Identification & Investigations,

Module 4:

Unit-1: Road & its Effect on Accidents:

Factors Causing Accidents, Skidding, Factors Determining Skid Resistance, Pedestrian Safety, Measures to Increase Pedestrian Safety, Safety Improvement Strategies, Case Studies

Module 5:

Unit-1: Mitigation Measures:

Accident prevention by better planning, Accident prevention by Better design of roads, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety.

Text Books:

1. "Transport planning and Traffic Engineering" by Dr. L. R. Kadiyali, Khanna

Publications 9th Edition (2017
2. ’Principles of Transportation Engineering’’ by ParthaChakroborty&Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).

Reference Books:

1. Fundamentals of Traffic Engineering, Richardo G Sigua
2. Road Safety by NCHRP.

E-Resources:

1. https://nptel.ac.in/courses/105/101/105101087/

Course Outcomes:

On completion of the course, students will be able to:

1. **Explain** the Traffic characteristics
2. **Analyze** Collision and Condition Diagrams.
3. **Analyze** Statistical Methods for accident data
4. **Describe** Road & its Effect on Accidents
5. **Explain** Accident preventions.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO2	1	1	1	-	-	3	2	-	-	-	-	-	2	2
CO3	1	1	1	-	-	3	1	-	-	2	-	2	1	1
CO4	1	1	1	-	-	2	-	-	-	-	-	2	1	2
CO5	1	1	1	-	-	2	-	-	-	-	-	2	1	1
Average	1	1	1	-	-	2	0.6	-	-	0.4	-	1.2	1.2	1.4

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J41OC</td><td rowspan="2">ELECTRICAL ENGINEERING MATERIALS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical and Electronics Engineering

Course Objectives:

The students will

1. To understand the importance of various materials used in electrical engineering.
2. To obtain a qualitative analysis of their behaviour and applications.
3. To understand Conducting and resistor materials, and their engineering application.
4. To understand Semiconducting materials, their properties and applications.
5. To understand Magnetic materials, Soft and hard magnetic materials and applications; Superconductors

MODULE - I

Unit-I: Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics.

Unit-II: Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyro electric materials.

MODULE – II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

MODULE – III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

MODULE – IV

Unit-I:Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials.

Unit-I: Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

MODULE – V

Unit-I: Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials.

Unit-II: Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

TEXT BOOKS:

1. "R K Rajput", "A course in Electrical Engineering Materials", Laxmi Publications, 2009.
2. "T K Basak", "A course in Electrical Engineering Materials", New Age Science Publications 2009.

REFERENCE BOOKS:

1. TTTI Madras, "Electrical Engineering Materials", McGraw Hill Education, 2004.
2. "AdrianusJ.Dekker", Electrical Engineering Materials, PHI Publication, 2006.
3. S. P. Seth, P. V. Gupta "A course in Electrical Engineering Materials", DhanpatRai& Sons, 2011.

E - Resources:

1. https://nptel.ac.in/courses/112/108/112108150/

Course Outcomes:

After completion of this course, the student will be able to

1. **Understand** various types of dielectric materials, their properties in various conditions.
2. **Evaluate** magnetic materials and their behaviour.
3. **Evaluate** semiconductor materials and technologies.
4. **Acquire** Knowledge on Materials used in electrical engineering and applications
5. **Acquire** Knowledge on Smart materials: Sensors and actuators, piezoelectric, magnetostrictive and electrostrictive materials.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	2	3	-	-	-	-	3	-	3
CO2	2	3	3	-	-	-	2	-	-	-	-	2	-	3
CO3	2	3	3	-	-	-	2	-	-	-	-	2	-	2
CO4	2	2	2	-	-	-	2	-	-	-	-	3	-	3
CO5	3	2	2	-	-	-	2	-	-	-	-	2	-	3
Average	2.4	2.5	2.5	-	-	2	2.2	-	-	-	-	2.4	-	2.8

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J41OD	**NON CONVENTIONAL ENERGY SOURCES** (Open Elective-III)	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Pre-requisite: Nil

Course Objectives:

The students will

1. Elucidate the fundamentals of various sources of Non-Conventional Energy such as Wind, Solar, Biomass, Geo thermal and other renewable energy sources.
2. Impart a thorough knowledge about the application of different types of Non-Conventional Energy systems.
3. Inculcate the students on feasibility and limitations of various Non-Conventional Energy Systems.
4. Analyze the principle and operation of direct energy conversion.
5. Apply the renewable energy sources to real world electrical and electronics problems.

MODULE –I: WIND ENERGY

Unit-I: Introduction to energy sources-Renewable and non-renewable energy sources – energy consumption as a measure of Nation's development – Strategy for meeting the future energy requirement – Global and national level energy scenarios –Prospects of renewable energy sources.

Unit-II: Basic principles of wind energy conversion –site selection consideration – types of wind mills – basic components of wind energy conversion systems (WECS) – types of WECS – applications of wind energy – safety system – environmental aspects.

MODULE –II: SOLAR ENERGY

Solar radiation - Physical principles of conversion of solar radiation into heat –Solar constant – Solar energy collectors - flat plate collector – collector efficiency –concentrating collector: focusing type – advantages of focusing collectors –cylindrical parabolic concentrating collector – selective absorber coatings – central receiver tower solar power plant – solar energy storage systems –types – solar driers – solar water heaters - principle of solar photo voltaic cell – solar photo voltaic power generation – MPPT (Maximum Power Point Tracking) – solar pump – solar hydrogen energy.

MODULE –III: ENERGY FROM BIO-MASS

Bio mass conversion technologies - Bio gas generation principle – types of bio- gas plants – applications of bio-gas plants – bio-mass as a source of energy – energy plantation – thermal gasification of bio mass – energy from agricultural waste – agro thermal power plant – Bio gas-based cogeneration programme – integrated waste management – advantages and disadvantages.

MODULE –IV: GEO-THERMAL AND OCEAN ENERGY

Unit-I: Nature of geo-thermal energy – geo-thermal sources – prime movers for geo- thermal energy conversion – advantages and disadvantages of geo-thermal energy – application of geo-thermal energy.

Unit-II: Principle of ocean thermal energy conversion (OTEC) – open cycle OTEC system – closed cycle – hybrid cycle – prospects of OTEC in India -applications – basic principle and components of tidal power plant – single basin and double basin tidal powerplants -site requirements – storage –advantages and limitations of tidal power generation – ocean wave energy conversion devices.

MODULE –V: OTHER ENERGY SOURCES

Unit-I: Basic principle and components of a fuel cell – types of fuel cell –conversion efficiency of fuel cell - advantages and disadvantages of fuel cell – conversion energy and application of fuel cell – basic battery theory – batteries applied for bulk energy storage. **Unit-II:** Hydrogen fuel – hydrogen production – methods - storage – transportation and utilization – hydrogen as alternative fuel for motor vehicle – safety management.

TEXT BOOKS:

1. Rai, G.D., 'Non-Conventional Energy Sources', Khanna Publishers, New Delhi, 4th Edition, 2004.
2. Gupta, B.R., 'Generation of Electrical Energy', S.Chand& Co. Ltd, New Delhi, 5th Edition, 2014.

REFERENCE BOOKS:

1. Agarwal, M.P., 'Future Sources of Electrical Power', S.Chand& Co. Ltd, New Delhi, 1999.
2. Hassan and D.K. Sharma 'Non-Conventional Energy Resources, S.K. Kataria and Sons Ltd, 2009
3. S.P. Sukhatme, 'Solar Energy: Principles of Thermal Collection and Storage,' Tata McGraw Hill, 2015.
4. B.K. Bansal 'Non-Conventional Energy Resources' Vikas Publishing Ltd, 2014.

E - Resources:

1. https://nptel.ac.in/courses/121/106/121106014/
2. http://ethesis.nitrkl.ac.in/218/1/Thesis.pdf

Course Outcomes:

The student will be able to

1. **Understand** the need of utilization of alternate energyresources&fundamentals of various non-conventional energy Systems.
2. **Analyze** the knowledge of Biomass and Geothermal energy sources

3. **Describe** the collection of solar energy, storage of solar energy and its applications.
4. **Illustrate** the potential of Wind and bio mass as a renewable source.
5. **Understand** the potential of geothermal energy and ocean energy as a renewable source.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	2	3	-	-	-	-	3	-	3
CO2	2	3	3	-	-	-	2	-	-	-	-	2	-	3
CO3	2	3	3	-	-	-	2	-	-	-	-	2	-	2
CO4	2	2	2	-	-	-	2	-	-	-	-	3	-	3
CO5	3	2	2	-	-	-	2	-	-	-	-	2	-	3
Average	2.4	2.5	2.5	-	-	2	2.2	-	-	-	-	2.4	-	2.8

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OE</td><td rowspan="2">BASICS OF ROBOTICS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mathematics

Course Objectives:
This course will enable students to:
1. Understand the theoretical aspects of Robotics
2. Acquire practical experience in the field of Robotics through design projects and case studies.
3. Understand the importance of robots in various fields of engineering.
4. Understand trajectory planning and types of motion
5. Expose to various robots and their operational details.

Module 1:
Unit 1: Introduction: Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator.

Unit 2: Components of Industrial robotics - precession of movement - resolution, accuracy & repeatability – Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

Module 2:
Unit 1: Grippers - Mechanical Gripper-Grasping force – Engelberger-g-factors-mechanisms for actuation, Magnetic gripper, vacuum cup gripper-considerations in gripper selection &design. Industrial robots specifications. Selection based on the Application.

Module 3:
Unit 1: Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots

Module 4:
Unit 1: Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme. Control- Interaction control, Rigid Body mechanics, Control architecture-position, path velocity, and force control systems, computed torque control, adaptive control, and Servo system for robot control.

Module 5:

Unit 1: Programming of Robots and Vision System-Lead through programming methods-Teach pendent- overview of various textual programming languages like VAL etc.

Unit 2: Introduction to Mobile Robots: A brief history of mobile robotics, applications and market. Recent advances in the mobile robotics for RISE (Risky Intervention and Surveillance Environment) applications.

Text Books:

1. Industrial Robotics / Groover M P /McGraw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

Reference Books:

1. Theory of Applied Robotics /Jazar/Springer.H. Asada and J. J. E. Slotine, "Robot Analysis and Intelligence", Wiley Inter-Science. 1986
2. Robotics / Ghosal / Oxford

E - Resources:

1. https://rb.gy/dw0rkv
2. https://rb.gy/iayh9d
3. https://nptel.ac.in/courses/112/105/112105249/
4. https://nptel.ac.in/courses/112/101/112101098/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Apply** the basic components of robots.
2. **Differentiate** types of robots and robot grippers.
3. **Model** forward and inverse kinematics of robot manipulators.
4. **Analyze** forces in links and joints of a robot.
5. **Programme** a robot to perform tasks in differential applications.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	2	2	-	-	-	-	-	-	2		
CO2	3	3	2	2	2	-	-	-	-	-	-	1		
CO3	3	2	2	2	2	-	-	-	-	-	-	1		
CO4	3	2	2	1	1	-	-	-	-	-	-	2		
CO5	1	2	1	2	2	-	-	-	-	-	-	2		
Average	2.6	2	1.8	1.8	1.8	-	-	-	-	-	-	1.6		

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J41OG</td><td rowspan="2">DIGITAL SYSTEMS USING VHDL
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

Course Objectives:
The students will

1. Learn how a Hardware Description Language (HDL) is used to describe and implement hardware.
2. Learn how to simulate and test that hardware and optimise their designs.
3. Learn in-depth study of combinatorial and sequential hardware systems and the use of finite state machines in the design of sequential systems.
4. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
5. To implement combinational and sequential circuits using VHDL.

Module 1
Unit I
Review of Logic Design Fundamentals: Combinational Logic, Boolean Algebra and Algebraic Simplification, Karnaugh maps, Designing with NAND and NOR Gates, Hazards in Combinational Networks, Flip-flops and latches, Mealy Sequential Network, Equivalent States and reduction of State Tables, Sequential Network Timing, Setup and Hold Times, Synchronous Design, Tristate Logic and Buses.

Module 2
Unit I
Introduction to VHDL: VHDL Description of Combinational Networks, Modeling Flip- flops using VHDL Process, VHDL Models for a Multiplexer, Compilation and Simulation of VHDL Code, Modeling a Sequential Machine, Variables, Signals and Constants, Arrays, operators, Functions, Procedures, Packages and Libraries, VHDL Model for a 74163 Counter.

Module 3
Unit I
Designing with Programmable Logic Devices: Read-Only Memories, Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs) , Other Sequential Programmable Logic devices(PLDs),Design of a Keypad Scanner.

Unit II

Design of Networks for Arithmetic Operations: Design of a Serial Adder with Accumulator, State Graphs for Control Networks, Design of a Binary Multiplier, Multiplication of Signed Binary Numbers, Design of a Binary Divider.

Module 4

Unit I

Digital Design with SM Charts: State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative Realizations for SM Charts using Microprogramming, Linked State Machine.

Unit II

Designing with Programmable gate Arrays and Complex Programmable Logic Devices: Xilinx 3000 Series FPGAs, Designing with FPGAs, Xilinx 4000 Series FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices(CPLDs),Altera FLEX 10K Series CPLDs

Module 5

Unit I

Floating-Point Arithmetic: Representation of Floating-Point Numbers, Floating-point Multiplication, Other Floating-Point Operations.

Unit II

Hardware Testing and Design for Testability: Testing Combinational Logic, Testing Sequential Logic, Scan Testing, Boundary Scan, Build-In Self-Test**.**

Text Books:

1. Charles H,Roth ,"Digital system design using VHDL" , 2nd Edition, PWS publishing co.
2. ZainalabedinNavabi, "VHDL analysis and modeling of digital systems",2nd Edition, MGH, 2004.

References Books:

1. Stphen Brown, "Fundamental of Digital logic with VHDL Design", Tata McGraw Hill, 2008.
2. J.Bhaskar ,"A VHDL primer",3rd edition 2004, Prentice Hall of India Limited.
3. Michael D.Ciletti, "Advanced Digital design with Verilog HDL", 2nd Edition, PHI Ltd, 2005.

E - Resources:

1. https://nptel.ac.in/courses/111/102/111102111/

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1. **Develop** a digital logic and apply it to solve real life problems.
2. **Practice** combinational and sequential digital circuits using different styles of modeling of vhdl.
3. **Analyze**, design and implement sequential logic circuits.

4. **Employ** digital system design using PLD.
5. **Simulate and implement** combinational and sequential circuits using VHDL systems.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2	2	-	-	-	-	-	-	-	-	1	1.2	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J41OH	**MATLAB PROGRAMING LANGUAGE** (Open Elective-III)	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Prerequisites: Nil

Course Objectives:
The students will

1. To understand the basic principles of programming and of implementing mathematical concepts in MATLAB.
2. To write numerical algorithms with MATLAB Programming language.
3. To evaluate the computational results using graphical representations.
4. To gain knowledge about advanced MATLAB Programming methods.
5. To gain knowledge on Simulink used in MATLAB.

Module-1
Unit-I: Introductionto MATLAB
Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).
Unit-2
Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

Module-2
Unit-I: **Data Flow in MATLAB**
Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

Module-3
Unit-I: MATLAB Programming
Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Module-4
Unit-I: **MATLAB Advanced**
Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface).
Matlab- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Module-5

Unit-1: SIMULINK

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

TEXT BOOKS:

1. Getting Started WithMatlab: A Quick Introduction For Scientists And Engineers (English) by RudraPratap, OXFORD University Press.
2. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication.

REFERENCE BOOKS:

1. MATLAB® Programming For Engineers, Fourth edition by Stephen J. Chapman.
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang ,Wenwu Cao, Tae-Sang Chung, John Morris.

Course Outcomes:

By the end of this course, the student will be able to

1. **Translate** mathematical methods to MATLAB code.
2. **Generalize** results and represent data visually.
3. **Apply** computer methods for solving a wide range of engineering problems.
4. **Utilize** computer skills to enhance learning and performance in other engineering and science courses.
5. **Acquire** knowledge of Advanced Matlab programming methods and Simulink.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2	-	2	-	-	-	-	-	-	-	1	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code:J41OI</td><td rowspan="2">INTRODUCTION TO PYTHON PROGRAMMING
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Need basic knowledge about computer.
2.
3. Need Basic understanding of Programming language.

Course objectives:

The Student will:

1. Design and program Python applications.
2. Use lists, tuples, and dictionaries in Python programs.
3. Learn to identify Python object types, Components, decision statements, pass arguments in Python.
4. Build and package Python modules for reusability, design object oriented programs with Python classes, use class inheritance in Python for reusability.
5. Use exception handling in Python applications for error handling.

Module:1

Programming paradigms; Structured programming vs object-oriented programming, OOPs fundamentals- class, object, abstraction, encapsulation, polymorphism, and inheritance; Introduction to Python Getting started to Python- an interpreted high-level language, interactive mode and script mode. Variables, Expressions and Statements Values and types, Variables and keywords, statements, evaluating expressions, operators and operands, order of operations, composition. Functions function calls, type conversion, type coercion, pre-defined functions, composition, user define functions, flow of execution, passing parameters, function parameters and scope. Conditionals and recursion modulus operator, Boolean expression, logical operators, conditional execution, alternative execution, chained and nested conditionals, return statement; Recursion, infinite recursion.

Module 2:

Python data structures Strings Creating, initializing, and accessing the elements; String operators, comparing strings using relational operators; String functions and methods.

Lists: Concept of mutable lists, creating, initializing, and accessing the elements, traversing, appending, updating, and deleting elements; List operations; List functions and Methods, list parameters, nested lists, Matrices.

Dictionaries

Concept of key-value pair, creating, initializing, and accessing the elements in a dictionary, dictionary operations traversing, appending, updating, and deleting elements, Dictionary functions and methods.

Tuples

Mutability and tuples, Immutable concept, creating, initializing, and accessing the elements in a tuple, Tuple functions.

Module 3:

Object oriented programming using Python: creating python classes, classes and objects: user defined compound types, objects are mutable, copying; Access modifiers, classes and functions: pure function, modifiers, Classes and methods: object oriented features, optional arguments, initialization method, operator overloading and polymorphism.

Module 4:

Inheritance: Basic Inheritance: extending built-ins, overriding and super; Multiple inheritance: the diamond problem.

Module 5:

Files handling and Exceptions: Text files, writing variables, Directories, Pickling.
Exceptions: raising exceptions, handling exceptions, exception hierarchy.

Text Books:

1. Python Object Oriented Programming, Dusty Phillips, Packet Publishing, 2010.
2. Programming in Python 3 - A complete Introduction to the Python Language- Second Edition, Mark Summerfields, Addison-Wesley 2010.

Reference Books:

1. Programming Python- 4th Edition, Mark Lutz, O'Reilly, 2011.
2. Object-Oriented Programming in Python, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

E - Resources:

1. https://www.youtube.com/watch?v=MLP1v80yU14
2. https://pythonprogramming.net/functions-python-3-basics-tutorial/
3. https://www.youtube.com/watch?v=QGLNQwfTO2w
4. https://www.youtube.com/watch?v=ZDa-Z5JzLYM
5. https://www.youtube.com/watch?v=M-t4ILRHnxE

Course Outcomes:

The students will be able to

1. Describe to design and program Python applications.
2. Analyze and conversion of to use lists, tuples, and dictionaries in Python programs.
3. Explain the concept to identify Python object types, Components, decision statements, pass arguments in Python.

4. Apply decision for building and package Python modules for reusability, designobject-oriented programs with Python classes, use class inheritance in Python for reusability.
5. Apply file handling and Exception handling Concepts in real world using python.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	1	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	3	-	-	-	-	-	-	-	-	1	2
CO4	3	2	1	2	-	-	-	-	-	-	-	-	-	3
CO5	3	2	2	2	-	-	-	-	-	-	-	-	-	3
Average	**3.0**	**2.0**	**1.8**	**2.2**	-	-	-	-	-	-	-	-	**1.5**	**2.4**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OJ</td><td rowspan="2">INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Basic Knowledge on Data base

Course objectives:
The Student will:
1. Evaluate a User Interface for a mobile application using J2ME.
2. Create a small but realistic working mobile application for small computing devices.
3. Categories the challenges posed by developing mobile applications and be able to propose and evaluate and select appropriate solutions.
4. Differentiate between high and low level display screens.
5. Familiar with record management systems.

Module 1:
J2ME Overview: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices
Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants

Module 2:
J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MiDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MlDlets in a MIDlet Suite,J2MEWirelessToolkit J2ME Best Practices and Patterns: The Reality of Working in a J2ME World, Best Practices

Module 3:
Commands, Items, and Event Processing: J2ME User Interfaces, Display Class, The Palm OS Emulator, Command Class, Item Class, Exception Handling.

Module 4:
High-Level Display Screens: Screen Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class. Low-Level Display Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

Module 5:

Record Management System- Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener.

Text Books:

1. J2ME: The Complete Reference, James Keogh, Tata McGrawHjll.
2. Programming for Mobile and Remote Computers, G.T.Thampi, drearntec press.

Reference Books:

1. Enterprise J2ME: Developing Mobile Java Applications — Michael Juntao Yuan, Pearson Education, 2004
2. Beginning Java ME Plafform, Ray Rischpater, Apress, 2009
3. Beginning J2ME: From Novice to Professional, Third Edition, Sing Li, Jonathan B. Knudsen, Apress, 2005
4. Kicking Butt with MIDP and MSA:C,eating Great Mobile Applications, I edition, J.Knudsen, Pearson.

E - Resources:

1. https://www.smartzworld.com/notes/mobile-application-development-notes-pdf-mad-pdf-notes/
2. https://www.slideshare.net/ChromeInfotech/mobile-application-development-process
3. https://nptel.ac.in/courses/106/106/106106156/
4. http://w1236xz.website/j2ee-the-complete-reference-tata-mcgraw-hill pdf

Course outcomes:

The students will be able to

1. **Implement** a User Interface for a mobile application using J2ME.
2. **Design** a small but realistic working mobile application for small computing devices.
3. **Classify** the challenges posed by developing mobile applications and be able to propose and evaluate and select appropriate solutions.
4. **Classify** between high and low level display screens.
5. **Apply** the concepts on record management systems.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	2	3	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2	3	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2	3	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2	3	2
CO5	3	2	2	-	-	-	-	-	-	-	-	2	3	2
Average	**3.0**	**2.0**	**2.0**	-	-	-	-	-	-	-	-	**2.0**	**3.0**	**2.0**

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code:
J41OK</td><td rowspan="2">FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING THROUGH C++
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Fundamental Knowledge of Programming in C.

Course Objectives:

The students will

1. Be able to explain the difference between object oriented programming and procedural programming.
2. Be able to program using more advanced C++ features such as composition of objects, operator overloads, inheritance
3. Be able to build C++ classes using appropriate encapsulation and design principles.
4. Improve problem solving skills.
5. Be able to apply object oriented or non-object oriented techniques to solve bigger computing problems

Module I: Introduction

Unit 1:

What is object oriented programming? Why do we need object oriented Programming characteristics of object-oriented languages

Unit 2:

C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. Thesetw manipulator. Type conversions.

Module II: Functions and Pointers

Unit 1:

Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.

Unit 2:

Addresses and pointers. The address of operator and pointer and arrays. Pointer and action pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers.

Module III: Classes and Objects

Unit 1:

Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor.

Unit 2: Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const. and classes.

Module IV: Arrays and Strings
Unit 1:
Arrays and string arrays fundamentals. Arrays as class Member Data : Arrays of object, string, The standard C++ String class
Unit 2:
Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords.Explicit and Mutable.
Module V: Inheritance
Unit 1:
Concept of inheritance. Derived class and based class. Derived class constructors, member function, class hierarchies.
Unit 2:
Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.

Text Books:

1. Object Oriented Programming with C++ by E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education.

Reference Books:

1. C++ and Object Oriented Programming – Jana, PHI Learning.
2. Object Oriented Programming with C++ - Rajiv Sahay, Oxford

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105151/

Course Outcomes:
The students will be able to

1. Articulate the principles of object-oriented problem solving and programming.
2. Outline the essential features and elements of the C++ programming language.
3. Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading.
4. Program with basic data structures using array.
5. Analyze, write, debug, and test basic C++ codes using the approaches introduced in the course.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**P O3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	2	1	3	-	2	-	-	-	-	-	-	-	2	2
CO2	1	2	3	-	2	-	-	-	-	-	-	-	2	2
CO3	-	2	2	-	1	-	-	-	-	-	-	-	1	1
CO4	2	1	2	-	1	-	-	-	-	-	-	-	1	1
CO5	1	2	1	-	2	-	-	-	-	-	-	-	2	1
Average	1.2	1.6	2.2	-	1.6	-	-	-	-	-	-	-	1.6	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OL</td><td rowspan="2">FUNDAMENTALS OF DATA SCIENCE
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Good mathematical background and programming skills.

Course Objectives:
The students will

1. To explain how math and information sciences can contribute to building better algorithms and software.
2. To develop fundamental knowledge of concepts underlying data science projects.
3. To develop applied experience with data science software, programming, applications and processes.
4. To develop practical data analysis skills, which can be applied to practical problems.
5. To develop practical skills needed in modern analytics.

Module 1: Introduction to Data Science
What is Data Science? - Big Data VS Data Science, Datafication, Current landscape of perspectives and Skill sets needed.

Module 2: Statistics in Data Science
Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model.

Module 3: Exploratory Data Analysis
Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process.

Module 4: Liner Regression for Data Science
Simple Linear Regression, Multiple Linear Regression, other Considerations in the Regression Model,

Module 5: Classification
An Overview of Classification, Why Not Linear Regression?, Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods.

Text Books:

1. Practical Data Science with R". Nina Zumel, John Mount. Manning, 2014.

Reference Books:

1. Data Science for business", F. Provost, T Fawcett, 2013.

E-Resources:

1. https://www2.cs.duke.edu/courses/compsci190/fall18

Course Outcomes:

1. **Know** basic notions and definitions in data analysis.
2. **Know** standard methods of data analysis
3. **Understand** and Apply Statistical Methods for Data Analysis.
4. **Formulate** the problem of knowledge extraction.
5. **Translate** a real-world problem into mathematical terms.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	P O3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	2	2	1	1									2	1
CO2	1	2	2	1									1	2
CO3	2	2	2	2									1	1
CO4	2	2	2	2									2	2
CO5	1	2	2	2									2	1
Average	1.6	2	1.8	1.6									1.6	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OM</td><td rowspan="2">INTRODUCTION TO NEURAL NETWORKS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nill

Course Objectives:
The students will
1. Understand the differences and similarities neural network, human brain and feedback systems
2. Learn the different learning techniques
3. Familiar with the concept of single layer perceptron and its algorithms.
4. Familiar with the concept of multilayer perceptron and its algorithms
5. Know the self-organization mapping techniques.

Module 1:
Unit 1: Introduction: What is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs.
Unit 2 : Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

Module 2:
Unit 1: Learning Process: Error Correction learning, Memory based learning, Hebbian learning, Competitive.
Unit 2 : Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

Module 3:
Unit 1: Single layer perceptron's: Adaptive filtering problem, Unconstrained Optimization Techniques, Linear least square filters, least mean square algorithm, learning curves.
Unit 2 : Learning rate annealing techniques, perception-convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment.

Module 4:
Unit 1 : Multilayer Perceptron's: Back propagation algorithm XOR problem.
Unit 2 : Heuristics, Output representation and decision rule, computer experiment, feature detection

Module 5:
Unit 1: Self –Organization Maps: Two basic feature mapping models, Self-Organization maps, SOM algorithm.
Unit 2: Hopfield models: Hopfield models, computer experiment.

Text Books:

1. Neural networks A comprehensive foundation, Simon Hhaykin, PHI edition.
2. Artificial neural networks-B.Vegnanarayana Prentice Halll of India P Ltd 2005.

Reference Books:

1. Neural networks in Computer intelligence, Li Min Fu TMH 2003.
2. Neural networks James A Freeman David M S kapurapearson education 2004.

E-Resources:

1. https://towardsai.net/p/machine-learning/main-types-of-neural-networks-and-its-applications-tutorial-734480d7ec8e
2. http://neuralnetworksanddeeplearning.com/index.html
3. http://neuralnetworksanddeeplearning.com/chap2.html
4. http://neuralnetworksanddeeplearning.com/chap3.html
5. http://neuralnetworksanddeeplearning.com/chap4.html
6. http://neuralnetworksanddeeplearning.com/chap5.html
7. http://neuralnetworksanddeeplearning.com/chap6.html
8. http://neuralnetworksanddeeplearning.com/chap1.html

Course Outcomes:

Students will be able to:

1. **Know** differences and similarities between neural network, human brain and feedback systems
2. **Get** the knowledge of different learning techniques
3. **Describe** the concept of single layer perceptron and its algorithms.
4. **Describe** the concept of multilayer perceptron and its algorithms.
5. **Analyze** the self-organisation mapping techniques.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**											**Program Specific Outcomes***		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Average	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J41ON	IC APPLICATIONS (Open Elective-III)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Electronic devices and circuits, Switching Theory & Logic Design, Pulse & Digital Circuits.

Course Objectives:

Students will learn to

1. Introduce the basic building blocks of linear integrated circuits.
2. Teach the linear and non – linear applications of operational amplifiers.
3. Introduce the theory and applications of analog multipliers and PLL.
4. Introduce the concepts of waveform generation and introduce some special function ICs.
5. Understand and implement the working of basic digital circuits

Module 1:

Unit 1: Introduction to Linear Integrated Circuits

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential

Unit 2: Non-Linear Applications of OP-AMP

Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Module 2:

Unit 1: Introduction to IC-555 Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer -Functional Diagram, Monostable, and Astable Operations, Applications.

Unit 2: Timer and Phase Locked Loops(PLL)

Applications

IC565 PLL – Block Schematic, Description of Individual Blocks, Applications.

Module 3:

Unit 1: Converters of DAC

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC

Unit 2: Converters of ADC

Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Module 4:

Unit 1: Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications and Applications of TTL-74XX

Unit 2: Applications of Digital ICs

Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators

Module 5:

Unit 1: Combinational Circuits Using TTL 74XX ICS

Familiarity with commonly available 74XX &
CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Unit 2: Memories

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static& Dynamic RAMs.

Text Books:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILLEDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E-Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20Notes.pdf.
3. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20LDIC(Linear%20 and%20Digital%20IC%20Applications).pdf
4. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Course Outcomes:

Students will be able to

1. **Understanding** of operational amplifiers with linear integrated circuits.
2. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
3. **Analyze** the functioning of various design circuits using operational amplifiers for various applications.
4. **Design** various techniques to develop a/d and d/a convertors.
5. **Acquire** hands-on laboratory experience on ic based project kits in above areas according to specifications.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	3	3
CO3	1	2	2	-	-	-	-	-	-	-	-	-	1	2
CO4	1	2	1	-	2	-	-	-	-	-	-	1	1	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	3
Average	1.6	2	1.7	-	2	-	-	-	-	-	-	1	1.75	2.5

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OP</td><td rowspan="2">INTRODUCTION TO GEOLOGY
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
1. To introduce rock types and their physical properties
2. To acquaint with different structures occurring in rocks
3. To get idea about Ground water, and aquifers
4. To get idea about coal formation and its stages.
5. To know about minerals occurring in India.

Module 1
Unit - 1: Introduction, Definitions, Importance of geology in mining, Types of rocks, Physical properties of rocks.

Module 2
Unit - 1: Structural Geology: Definition, terminology, and Primary and secondary structures: Bedding, lineation, foliation, cleavage, Strike and dip.
Unit - 2: Definition of faults, folds and joints and their types, Unconformities and its kinds.

Module 3
Unit - 1: Ground Water: Introduction, Hydrological Cycle, origin and occurrence of groundwater, water table.
Unit - 2: Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers.

Module 4
Unit - 1: Coal: Stages of formation, composition, theories of formation of coal.

Module 5
Unit - 1: Occurrence and distribution of important metallic mineral deposits in India: Iron, Copper, Lead, Zinc, Manganese, Aluminum, Chromium.
Unit - 2: Occurrence and distribution of important non-metallic mineral deposits in India: Asbestos, Kyanite, Sillimanite.

Textbooks:
1. Structural Geology – Billings, M.P. Prentice Hall.
2. Engineering geology –by Dr. Chennkeshavulu.

Reference Books:

1. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.

E-resources:

1. http://www.publiclandsforthepeople.org/wp-content/uploads/2015/06/Introduction-to-Geology-and-Hard-Rock-Mining-2015.pdf
2. https://www.eolss.net/Sample-Chapters/C01/E6-15-08-03.pdf
3. https://pubs.usgs.gov/of/2001/0151/pdf/of01-151.pdf
4. https://digitalworks.union.edu/cgi/viewcontent.cgi?article=1008&context=ajes

Course Outcomes:

The student will be able to:

1. **Understand** about rocks and their properties
2. **Learn** about different structures occurring in rocks
3. **Understand** about ground water, water table and aquifers
4. **Learn** about coal and its formation theories
5. **Distinguish** metallic and non-metallic minerals.

1. CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:</td><td rowspan="2">INTEGRAL TRANSFORMS AND INTEGRAL EQUATIONS
(Common to CE,EEE, ECE, ME, CSE,IT ,ECM & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Differential Equations

Course Objectives:

The students will

1. Approximation of real-valued periodic functions to suitably restricted non-periodic functions f(x) defined for all real numbers
2. How to use laplace transform methods to solve ordinary and partial differential equations
3. Make them familiar with the methods of solving differential equations, partial differential equations.
4. The properties of z-transform and associating the knowledge of properties of roc in response to different operations on discrete signals.
5. Discretization techniques to find approximate solutions of differential equations different types of errors involved in such solutions, their measures and practical applications.

MODULE-I: Applications of Differential Equations

Basic introduction of the course using precise examples like periodic functions, signal propagation, solving mathematical models corresponding to Electrical Circuits.

MODULE-II: Laplace Transforms

UNIT-I: Laplace Transform (LT) – definition – linearity property of LT. Existence Theorem – First and Second Translation theorems. Change of scale property, LT of derivatives, multiplication by t and division by t – Initial and Final Value theorems.

UNIT-II: Inverse Laplace Transforms: definition – standard forms. First and Second shifting theorems. Change of scale property – Use of partial fractions, Inverse transforms of derivatives, Inverse Laplace Transform of integrals – definition of convolution – Convolution theorem

MODULE–III : Fourier Transforms

Fourier Transforms – Fourier integral formula, Inverse Theorem for Fourier Transform; Fourier Sine Transform, Inverse formula for Fourier Sine Transform; Fourier Cosine Transform, Inverse formula for Fourier Cosine Transform; linearity property, change of scale property, shifting property.

MODULE–IV : Z-Transforms

Definition and properties of Z-Transform, Standard functions of Z-Transform, Unit step

Function. Unit Impulse function, Initial value Theorem and Final value Theorem, Inverse Z-Transform, Partial fraction method, Difference Equation using Z-Transforms.

MODULE-V: Henkel Transforms

Henkel Transforms- Henkel Transform of the derivatives of a function.- Application of Henkel Transforms in boundary value problems.

TEXT BOOKS:

1. A.R.Vashista, Dr. R.K.Gupta, Integral transforms - Krishna PrakashamMandirurray
2. .R.Spiegel, Theory and problems of Laplace transforms - Shamus Outline Series Tata Mac Grawhill

REFERENCES:

1. Brian Daries, Integral Transforms & their applications - Springers
2. L Debnath , D Bhatta, Integral Transforms & their Applications – Chapman & Hall/CRC
3. Chorafas, Integral Transforms & their Applications

E-RESOURCES

1. https://nptel.ac.in/content/storage2/courses/112104158/lecture8.pdf
2. https://tutorial.math.lamar.edu/classes/de/inversetransforms.aspx
3. http://www.thefouriertransform.com/
4. http://dsp-book.narod.ru/TAH/ch06.pdf
5. https://www.henkel-adhesives.com/in/en.html

Course outcomes:

At the end of this course students will be able to

1. understand the concepts of integral transforms
2. Determine Laplace transform of a function and understand the fundamental properties and apply Laplace transform in solving ODEs.
3. Determine Fourier and inverse Fourier transform of a function and understand the fundamental properties and apply Fourier transform in solving ODEs.
4. apply the Z transform techniques to solve second-order ordinary difference equations.
5. apply the Hankel transform in the infinite 2-dimensional plane

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

<table>
<tr><td rowspan="1">AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OS</td><td rowspan="2">NDT and VACUUM TECHNOLOGY
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. study various Non Destructive Testing and types of defects.
2. know the basics of non-destructive techniques using ultrasonic interferometer.
3. provide a basic level of understanding on Vacuum technology.
4. understand the importance Pressure gauges.
5. introduce the fundamental concepts vacuum pumps.

Module 1: Introduction to Non-destructive testing

Introduction, Objectives of Non-destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage..

Module 2: Methods of Non-destructive Testing

Liquid penetration method, Dye penetration method, Ultrasonic Inspection method, Pulse Echo method, Radiographic testing Magnetic particle testing, Eddy current Testing.

Module 3: Introduction to Vacuum Technology

Unit-1: Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance.

Unit-2: Flow meters: Molar flow, Mass flow.

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Module 4: Pressure gauges

Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge.

Module-5: Vacuum Pumps

Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps.

Text Books:

1. "Engineering Physics",B K Pandey and S Chaturvedi, Cengage Learning India, Revised Edition, 2014.
2. "A User's guide to Vacuum technology", John. F. O'Hanlon, Wiley, 3rd Edition, 2003.

Reference Books:

1. "Physics for Engineers", R Srinivasan, New Age international, 1st reprint, 2007.
2. "Engineering Physics", R K Gaur and S L Gupta, Dhanpatrai, Reprint, 2006.
3. "Hand Book of Thin film deposition", Krishna Seshan, Noyes, 2nd Edition, 2002

E - Resources:

1. http://www.enfm.net/catalog/catalog/enfm-usa.pdf
2. http://web.itu.edu.tr/~arana/ndt.pdf
3. http://www.issp.ac.ru/ebooks/books/open/Nondestructive_Testing_Methods_and_
4. New_Applications.pdf
5. https://www.journals.elsevier.com/ndt-and-e-international/https://www.journals.elsevier.com/vacuum
6. http://nptel.ac.in/courses/114106035/35
7. http://nptel.ac.in/courses/112101004/37.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the Types of defects and analyze them.
2. **Analyze** the principles of NDT methods.
3. **Analyze** Vacuum technology and concepts of flow meters.
4. **Develop** pressure gauges.
5. **Understand** the concepts of different vacuum pumps.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	2	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	2	-	-	-	-	-	-	-	1	-
Average	2.6	2	-	-	2	-	-	-	-	-	-	--	1	-

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J41OS</td><td rowspan="2">NANO CHEMISTRY
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To know about the scope of Nanoscale materials and synthesis.
2. Understand the properties of Nanomaterials.
3. Give knowledge of various instrumental techniques to the analysis the Nanomaterials.
4. learn about the different applications of Nanomaterials.
5. Analyze the Nano technology in Environmental purpose.

Module 1:Synthesis of Nano materials:

Introduction -synthesis of Nanostructure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

Module 2:Properties of Nano materials:

Properties of Nanomaterials-Electronic properties, Energy bands and gaps in semiconductors, Fermi Surfaces-Optical properties- Fluorescence, Photoluminescence, Electroluminescence. Magnetic properties-mechanical properties-thermal properties.

Module 3: Instrumental Analysis:

Characterization techniques- Principle and block diagram of Scanning Electron Microscopy (SEM), Electron Dispersion Spectroscopy(EDS). Principle and block diagram of Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) - Illustrative examples.

Module 4:Carbon Nano structures and Applications:

Carbon Nano structures, carbon clusters, types and preparation of carbon Nano tubes-optical and telecommunication applications, Nano structured crystals (graphite), graphene, carbon fibers, fullerenes and their applications. Nano solar cells and its applications

Module-5: Environmental Nanotechnology:

Implications of Nanotechnology & Research Needs-Nanostructured Catalysts TiO_2 Nanoparticles for Water purification- Nano membranes in drinking water treatment and desalination, Nanomembranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

Text Books:

1. "Nanotechnology a gentle introduction to the next big idea",Mark A. Ratner, D. Ratner. Pearson Education Inc., Asia, 2003.
2. "Nano: The essentials-understanding Nanoscience and Nanotechnology", Pradeep.T. Tata Mc.Graw Hill, New Delhi, 2007.

Reference Books:

1. "Nanomaterials: Synthesis, Characterization, and Applications", A. K. Haghi, Ajesh K. Zachariah, NandakumarKalariakkal. Apple Academic Press, 2013.
2. "Nanomaterials and Nanochemistry", Brechignac C., Houdy P., Lahmani M. (Eds.) (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
3. "Principles of Nanotechnology", Phanikumar. SciTech Publications 2nd Edition, 2010.
4. "Environmental Nanotechnology"Preetijain, Shankar lalGarg. Lap lambert Academic publishing, 2015.

E - Resources:

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/nanochemistry.html
2. https://www.sciencedirect.com/book/9780444519566/nanochemistry
3. https://www.researchgate.net/publication/320068992_Introduction_to_Nano-chemistry_and_Nano-materials
4. https://www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/nanochemistry
5. https://www.cambridge.org/core/books/engineering-chemistry/nanochemistry/D6DB35E32E530525DD927E68CED43197

Course Outcomes:

On completion of the course, the students will be able to:

1. **Learn** the different synthetic methods of the Nano materials.
2. **Know** the student Electronic, optical and magnetic properties of Nan materials.
3. **Acquire** the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS &AFM).
4. **Know** the carbon nanotubes, carbon Nano fibers, Nano structured catalysts and Nano solar cells.
5. **Learn** usage of Nano materials in the purification of water.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	1	-	-	-	-	-	-	-	2	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	1	-	-
CO3	2	2	-	1	-	-	-	-	-	-	-	2	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-		-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	2	-	-
Average	2.2	1.6	1.6	1	-	-	-	-	-	-	-	1.4	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J41OU</td><td rowspan="2">TEAMWORK AND TEAM BUILDING
(COMMON TO ALL)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Objectives:

The students will

1. Know the working experience in the group and team
2. Understand the process and role of the team
3. Apply the knowledge of team building
4. Understand the role of team leader.
5. Plan the meetings and understanding the role of meetings

Module -I Working in Groups and Teams

Introduction-defining Types of Groups and Teams- Understanding the role of Teams in Organization; Recognizing differences between group and Teams-ensuring team success-empowering teams- working with a distributed team- technology @work: virtual worlds.

Module -II Exploring Team Roles and Processes

Defining common team roles-selecting team members-choosing the optimal team size-establishing team rules-clarifying team objectives-making collective decisions etc.

Module -III Building and Developing Team

Understanding the benefits of working in teams-fostering Resistance-using team-building activities-creating a team identity-coping with conflict and ego-dealing with difficult team members and celebrating successes.

Module -IV Leading a Team

Pursuing team leadership-preparing to be a team leader-getting start with your team-taking a project management approach- managing a team diplomatically-being sensitive to intangibles and concluding team activities.

Module -V Managing Meetings

Scheduling meeting-developing meeting agenda- planning meetings-understanding the role of meetings-conducting meetings effectively-taking notes and publishing minutes-concluding meetings and creating action plans and solving common meeting problems.

Reference/text book:

1. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.

E-Resources:

1. https://smallbusiness.chron.com/difference-between-team-building-teamwork-10981.html

Course outcomes:

1. **Recognize** differences between group and team, ensuring team success, and empowering teams.
2. **Define** common team roles, establishing team rules, selecting team members, and making collective decisions
3. **Understand** the benefits of working in teams, fostering Resistance, using team-building activities
4. **Manage** a team diplomatically, and preparing to be a good team leader.
5. **Create** action plans and solving common meeting problems

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO3	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	3	-	-
Total	-	-	-	-	-	-	-	-	3	2	-	3	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code: J41OV</td><td rowspan="2">INTELLECTUAL PROPERTY RIGHTS
(Open Elective - III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives:

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

Module 1:
UNIT - I:
Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Module 2:
UNIT - I:
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter.
UNIT – II: Selecting and evaluating trade mark, trade mark registration processes.

Module 3:
UNIT - I:
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.
UNIT - II
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Module 4:
UNIT - I:
Trade Secrets: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.
UNIT - II:
Unfair competition: Misappropriation right of publicity, false advertising.

Module 5:

UNIT - I:

New development of intellectual property: New developments in trade mark law; copy right law, patent law, intellectual property audits.

UNIT – II:

International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing Company Ltd.
3. Managing Intellectual Property-The Strategic Imperative, Second Edition by Vinod V Sople, PHI.

Reference Books:

1. Intellectual Property –Copyrights, Trademarks and patents by Richard Stim, Cengage Learning.
2. NirajPandey&Khushdeep Dharani –Intellectual Property rights
3. V.K. AHUJA – Law relating to Intellectual Property

E-Resources:

1. www.Ipindia.nic.in
2. www.Iprlwawindia.org
3. www.mondaq.com

Course outcomes:

The students once they complete their academic projects, they get:

1. **Awareness** of the legal environment.
2. **Understanding** of different acts under the national and international laws.
3. **Acquiring** the patent and copyright for their innovative works.
4. **Awareness** of trade secrets and method of advertising.
5. **Knowledge** of plagiarism in their innovations which can be questioned legally.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO3	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	3	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	3	-	-
Total	-	-	-	-	-	-	-	-	3	2	-	3	-	-

OPEN ELECTIVE-4

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J42OA	**AIR POLLUTION & CONTROL** (Open Elective-IV)	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Environmental Science

Course Objectives:
This course will enable students to:
1. Introduce students to basic concepts of pollution.
2. Understand the causes of air pollution.
3. Study about the health related to air pollution.
4. Develop skills relevant to control of air pollution.
5. Understand the quality of air.

Module 1:
Unit-1:
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution- stationary and mobile sources

Module 2:
Unit-1: Effects of Air pollutants on man, material and vegetation; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

Module 3:
Unit-1:
Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_x; NO_x; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality- wind rose diagrams.

Module 4:
Unit-1: Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control.Equipment’s – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

Module 5:
Unit-1: General Methods of Control of NO_x and SO_x emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards.

Text Books:
1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution by Wark and Warner.- Harper & Row, New York

Reference Books:
1. Air pollution and control By K.V.S.G. Murali Krishna, Kaushal Publishers. Kakinada

E-Resources:
1. http://mjcetenvsci.blogspot.in/2013/11/air-pollution-causes-effects-and.html
2. https://www.britannica.com/technology/air-pollution-control
3. http://www.yourarticlelibrary.com/air-pollution/5-effective-methods-to-control-air-pollution-explained-with-diagram/28360/
4. http://www.transportlinks.org/rtkb/english/Module%205%5C5_4a%20Environmental%20Impact%20Assessment.pdf

Course Outcomes:
On completion of the course, the students will be able to:
1. **Acquired** knowledge on the basic elements of causes and occurrence of the air pollution.
2. **Haveawareness** on the different causes of the air pollution.
3. **Haveawareness** about different health related problems caused due to air pollution.
4. **develop** concepts in controlling and prevention of air pollution.
5. **Analyze** air quality.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	-	-	1	2	-	-	-	-	1	-	-
CO2	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO3	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO4	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO5	-	-	-	-	-	1	2	-	-	-	-	1	-	-
Average	0.2	-	-	-	-	1	2	-	-	-	-	1	-	-

<table>
<tr><td>AY 2020-21 Onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J42OB</td><td rowspan="2">DISASTER MANAGEMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Environmental Science

Course Objectives:

This course will enable students to:

1. Provide basic conceptual understanding the difference between the hazard and a disaster.
2. Knowledge about the various disasters and their impacts.
3. Provide basic understanding about the hazard and vulnerability profile of India.
4. Have conceptual understanding about the disaster management phases.
5. Approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, Disasters, disaster prevention and risk reduction.

Module 1:

Unit-1: Understanding Disaster:

Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)

Unit-2: Hazards and Vulnerabilities:

Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

Module 2:

Unit-1: Disaster Management Mechanism:

Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

Module 3:

Unit-1: Capacity Building:

Capacity Building: Concept - Structural and Non-structural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Module 4:

Unit-1: Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

Module 5:

Unit-1: Planning for disaster management:

Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Text Books:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by MrinaliniPandey Wiley 2014. 3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

Reference Books:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

E-Resources:

1. https://nptel.ac.in/courses/105/104/105104183/
2. https://nptel.ac.in/courses/124/107/124107010/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Acquire** knowledge on various types of disasters and hazards
2. **Distinguish** between the hazard and a disaster can be analyzed
3. **Acquire** knowledge on the various approaches of Disaster Risk Reduction (DRR)
4. **Ability** to understand the relationship between vulnerability. disasters, disaster prevention and risk reduction
5. **Develop** ability to respond to different disasters

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO2	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO3	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO4	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO5	3	2	-	-	-	2	2	3	-	-	-	-	-	-
Average	3	2	-	-	-	2	2	3	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J42OC	SPECIAL ELECTRICAL MACHINES (Open Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives:
This course will enable students to:
1. Introduce the concepts of permanent magnets and to study the construction, operation, characteristics & control of PMBLDC motor.
2. Study construction, operation characteristics and control of PMSM.
3. Understand the construction, operation, characteristics, power controllers and control of SRM.
4. Study the operation of stepper motor, its types, control and its applications.
5. Understand the operation & characteristics of other special machines.

MODULE 1: PERMANENT MAGNET BRUSHLESS DC MOTORS
Fundamentals of permanent magnets – types - principle of operation- magnetic circuit analysis - EMF and torque equations, Characteristics and control.

MODULE 2: PERMANENT MAGNET SYNCHRONOUS MOTORS
Principle of operation – EMF and torque equations - Phasor diagram - Power controllers – performance characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor.

MODULE 3: SWITCHED RELUCTANCE MOTORS
Constructional features – Principle of operation - Torque prediction – performance Characteristics-Power controllers – Control of SRM drive - Sensor less operation of SRM – Applications.

MODULE 4: STEPPER MOTORS
Constructional features –Principle of operation –Types – Torque equation – Linear and Nonlinear analysis – Characteristics – Drive circuits – Closed loop control – Applications.

MODULE 5: OTHER SPECIAL ELECTRICAL MACHINES
Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear induction motor – Applications.

TEXT BOOKS:

1. T.J.E. Miller, Brushless magnet and Reluctance motor drives, Claredon press, London, 1989.

2. R.Krishnan, Switched Reluctance motor drives, CRC press, 2001.
3. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, New Delhi, 2000.
4. K. Venkataratnam, Special Electrical Machines, Universities Press, 2014.

REFERENCES:

1. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.
2. R.Krishnan, Electric motor drives, Prentice hall of India, 2002.
3. D.P.Kothari and I.J.Nagrath, Electric machines, Tata McGraw hill publishing company, New Delhi,Third Edition, 2004.
4. Irving L.Kosow, Electric Machinery and Transformers, Pearson Education, Second Edition, 2007.

E-RESOURCES:

1. https://nptel.ac.in/courses/108/102/108102156/
2. https://www.academia.edu/9885014/SPECIAL_ELECTRICAL_MACHINES_NPTEL_NOTES
3. https://easyengineering.net/ee6703-special-electrical-machines/

Course Outcomes:

The students will be able to:

1. **Analyze** given magnetic circuit and understand operation, characteristics and control of PMBLDC motor.
2. **Understand** the construction, operation performance characteristics of PMSM and its power controllers.
3. **Understand** the construction, operation and control of SRM drive and its power controllers.
4. **Understand** the construction, operation, characteristics and control of stepper motor.
5. **Understand** the operation & characteristics of other special electrical machines.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	3	3	3	-	-	-	-	-	-	-	-	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.8	2.2	3	3	-	-	-	-	-	-	-	-	3	3

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J42OD</td><td rowspan="2">ELECTRICAL SAFETY ENGINEERING
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives

The students will

1. To expose the students to electrical hazards.
2. To impart knowledge on prevention of electrical shocks.
3. To create awareness about various first aid methods.
4. To study about Hazardous zones-causes of sparks and flashovers in electrical plants
5. To study about safety management.

MODULE –I: INTRODUCTION

Unit-I: General Background-Objectives of safety and security measures-Hazards associated with electric current and voltage-principles of electrical safety- Approaches to Prevent Accidents.

Unit-II: Fire Prevention and Fire Fighting-Objectives and scope of IE act and IE rules- General requirements for electrical safety as per IE rules.

MODULE –II: ELECTRICAL SHOCKS AND THEIR PREVENTION

Unit-I: Primary and Secondary Electric Shocks- Occurrence of Electric Shock -Shocks Due to Flashovers/Spark-overs- Lightning Strokes on Overhead Transmission Lines and Outdoor Substations.

Unit-II: Safety Precautions in Small LV Installations, Residential Buildings, Shops -Safety Procedures in Electrical Plant Installation and description of Earthing System- Equipment Earthing - Substation Earthing.

MODULE –III: FIRST AID

Unit-I: Introduction- Removal of Contact with Live Conductor- First Principles of Actions after Electric Shock - Artificial Respiration - Schafer's Prone Pressure Method- Silvester's Method- Nielson's Arm-lift Back-pressure Method- Mouth to Mouth Method.

Unit-II: Use of Artificial Resuscitator- External Cardiac Massage- Cardiac Pulmonary Resuscitation-First aid treatment of Heat Exhaustion and heat stroke.

MODULE –IV: ELECTRICAL SAFETY IN HAZARDOUS AREAS

Introduction–Classification of Hazardous zones-causes of sparks and flashovers in electrical plants and machines-functional requirements of electrical equipment and installations for hazardous area/zones-classification of equipment/enclosure for hazardous locations.

MODULE –V: ELECTRICAL SAFETY MANAGEMENT

Introduction-Principles of safety management-management's safety policy-safety organization-organization charts for construction phase of a project, maintenance mode ofa plant and for safety department – safety auditing-training and supervision-annual reports - motivation to managers, supervisors and employees.

TEXT BOOKS:

1. S. Rao and H.L. Saluja, "Electrical Safety, Fire Safety and Safety Management", Khanna Publishers, 2012.
2. W.F. Cooper, "
3. Electrical Safety Engineering", Butterworth and Company, London, 1998.

REFERENCE BOOKS:

1. J. Cadick, D. Neitzel and A. Winfield, "Electrical Safety Hand Book", McGraw Hill Education, 2012.
2. J. Maxwell Adams, "Electrical Safety- A Guide to the Causes and Prevention of Electric Hazards", The Institution of Electric Engineers, 3rd Reprint, 2009.
3. Martha J. Boss and Gayle Nicoll, "Electrical Safety - Systems, Sustainability and Stewardship", CRC Press, 2015.

E-Resources:

1. https://onlinecourses.swayam2.ac.in/nou20_cs08/preview
2. https://npti.gov.in/electrical-safety-industries-and-accidents-prevention
3. https://www.kopykitab.com/Electrical-Safety-Fire-Safety-Engineering-And-Safety-Management-Second-Edition-by-S-Rao-Saluja

Course Outcomes:

The students will be able to:

1. **Learn** about Electrical safety, IE act and IE rules.
2. **Understand** Electrical shocks and their prevention
3. **Acquire** knowledge about various first aid measures.
4. **Familiarize** with electrical safety in hazardous areas.
5. **Get** introduced to safety management.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	3	-	3	3	-	-	2	-	-	-	2	-
CO2	3	-	2	-	3	2	-	-	3	-	-	-	2	-
CO3	3	-	2	-	3	3	-	-	2	-	-	-	3	-
CO4	3	-	2	-	3	2	-	-	2	-	-	-	2	-
CO5	3	-	2	-	3	2	-	-	2	-	-	-	2	-
Average	3	-	2.2	-	3	2.4	-	-	2.2	-	-	-	2.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code: J42OE</td><td rowspan="2">DIGITAL MANUFACTURING
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Drawing, Basics of CAD modelling.

Course Objectives:
This course will enable students to:
1. Understand the need of digital fabrication
2. Understand about Two dimensional layer by layer techniques
3. Know about extrusion based systems, post processing and the software issues involved in digital fabrication
4. Know the applications of digital fabrication

Module - I:
Unit-1: Introduction to additive manufacturing: Introduction to AM, AM evolution, Classification of Additive Manufacturing, Distinction between AM & CNC Machining, Advantages of AM

Module - II:
Unit-1: Two- dimensional layer- by layer techniques: Stereo-lithography (SL), Solid Foil Polymerization (SFP), Selective Laser Sintering (SLS), Selective Powder Building (SPB), Ballistic Particle Manufacturing (PM)

Module - III:
Unit-1: Extrusion based systems: Introduction, basic principles, Fused DepositionModeling, Materials, and Limitations of FDM
Unit-2: Post processing: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements

Module - IV:
Unit-1: Software issues for additive manufacturing: Introduction, Preparation of CAD Models: The STL file, Problems with STL files, STL file manipulation, Beyond the STL file, Additional software to assist AM

Module - V:
Unit-1: AM applications: Applications in design, Applications in Engineering Analysis and Planning
Unit-2: Medical Applications: Customized Implants and Prosthesis, Aerospace applications and Automotive Applications
Unit-3: Other Applications: Jewelry Industry, Coin Industry, Tableware Industry.

TEXT BOOKS:

1. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer 2010.
2. ChuaaChee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2010.

REFERENCES:

1. Ali K.Karmani, EmandAbouel Nasr, "Rapid Prototyping: Theory and Practice", Springer 2006.
2. Andreas Gebhardt, Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Hanser Publishers, 2013.
3. Hopkinson, N.Haque, and Dickens Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Taylor and Francis, 2007.

E- Resources:

1. shorturl.at/qQT07
2. shorturl.at/etyzN
3. shorturl.at/hBOV6

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** the importance of digital fabrication
2. **Identify** different techniques involved in two dimensional layering
3. **Analyze** the software issues involved in digital fabrication and know about extrusion based systems and post processing
4. **Apply** the knowledge gained in the digital fabrication

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	3	3	3	3							3		
CO2	2	2	3	3	3							3		
CO3	2	2	3	3	3							3		
CO4	1	3	3	3	3							3		
CO5	1	2	2	2	2							3		
Average	1.4	2.4	2.8	2.8	2.8							3		

<table>
<tr><td rowspan="1">2020-21</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:
J42OG</td><td rowspan="2">CONSUMER ELECTRONICS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

Course Objectives:

The students will

1. Learn how a Consumer Product is developed
2. Learn how to simulate and test that designs.
3. Learn in-depth study of systems and the use of those.
4. To understand concept of Audio Systems.
5. To implement Television Receivers & Video Systems.

Module 1

UNIT-I

Audio Fundamentals and Devices: Basic characteristics of sound signal: level and loudness, pitch, frequency response, fidelity and linearity, Reverberation. Audio level metering, decibel level in acoustic measurement. Microphone: working principle, sensitivity, nature of response, directional characteristics.

UNIT-II

Types: carbon, condenser, crystal, electrets, tie- clip, wireless. Loud speaker: working principle, characteristic impedance, watt capacity. Types: electrostatic, dynamic, permanent magnet, woofers and tweeters. Sound recording: Optical recording, stereophony and multichannel sound, MP3 standard.

Module 2

UNIT-I

Audio systems: CD player, home theatre sound system, surround sound. Digital console: block diagram, working principle, applications.

UNIT-II

FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T . PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification.

Module 3

UNIT-I

Television Systems: Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal: horizontal and vertical sync details, scanning sequence.

UNIT-II

Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera. Transmission standards: PAL system, channel bandwidth

Module 4

UNIT-I

Television Receivers and Video Systems: PAL-D colour TV receiver, block diagram, Precision IN Line colour picture tube. Digital TVs:- LCD, LED , PLASMA, HDTV, 3-D TV,projection TV, DTH receiver.

UNIT-II

Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface) , Digital Video Interface . CD and DVD player: working principles, Interfaces.

Module 5

UNIT-I

Home / Office Appliances: FAX and Photocopier. Microwave Oven: types, single chip controllers, wiring and safety instructions, technical specifications. Washing Machine: wiring diagram, electronic controller for washing machine, technical specifications, types of washing machine, fuzzy logic.

UNIT-II

Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices - picture processing - picture storage.

Text Books:

1. Consumer Electronics, Bali S.P., Pearson Education India,2010.
2. Audio video systems : principle practices & troubleshooting, Bali R and Bali S.P., Khanna Book Publishing Co. (P) Ltd., 2010Delhi , India.

REFERENCES:

1. Intellectual Property in Consumer Electronics, Software and Technology Startups, Springer Nature; 2014th edition (24 September 2013),ISBN-10:9781461479116.
2. Consumer Electronics, B.R. Gupta , V. Singhal, S.K. Kataria& Sons; 2013th edition

E- Resources:

1. https://www.allaboutcircuits.com/videos/category/consumer-electronics/
2. https://www.youtube.com/watch?v=IttXKAGl6zE

Course Outcomes:

1. **Learn** how a Consumer Product is developed
2. **Analyze** how to simulate and test that designs.
3. **Apply** in-depth study of systems and the use of those.
4. **Understand** concept of Audio Systems.
5. **Develope** Television Receivers & Video Systems.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	2											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**2.5**	**2.67**										

2020-21	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B. Tech: AI&DS**			
Course Code: J42OH	**NANO ELECTRONICS** (Open Elective-IV)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**1**	**0**	**0**

Prerequisites: Basic Electronics

Course Objectives:

The student will

1. Understand the basic concepts of nanotechnology and nano machines.
2. Understand the fundamental logic devices and the need of quantum computing.
3. Mathematically represent the 'quantum tunneling'.
4. Understand the mathematical treatment for the modeling and design of the carbon nanotubes.
5. Study the applications such as MEMS, RAM, Mass Storage devices etc.

Module 1

UNIT-I

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology:Electron microscope

UNIT-II

scanning electron microscope – atomic force microscope –scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation– nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation –plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling –applications of nanomaterials;

Module 2

UNIT-I

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing –

UNIT-II

DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

Module 3

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

Module 4

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

Module 5

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devicesfor washing machine, technical specifications, types of washing machine, fuzzy logic.

Text Books:

1. 'Introduction to Nanoelectronics' by V. V. Mitin, V. Kochelap, Michel A Stroscio. Cambridge, 2007.
2. 'Fundamental of Nanoelectronics' by George W Hanson, Prentice Hall, 2008.

References Books:

1. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard
2. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002.

E - Resources:

1. https://nptel.ac.in/courses/bjy/ab1011/102/111102111/

Course Outcomes:

1. **develop** the basic concepts of Nanotechnology and Nano machines.
2. **apply** fundamentals of logic devices and the need of Quantum computing.
3. **illustrate** the operation of Silicon MOSFETS.
4. **describe** the mathematical treatment for the modeling and design of the carbon nanotubes.

5. **understand** the applications such as MEMS, RAM, Mass Storage devices and gain knowledge on Electrodes and Contacts.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2	2	-	-	-	-	-	-	-	-	1	1.2	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS			
Course Code: J42OI	FUNDAMENTALS OF CLOUD COMPUTING (Open Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:
1. A course on “Computer Networks”.
2. A course on “operating systems”.

Course objectives:
The Student will:
1. Understand the fundamentals of the Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

Module 1:
Cloud Computing **Overview**- Origins of Cloud computing cloud components - Essential characteristics - On-demand self-service Broad network access Location independent resource pooling Rapid elasticity, Measured service.

Module 2:
Cloud scenarios - Benefits: scalability. Simplicity, vendor’ssecurity. Limitations - Sensitive information application development - Security concerns - privacy concern with a third party - security level of third party - security benefitsRegularity issues: Government policies.

Module 3:
Cloud architecture: Cloud delivery model - SPI framework SPI evolution, SPI vs.traditionalITModel and Software as a Service (SaaS):SaaS service providers - Google App Engine, Salesforce. Coin, google plat form - Benefits - operational benefits Economic benefits - Evaluating SaaS Platform as a service (PaaS): PaaS service providers - Right Scale
- Salesforce. Coin, Rackspace- Force .com, Services and Benefits

Module 4:
Infrastructure as a Service (IaaS): IaaS service providers - Amazon EC2, GoGrid Microsoft soft implementation and support - Amazon EC service level agreement - Recentdevelopments - Benefits
Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of cloud computing.

Module 5:
Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration. last deployment, reduce infrastructure cost - limitations
Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization
Desktop virtualization: Software virtualization - Memory virtualization - Storage virtualization - Data virtualization - Network virtualization Micro soft Implementation: Microsoft Hyper V - Vmware features and infrastructure - Virtual Box.

Text Books:

1. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenperer TATA McGraw- Hill, New Delhi – 2010.
2. Cloud Computing: Web-Based Application s That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

Reference Books:

1. Cloud Computing: ArshdeepBahga, Vijay Madisetti, 2014, University Press.
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-and-Paradigms.pdf
3. https://www.alljntuworld.in/download/cloud-computing-cc-materials-notes/
4. https://www.slideshare.net/jeetraj17/cloud-computing-it703-unit-1-5

Course outcomes:
The Student will be able to:

1. **Identify** different elements of cloud computing.
2. **Examine** the essential processes of a Cloud Computing system.
3. **Analyze** the impact of Cloud Computing on organizations and strategy.
4. **Learns** the various marketing strategies for an online business.
5. **Explain** the infrastructure and multimedia concepts

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	1	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	**1.7**	-	-	-	-	-	-	-	**2.0**	**2.0**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code:J42OJ</td><td rowspan="2">INTRODUCTION TO BIG DATA ANALYTICS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Database Management Systems, Cloud Computing.

Course objectives:

The Student will:

1. Understand the basics of Big Data and Big Data Platform
2. Attain the knowledge of Big Data analytics, Approaches and Tools
3. Describe Map Reduce fundamentals and HDFC File system
4. Differentiate between Hadoop and RDBMS concepts
5. Apply analytics on Structured and Unstructured Data.

Module 1:

UNIT-1:

Introduction to Big Data: Types of Digital Data**,** what is big data, History of Data Management; Characteristics of Data, Evolution of Big Data, Structuring Big Data; Elements of Big Data; Challenges with Big Data; Why Big Data; Traditional Business Intelligence (BI) versus Big Data.

UNIT-2:

Introduction to Data Analytics: What Big Data Analytics Isn't? Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why is Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; BASE; Few Top Analytics Tools.

Module 2:

UNIT-1:

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

UNIT-2:

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

Module 3:

UNIT-1:

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop

UNIT-2:

Introduction of HDFS: Architecture, HDFS Files, File system types, commands, org.apache.hadoop.io package, HDFS - High Availability; Introducing HBase, Architecture, Storing Big Data with HBase,interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS

Module 4:

UNIT-1:

Big Data Technology Landscape and Hadoop: NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors;

UNIT-2:

HDFS (Hadoop Distributed File System): HDFS Daemons, read, write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

Module 5:

UNIT-1:

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

UNIT-2:

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools.

Text Books:

1. BIG DATA, Black BookTM, Dreamtech Press, 2015 Edition.
2. BUSINESS ANALYTICS 5e, BY Albright |Winston

Reference Books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence –Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, “Business Intelligence Roadmap”, Addison-Wesley It Service.
3. YuliVasiliev, “Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012.

E - Resources:

1. https://www.coursera.org/learn/big-data-introduction
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. www.upgrad.com/Big-Data
4. https://www.javatpoint.com/what-is-big-data
5. https://www.edx.org/course/big-data-analytics-using-spark

Course outcomes:

The Student will be able to:

1. **Identify** the basics of Big Data and its environment
2. **Use** Big Data Analytics Tools and its Approaches
3. **Define** Map Reduce fundamentals and HDFC Architecture
4. **Distinguish** between Hadoop and RDBMS concepts
5. **Illustrate** analytics on Structured and Unstructured Data.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO3	1	2	2	1	2	-	-	-	-	-	1	-	2	2
CO4	1	-	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	-	1	1	-	-	-	-	-	-	-	-	-	-
Average	**1.0**	**1.5**	**1.3**	**1.0**	**2.5**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**2.0**	**2.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech			
		B. Tech: AI&DS			
Course Code:J42OK	FUNDAMENTALS OF E-COMMERCE (Open Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite:NIL

Course Objectives:

The students will

1. Introduction to information systems for business and management.
2. to familiarize students with organizational and managerial foundations of systems,
3. to understand the technical foundation for understanding information systems.
4. To get Electronic payment systems.
5. To familiarize with cyber laws and cyber money.

Module 1: Introduction to E Commerce

Unit 1:

E-Commerce Definitions, Business models related to E Commerce, Technical and Economical Challenges.

Unit 2:

Actors and stake holders, Fundamental Sales Process and Technological Elements**.**

Module 2: B2C Business

Unit 1:

The Process Model and its variants, Pricing Challenge, Fulfilment challenge, Payment Challenge.

Unit 2:

B2C Business and CRM, B2C Software Systems.

Module 3: B2B Business

The Process Model and its variants, B2B Software Systems.

Module 4: Impact of E-commerce and Security

Unit 1:

Ethics Morale and Technology, Ethical aspects of ICT, Overall impacts of E-Commerce, Foundations of Risk Management.

Unit 2:

Information Security Management(ISM) and Legal aspects of E-Commerce.

Module 5: Electronic Payment

Business and money, the payment challenges, payment procedures and cyber money.

Text Books:

1. Introduction to E-Commerce by Martin Kutz.

Reference Books:

1. Ravi Kalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.

E-Resources:

1. https://nptel.ac.in/courses/110/105/110105083/

Course Outcomes:

The students will be able to

1. **Understand** the basic concepts and technologies used in the field of E-Commerce
2. **Have** the knowledge of the different types of Business Systems.
3. **Understand** the processes involved in E Business Systems.
4. **Be aware** of the ethical, social, and security issues.
5. **Have** knowledge with Cyber laws and EPS.

CO-Articulation Matrix

CO-PO/PSO Mapping Chart

3/2/1 indicates the strength of the calculation

3-Strong, 2-Medium, 1-Low

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	2	1	2	2	-	1	-	-	-	-	-	1	-
CO2	1	1	2	2	2	-	1	-	-	-	-	-	2	-
CO3	1	3	3	3	3	-	2	-	-	-	-	-	2	-
CO4	-	2	2	2	1	-	1	-	-	-	-	-	-	-
CO5	1	2	1	1	1	-	1	-	-	-	-	-	2	-
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:J42OL</td><td rowspan="2">E-WASTE MANAGEMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: NIL

Course Objectives:
The students will
1. Know regarding E-Waste Management in India Global E-Waste Growth
2. Analyze the overview of WEEE.
3. Understanding scenarios for E-Waste management.
4. Visualize the basic concepts of E-Waste Regulation
5. Understand the basic concepts of Recycling technologies.

Module 1:
Unit 1:
Introduction to e-Waste Management in India Global e-waste growth, Dark shadows of digitization on Indian horizon, e-waste generation, migration, Present practice and systems, disposal methods, Present processing practices.
Unit 2:
Initiatives to manage e-waste, Strengths and weaknesses of the current system.

Module 2:
Unit 1:
WEEE (waste electrical and electronic equipment) - toxicity and health Hazardous substances in waste electrical and electronic equipment-toxicity and release.
Unit 2:
Occupational and environmental health perspectives of e-waste recycling.

Module 3:
Unit 1:
Options and Scenarios for e-Waste Management Actions to be considered to achieve goals of ewaste management, Collection/ take back system,
Unit 2:
Closing the Plastic loop: Turning the supply chain into a supply cycle by mining plastics from end-of-life electronics and other durable goods.

Module 4:
Unit 1:
E-waste legislation in the European Union and the Basel Convention. Regulating e-waste: a review of the international and national legal framework on e-waste Extended producer responsibility: a key tool for international rules and regulations on e-waste.

Module 5:

Unit 1:

Recycling technologies for e-waste Recycling of e-scrap in a global environment opportunities and challenges.

Unit 2:

Technologies for recovery of resources from e-waste. Reuse:A Bridge from Unsustainable e-waste to sustainable e-resources.

Text Books:

1. RakeshJohri, E-waste: Implications, regulations, and management in India and current global best practices.
2. Klaus Hieronymi, RamzyKahhat, Eric Williams, E-Waste Management: from Waste to Resource

Reference Books:

1. SatishSinha, PritiMahesh,Waste Electrical and Electronic Equipment The EU and India.
2. By Ronald E. Hester, Roy M. Harrison , Electronic Waste Management.

E-Resources:

1. https://nptel.ac.in/courses/105/105/105105169/

Course Outcomes:

At the end of the course, students will be able to:

1. **Demonstrate** knowledge of E-Waste management.
2. **Implementing** environmental health perspectives of E-Waste recycling.
3. **Achieve** goals of E-Waste management.
4. **Develop** the skills in E-Waste extended producer responsibility.
5. **Describe** the technologies for recovery of resources from E-Waste.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**2**	**1**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	**1**	**1**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	**1**	**3**	**3**	**3**	**3**	-	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	**-**	**2**	**2**	**2**	**1**	-	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	1	**2**	**1**	**1**	**1**	-	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code:J42OM</td><td rowspan="2">INTRODUCTION TO EMBEDDED SYSTEMS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>AY 2020-21 onwards</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basics Computer Knowledge

Course Objectives:
Students will learn to
1. Understand the basic concepts of embedded systems and 8051 microcontrollers.
2. Compare and contrast the basics of assembly programming language.
3. Identify the unique characteristics of real-time systems
4. Analyze the general structure of a real-time system and define the unique design problems and challenges of real-time systems.
5. Acquaint the embedded software development tools and various advanced architectures.

Module 1:
Unit 1: Embedded Computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples
Unit 2 :The 8051 Architecture: Introduction, 8051 micro controller hardware, input/output ports and circuits, external memory, counter and timers, serial data input/output, interrupts.

Module 2:
Unit 1: Basic Assembly Language Programming Concepts: The assembly language programming process, programming tools and techniques, programming the 8051.
Unit 2 : Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions.

Module 3:
Unit 1: Introduction to Real-Time Operating Systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.
Unit 2 :Basic Design Using a Real-Time Operating System: Principles, semaphores and queues, hard real-time scheduling considerations, saving memory and power, an example RTOS like uC-OS (open source).

Module 4:
Unit 1 :Embedded Software Development Tools: Host and target machines, linker/locators for embedded software, getting embedded software into the target system.
Unit 2 :Debugging Techniques: Testing on host machine, using laboratory tools, an example system.

Module 5:

Unit 1: Introduction to advanced Architectures: ARM and SHARC, processor and memory organization and instruction level parallelism.

Unit 2: Networked embedded systems: bus protocols, I2C bus and CAN bus; internet-enabled systems, design example-elevator controller.

Text Books:

1. Wayne Wolf (2008), Computers as Components-principles of embedded computer system design, Elseveir, New Delhi, India.
2. Kenneth J. Ayala (2008), The 8051 Microcontroller, 3rd edition, Cengage Learning, India.

Reference Books:

1. David E. Simon (1999), An Embedded Software Primer, Pearson Education, India.
2. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
3. Raj Kamal (2004), Embedded Systems, Tata McGraw hill, India.

E-Resources:

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://www.edx.org/course/utaustinx/utaustinx-ut-6-02x-embedded-systems-4806

Course Outcomes:

Students will be able to

1. **Program** an embedded system
2. **Analyze** Interfacing with keyboard, A/D & D/A conversions, serial data Communication, LCD and LED display.
3. **Illustrate** Tasks, Semaphores, Message queues, pipes, Timer functions.
4. **Design** embedded systems and real-time systems
5. **Compare** and contrast ARM, SHARC, internet enabled systems.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak													
Course Outcomes (COs)	**Program Outcomes (POs)**											**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**2**	**-**
CO2	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**	**1**
CO3	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**3**	**1**
CO4	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**3**	**1**
CO5	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**2**	**1**
Average	**1.8**	**1.8**	**2**	**-**	**-**	**-**	**-**	**-**	**1.8**	**-**	**2**	**2**	**2.6**	**1**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
AI&DS</td></tr>
<tr><td>Course Code: J42ON</td><td rowspan="2">INTRODUCTION TO NETWORK SECURITY
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
1. Learn about Information security, security attacks, threats, services, and mechanisms and Application of each of confidentiality, integrity, and availability.
2. Know the principles of public key encryption and private key encryption and the algorithms used for both.
3. Master in E-mail security understand the algorithms PGP, MIME and S/MIME
4. Analyze IP Security architecture and understand concepts of SSL (Secure socket layer), TLS (transport layer security) and SET (secure electronic transactions)
5. Become familiar with the basic categories of threats to computers and networks.

Module 1:
Unit 1: Attacks on Computers and Computer Security:
Introduction, The need for security, Security approaches, Principles of security.
Unit 2 Security Cryptography:
Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

Module 2:
Unit 1: Symmetric key Ciphesrs:
Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Crypt Analysis Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption, function, Key distribution.

Unit 2: Asymmetric key Ciphers:
Principles of public key crypto systems, Algorithms (RSA, Diffie- Hellman, ECC), Key Distribution.

Module 3:
Unit 1: Message Authentication Algorithms and Hash Functions:
Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

Module 4:
Unit 1:Data visualisation:
Introduction, Types of data visualisation, Data for visualisation:

Unit 2: Data Types and Methods :
Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

Module 5:
Unit 1:Applications:
Applications of Data Science, Technologies for visualisation, Bokeh (Python), recent trends in various data collection and analysis techniques
Unit 2:Technologies:
Various visualization techniques, application development methods of used in data science.

Text Books:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2013.

Reference Books:

1. Jure Leskovek, AnandRajaraman, Jeffrey Ullman, Mining of Massive Datasets. V2.1, Cambridge University Press, 2014.

Web Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
2. https://www.tutorialspoint.com/information_security_cyber_law/cyber_security_strategies.htm
3. https://www.tutorialspoint.com/information_security_cyber_law/index.htm
4. https://www.tutorialspoint.com/information_security_cyber_law/cyber_law_objectives.htm
5. https://www.tutorialspoint.com/information_security_cyber_law/introduction.htm
6. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
7. https://www.tutorialspoint.com/information_security_cyber_law/policies_to_mitigate_cyber_risk.htm
8. https://www.tutorialspoint.com/information_security_cyber_law/information_technology_act.htm

Course Outcomes:
Students will be able to

1. **Understand** cyber-attacks and types of cybercrimes.
2. **Summarize** Cyber Laws and Cyber Forensics.
3. **Understand** frauds in Wireless era.
4. **Analyze** and evaluate the cyber security needs of an organization.
5. **Outline** Data Privacy and privacy policies.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak													
Course Outcomes (Cos)	**Program Outcomes (Pos)**											**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	2	2	1	-	-	-	-	1		
CO2	-	-	2	-	1	2	-	-	-	-	-	1		
CO3	2	3	1	-	2	1	1	-	-	-	-	-		
CO4	2	2	2	-	-	-	1	-	-	-	-	1		
CO5	-	-	-	-	-	1	2	-	-	-	-	2		
Average	1.2	1.4	1.4	-	1	1.2	1	-	-	-	-	1		

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: AI&DS</td></tr>
<tr><td>Course Code: J42OP</td><td rowspan="2">INTRODUCTION TO MINE ENVIRONMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="6">Pre-requisite: Nil</td></tr>
</table>

Course Objectives:
The students will

1. To introduce about atmospheric, mine air & their limitations
2. To acquaint with spontaneous heating and explosions in coal mines
3. To get idea about sources of dust, and its control in mines
4. To get idea about miners' diseases & lighting in mines
5. To know about reclamation of mines, impact of mining on environment & sustainable mining

Module 1
Unit - 1: Atmosphere and mine air composition. Origin of gases, properties, limitations of gases in underground mines

Module 2
Unit - 1: Spontaneous Combustion: Factors, control measures.
Unit - 2: Explosions: Causes of firedamp explosion, preventive measures against firedamp explosion.

Module 3
Unit - 1: Dust: Sources in underground and opencast mines, standards and control measures.

Module 4
Unit - 1: Miners diseases, Lighting standards in underground and opencast mines**.**

Module 5
Unit - 1: Reclamation, plantation of surface mines, Impact of mining on environment & sustainable mining.

Textbooks:
1. Elements of Mining Technology (VOL-2) – by D.J. Deshmukh.
2. Surface Mining – by S.K. Das.

Reference Books:
1. Mine Ventilation – by G.B. Mishra.

E-Resources:
1. https://www.ltu.se/cms_fs/1.124549!/file/rapport%20Environmental%20Aspects%20

of%20mining_low.pdf
2. https://pubs.usgs.gov/pp/1802/b/pp1802b.pdf
3. https://www.elaw.org/files/mining-eia-guidebook/Chapter1.pdf

Course Outcomes:

The student will be able to:

1. **Learn** about atmospheric and mine air
2. **Learn** about spontaneous combustion and explosion in coal mines
3. **Understand** about dust sources and its control in mines
4. **Learn** about miners' diseases, mine lighting and its standards
5. **Learn** about reclamation of mines, impacts of mining on environment and sustainable mining

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-