ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

B. TECH FOUR YEAR UG COURSE

(Applicable for the batches admitted from 2021-2022)

REGULATION: R20
(I, II, III & IV Year Syllabus)

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC AUTONOMOUS)
Bhaskar Nagar, Yenkapally (V), Moinabad (M), Hyderabad – 500075,
Telangana, India

INSTITUTE-VISION AND MISSION

VISION:

To be a Centre of Excellence in Engineering and Management Education, Research and Application of Knowledge to benefit Society with blend of Ethical Values and Global Perception.

MISSION:

M1: To provide world class engineering education, encourage research and development.

M2: To evolve innovative applications of technology and develop entrepreneurship.

M3: To mould the students into socially responsible and capable leaders.

DEPARTMENT-VISION AND MISSION

VISION:

To become a Centre of Excellence in AI&ML, shaping professionals obliging to the research and proficient needs of national and international organizations and to bring up innovative ideas to solve real time problems through continuous research, innovation, and industry steered curriculum.

MISSION:

M1: To transform the students into technologically proficient and help them to absorb the innovative spirit.

M2: To impart premier quality, skill-based and value-based education to the students in the field of Artificial Intelligence and Machine Learning.

M3: To identify corporate requirements and enrich the students' expertise with a strong theoretical and practical backdrop having an emphasis on hardware and software development with social ethics.

Program Educational Objectives (PEOs)

PEO1

To Formulate, analyse and solve Engineering problems with strong foundation in Mathematical, Scientific, Engineering fundamentals and modern AI&ML practices through advanced curriculum.

PEO2

Analyze the requirements, realize the technical specification and design the Engineering solutions by applying artificial intelligence and machine learning theory and principles.

PEO3

Demonstrate technical skills, competency in AI&ML and promote collaborative learning and team work spirit through multi-disciplinary projects and diverse professional activities along with imbibing soft skills and ethics.

Program Outcomes and Program Specific Outcomes of AI&ML Department (POs & PSOs)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long Learning: Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change. Any signatory needs to provide an overview of its learning outcomes and confirm that compliance of programs.

PSO1

The ability to understand, analyse and demonstrate the knowledge of human cognition, Artificial Intelligence, Machine Learning and data science in terms of real world problems to meet the challenges of the future.

PSO2

The ability to develop computational knowledge and project development skills using innovative tools and techniques to solve problems in the areas related to Deep Learning, Machine learning, Artificial Intelligence.

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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 ≥ 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 1^{st} semester onwards up to and inclusive of the 8^{th} 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.	

JBIET-R20	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-AI & ML
B. Tech Course Structure		

I Year I Semester									
S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)
1	J110A	Differential Equations and Calculus	3	1	0	0	4	BS	y
2	J110B	English	3	0	0	0	3	HS	y
3	J110D	Semiconductor Physics	3	0	0	0	3	BS	y
4	J115A	Programming for Problem Solving	3	0	0	0	3	ES	y
5	J1101	English Language and Communication skills Lab	0	0	2	0	1	HS	y
6	J1104	Physics Lab	0	0	2	0	1	BS	y
7	J1151	Programming for Problem Solving Lab	0	0	4	0	2	ES	y
8		Induction Program	0	0	0	0	0		y
		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)
1	J120A	Linear Algebra and Advanced Calculus	3	1	0	0	4	BS	y
2	J1231	Engineering Drawing	0	0	0	6	3	ES	y
3	J120D	Engineering Chemistry	3	0	0	0	3	BS	y
4	J122A	Basic Electrical Engineering	3	0	0	0	3	ES	y
5	J124A	Basic Electronics Engineering	3	0	0	0	3	ES	y
6	J1201	Chemistry Lab	0	0	2	0	1	BS	y
7	J1221	Basic Electrical Engineering Lab	0	0	2	0	1	ES	y

8	J1241	Basic Electronics Engineering Lab	0	0	2	0	1	ES	y
9	J1292	Engineering and IT Workshop Lab	0	0	4	0	2	ES	y
10	J12M1	Environmental Science	2	0	0	0	0	MC	y
		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)
1	J210B	Probability and Statistics	3	1	0	0	4	BS	y
2	J215A	Data Structures	3	0	0	0	3	PC	N
3	J216A	Database Management Systems	3	0	0	0	3	PC	N
4	J210A	Mathematics for Machine Learning & Data Science	3	0	0	0	3	BS	N
5	J215D	Python Programming	3	0	0	0	3	PC	N
6	J21M1	Gender Sensitization	2	0	0	0	0	MC	Y
7	J2151	Data Structures Lab	0	0	2	0	1	PC	N
8	J2161	Database Management Systems Lab	0	0	3	0	1.5	PC	N
9	J2154	Python programming Lab	0	0	3	0	1.5	PC	N
10	J21A1	Internship – I	0	0	2	0	1	PW	
		Total	**17**	**1**	**10**	**0**	**21**		

JBIET-R20	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-AI & ML
B. Tech Course Structure		

II Year II Semester									
S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)
1	J225B	Operating Systems	3	0	0	0	3	PC	N
2	J22AA	Artificial Intelligence & its applications	3	0	0	0	3	PC	N
3	J224G	Digital Image Processing	3	1	0	0	4	ES	N
4	J22DC	Introduction to Data science	2	0	0	0	2	PC	N
5	J225J	Object Oriented Programming Through Java	3	0	0	0	3	PC	N
6	J22AB	Machine Learning	3	0	0	0	3	PC	N
7	J22M1	Professional Ethics	2	0	0	0	0	MC	N
8	J2201	Soft Skills	2	0	0	0	0	AC	N
9	J22A1	Machine Learning Lab	0	0	3	0	1.5	PC	N
10	J2253	Object Oriented Programming Through Java Lab	0	0	3	0	1.5	PC	N
		Total	**21**	**1**	**6**	0	**21**		

JBIET-R20	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-AI & ML
B. Tech Course Structure		

III Year I Semester									
S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)
1	J31EA	Managerial Economics and Management Science	3	1	0	0	4	HS	N
2	J315D	Design and Analysis of Algorithms	3	1	0	0	4	PC	N
3	J315E	Information Security	3	0	0	0	3	PC	N
4	J31AA	Deep Learning	3	0	0	0	3	PC	N
5	BTAIMO1	Open Elective – I	3	0	0	0	3	OE	N
6	J31M2	Computer Vision	2	0	0	0	0	MC	N
7	J3101	Employability Skills	2	0	0	0	0	AC	Y
8	J31A1	Deep Learning Lab	0	0	4	0	2	PC	N
9	J31D2	Data Science Through Python Lab	0	0	2	0	1	PC	N
10	J31A2	Internship – II	0	0	2	0	1	PW	N
		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)**
1	J325L	Cloud Computing	3	0	0	0	3	PC	N
2	J326J	Automata and Compiler Design	3	0	0	0	3	PC	N
3	J326C	Software Engineering	3	0	0	0	3	PC	N
4	BTAIME1	Professional Elective – I	3	0	0	0	3	PE	N
5	BTAIME2	Professional Elective - II	3	0	0	0	3	PE	N
6	BTAIMO2	Open Elective – II	3	0	0	0	3	OE	N
7	J32M2	Cyber Security	2	0	0	0	0	MC	N
8	J3261	Software Engineering lab	0	0	2	0	1	PC	N
9	J3201	Life Skills and Professional Skills Lab	0	0	4	0	2	HS	Y
		Total	**20**	**0**	**6**	**0**	**21**		

JBIET-R20	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-AI & ML
B. Tech Course Structure		

IV Year I Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)
1	J41AA	Reinforcement Learning	3	0	0	0	3	PC	N
2	BTAIME3	Professional Elective - III	3	0	0	0	3	PE	N
3	BTAIME4	Professional Elective - IV	3	0	0	0	3	PE	N
4	BTAIME5	Professional Elective - V	3	0	0	0	3	PE	N
5	BTAIMO3	Open Elective – III	3	0	0	0	3	OE	N
6	J41A1	Reinforcement Learning Lab	0	0	4	0	2	PC	N
7	J4154	Information Security Lab	0	0	4	0	2	PC	N
8	J41A2	Industry Oriented Mini Project	0	0	4	0	2	PW	N
9	J41A3	Project Stage – I	0	0	6	0	3	PW	N
		Total	**15**	**0**	**18**	**0**	**24**		

IV Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)
1	BTAIME6	Professional Elective - VI	3	0	0	0	3	PE	N
2	BTAIMO4	Open Elective – IV	3	0	0	0	3	OE	N
3	J42A2	Project Stage – II	0	0	14	0	7	PW	N
4	J42A1	Seminar	0	0	2	0	1	PW	N
		Total	**6**	**0**	**16**	**0**	**14**		

Professional Elective-I (III / II)									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Category**	**common Subject (Y/N)**
1	J32D1	NoSQL Data Base	3	0	0	0	3	PE	N
2	J325K	**Web Services**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**
3	J325M	Design Thinking	3	0	0	0	3	PE	N

Professional Elective-II (III / II)									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Category**	**common Subject (Y/N)**
1	J32D3	Information Retrieval Systems	3	0	0	0	3	PE	N
2	J325E	Mobile Computing	3	0	0	0	3	PE	N
3	J32D2	**Software Architecture and Design Pattern**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**

Professional Elective-III (IV / I)									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Category**	**common Subject (Y/N)**
1	J41DA	Big Data Analytics	3	0	0	0	3	PE	N
2	J415N	Android Application Development	3	0	0	0	3	PE	N
3	J32AB	**UI/UX Design**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**

Professional Elective-IV (IV / I)									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Category**	**common Subject (Y/N)**
1	J41AC	**Predictive Analytics**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**
2	J417E	Internet of Things	3	0	0	0	3	PE	N
3	J41AD	**Agile Methodologies**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**

Professional Elective-V (IV-I)									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Category**	**common Subject (Y/N)**
1	J41DB	AI for Business	3	0	0	0	3	PE	N
2	J41AE	**Intelligent Robotics**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**
3	J415H	Database Security	3	0	0	0	3	PE	N

Professional Elective-VI (IV / II)									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Category**	**common Subject (Y/N)**
1	J41AF	**Generative Adversarial Networks**	**3**	**0**	**0**	**0**	**3**	**PE**	**N**
2	J426E	Quantum Computing	3	0	0	0	3	PE	N
3	J426D	Block Chain Technology	3	0	0	0	3	PE	N

R20 - Open Elective-I to V (Offered by AI&ML)								
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**D**	**Credits**	**Year / Sem**
1.	**J31OW**	**Introduction to Machine Learning**	**3**				**3**	**III-I**
2.	**J32OW**	**Introduction to Predictive Analytics**	**3**				**3**	**III-II**
3.	**J41OW**	**Introduction to Neural Networks**	**3**				**3**	**IV-I**
4.	**J42OQ**	**Introduction to Deep Learning**	**3**				**3**	**IV-II**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J110A	DIFFERENTIAL EQUATIONS AND CALCULUS (COMMON TO CE, EEE, ME, ECE, AI & ML, IT, ECM& MIE)	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:
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:
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:
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.
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:
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, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11th Reprint, 2010.

E - Resources:

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J110B	ENGLISH (Common to CE, ME, MIE& EEE)	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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J110D	SEMICONDUCTOR PHYSICS (Common to EEE, ECE, AI & ML, IT & ECM)	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=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidO0.
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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J115A	PROGRAMMING FOR PROBLEM SOLVING (Common to ECE, AI & ML, IT & ECM)	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'sOutline 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. Construct Code and test a given logic in C programming language.
3. Categorize a problem into functions and to develop modular reusable code.
4. Investigate arrays, pointers, strings, and structures to write C Programs.
5. Apply searching and sorting algorithms.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J1101	ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB (COMMON TO CE, ME, MIE & EEE)	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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J1104	PHYSICS LAB (COMMON TOEEE, ECE, AI & ML, IT & ECM)	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.

5. **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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – I Sem			
Course Code: J1151	PROGRAMMING FOR PROBLEM SOLVING LAB (common to ECE, AI & ML, IT & ECM)	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. Implement the algorithms for simple problems.
2. Investigate syntax errors as reported by the compilers.
3. Implement data with arrays, strings, and structures.
4. Plan the use of pointers of different function types.
5. Create, read, and write to and from simple text and binary files.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J120A	LINEAR ALGEBRA AND ADVANCED CALCULUS (Common to CE, EEE, ME, ECE, AI & ML, IT, ECM & MIE)	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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&ML I Year – II Sem			
Course Code: J1231	ENGINEERING DRAWING (Common to ECE, AI & ML, IT, ECM)	L	T	P	D
Credits: 3		0	0	0	6

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:

The 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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J120D	ENGINEERING CHEMISTRY (COMMON TO EEE, ECE, AI & ML, IT & ECM)	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:

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:

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

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.
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:
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 KMnO4 and chromic acid. Reduction reactions: reduction of carbonyl compounds using LiAlH4& NaBH4.
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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J122A	BASIC ELECTRICAL ENGINEERING (COMMON TO CE, ME, AI & ML, IT & MIE)	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 analyse 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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J124A	BASIC ELECTRONICS ENGINEERING (COMMON TO ECE, ECM, EEE)	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. C.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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J1201	CHEMISTRY LAB (Common to All Branches)	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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J1221	BASIC ELECTRICAL ENGINEERING LAB (COMMON TO CE, ME, AI & ML, IT & MIE)	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Nil

Course objectives:
The Student will:

1. Analyse 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. Analyse 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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J1241	BASIC ELECTRONICS ENGINEERING LAB (COMMON FOR AI & ML, ECE, EEE, ECM)	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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML I Year – II Sem			
Course Code: J1292	ENGINEERING AND IT WORKSHOP LAB (COMMON TO EEE, AI & ML & IT)	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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML I Year – II Sem			
Course Code: J12M1	ENVIRONMENTAL SCIENCES (Common to AI & ML,ECE,ECM,EEE&IT)	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&Anubhakaushik

Reference Books:

1. Tata McgrawHill : Introduction to Environmental Studies by Benny Joseph
2. Environmental Studies by ErachBharucha 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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – I Sem			
Course Code: J210B	PROBABILITY AND STATISTICS (Common to AI & ML & IT)	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:

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:

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

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

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:

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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML II Year – I Sem			
Course Code: J215A	DATA STRUCTURES (Common to AI&ML, CSE, IT, AI&DS)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Programming for Problem Solving

Course objectives:
The students 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 hashing and pattern matching algorithms.

Module 1:
Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circular linked list implementation, Doubly linked list.

Basic concepts - Algorithm Specification, Performance analysis - time complexity and space complexity, Asymptotic Notation - Big O, Omega and Theta notations, Introduction to Linear and Non-Linear data structures. implementation, insertion, deletion and searching operations. Applications of linked lists.

Module 2:
Queues-operations, array and linked representations. Circular Queue operations, Dequeue, applications of queue.
Stacks-Operations, array and linked representations of stacks, stack applications-infix to postfix conversion, postfix expression evaluation, recursion implementation.

Module 3:
Search Trees-Binary Search tree, Tree traversals, AVL tree – operations, B-tree – operations, B+ trees, Red Black tree.

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, Heap Sort.

Module 4:
Graphs-Terminology, sequential and linked representation, graph traversals: Depth First Search & Breadth First Search implementation. Spanning trees, Minimum spanning tree , 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

References:

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. www.tutorialpoint.com
2. www.greekforgreeks.com
3. https://www.javatpoint.com

Course outcomes:

The student will be able to:

1. Investigate operations like searching, insertion, deletion, traversing mechanism using linked list.
2. Implement linear and non-linear data structures like stacks, queues etc.
3. Design different types of tree data structures.
4. Analyse the concepts of graph data structures.
5. Apply the hashing and pattern matching techniques.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – I Sem			
Course Code: J216A	DATABASE MANAGEMENT SYSTEMS (Common to AI&ML, CSE, IT, AI&DS)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

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,**ElmasriNavrate 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. Identify the basic concepts of database system.
2. Design a data model and schemas in RDBMS.
3. Implement RDBMS for developing industry applications.
4. Investigate the use of structured query language SQL.
5. Analyze functional dependencies for designing a robust database.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML II Year – I Sem			
Course Code: J210A	MATHEMATICS FOR MACHINE LEARNING & DATA SCIENCE	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites : Nil

Course Objectives:.

The Student will:

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-I:Linear Algebra:

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

MODULE-II: Analytic Geometry

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

MODULE–III : Matrix Decomposition

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

MODULE–IV :Linear Regression

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

MODULE-V: 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,MarcPeterDeisenroth ,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, Narosa PublicationsG. 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. Solve matrix operations by using matrix decomposition
3. Solve matrix operation in easier way
4. Predict the relationship between two variables
5. Apply optimization techniques in problems of Engineering and Technology.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – I Sem			
Course Code: J215D	PYTHON PROGRAMMING (Common to AI&ML, CSE, IT, AI&DS)	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. Identify the 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. Investigate how to achieve reusability using inheritance, interfaces and packages.
5. Assess how to read and write files in Python and evaluate different database operations.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech AI & ML II Year – I Sem			
Course Code: J21M1	GENDER SENSITIZATION (Common to AI & ML, IT, ECE, & ECM)	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. Investigate the importance of gender equality in contemporary India.
2. Prioritize the basic dimensions of the sensitization using 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. Compose a finer grasp of how gender discrimination works in our society and how to counter it.
4. Justify the insights into the gendered division of labour and its relation to politics and economics.
5. Recommend the Men and women students and professionals to be equipped to work and live together as equals

Y 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI& ML II Year – I Sem			
Course Code: J2151	DATA STRUCTURES LAB (Common to AI&ML, AI&DS, CSE, IT)	L	T	P	D
Credits: 1		0	0	2	0

Pre-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. Investigate operations like searching, insertion, deletion, traversing mechanism using linked list.
2. Implement linear and non-linear data structures like stacks, queues etc.
3. Design different types of tree data structures.
4. Analyse the concepts of graph data structures.
5. Apply the hashing and pattern matching techniques.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – I Sem			
Course Code: J2161	DATABASE MANAGEMENT SYSTEMS LAB (Common to AI & ML, AI&DS, CSE & IT)	L	T	P	D
Credits: 1.5		0	0	3	0

Pre-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 techniques relating to concurrency and recovery in multi-user database environments.

This lab enables the **Student** to practice the concepts learnt in the subject DBMS by developing a database for an example company named "Roadway Travels" whose description is as follows. The student is expected to practice the designing, developing and querying a database in the context of example database "Roadway travels". **Student** are expected to use "Oracle" database. Roadway Travels "Roadway Travels" is in business since 1997 with several buses connecting different places in India. Its main office is located in Hyderabad.

The company wants to computerize its operations in the following areas:

- Reservations and Ticketing
- Cancellations Reservations & Cancellation: Reservations are directly handled by booking office. Reservations can be made 30 days in advance and tickets issued to passenger. One Passenger/person can book many tickets (to his/her family). Cancellations are also directly handed at the booking office. In the process of computerization of Roadway Travels you have to design and develop a Database which consists the data of Buses, Passengers, Tickets, and Reservation and cancellation details. You should also develop query's using SQL to retrieve the data from the database.

The above process involves many steps like

1. Analyzing the problem and identifying the Entities and Relationships
2. E-R Model
3. Relational Model
4. Normalization
5. Creating the database
6. Querying. **Student** are supposed to work on these steps week wise and finally create a complete "Database System" to Roadway Travels.

Examples are given at every experiment for guidance to **Student**.

Experiment – 1.

E-R Model

Analyze the problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc.

Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any

Example: Entities:

1. BUS
2. Ticket
3. Passenger

Relationships:

1. Reservation
2. Cancellation

PRIMARY KEY ATTRIBUTES:

1. Ticket ID (Ticket Entity)
2. Passport ID (Passenger Entity)
3. Bus_NO(Bus Entity)

Apart from the above mentioned entities you can identify more. The above mentioned are few.

Note:

The student is required to submit a document by writing the Entities and Keys to the lab teacher.

Experiment – 2.

Concept design with E-R Model

Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). Indicate the type of relationships (total / partial). Try to incorporate generalization, aggregation, specialization etc wherever required.

This lab enables the **Student** to practice the concepts learnt in the subject DBMS by developing a database for an example company named "Roadway Travels" whose description is as follows. The student is expected to practice the designing, developing and querying a database in the context of example database "Roadway travels". **Student** are expected to use "Oracle" database. Roadway Travels "Roadway Travels" is in business since 1997 with several buses connecting different places in India. Its main office is located in Hyderabad.

The company wants to computerize its operations in the following areas:

- Reservations and Ticketing
- Cancellations Reservations & Cancellation: Reservations are directly handled by booking office. Reservations can be made 30 days in advance and tickets issued to passenger. One Passenger/person can book many tickets (to his/her family). Cancellations are also directly handed at the booking office. In the process of computerization of Roadway Travels you have to design and develop a Database which consists the data of Buses, Passengers, Tickets, and Reservation and cancellation details. You should also develop query's using SQL to retrieve the data from the database.

The above process involves many steps like

7. Analyzing the problem and identifying the Entities and Relationships
8. E-R Model
9. Relational Model
10. Normalization
11. Creating the database
12. Querying. **Student** are supposed to work on these steps week wise and finally create a complete "Database System" to Roadway Travels.

Examples are given at every experiment for guidance to **Student**.

Experiment – 1.

E-R Model

Analyze the problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc.

Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any

Example: Entities:

1. BUS
2. Ticket
3. Passenger

Relationships:

1. Reservation
2. Cancellation

PRIMARY KEY ATTRIBUTES:

1. Ticket ID (Ticket Entity)
2. Passport ID (Passenger Entity)
3. Bus_NO(Bus Entity)

Apart from the above mentioned entities you can identify more. The above mentioned are few.

Note:

The student is required to submit a document by writing the Entities and Keys to the lab teacher.

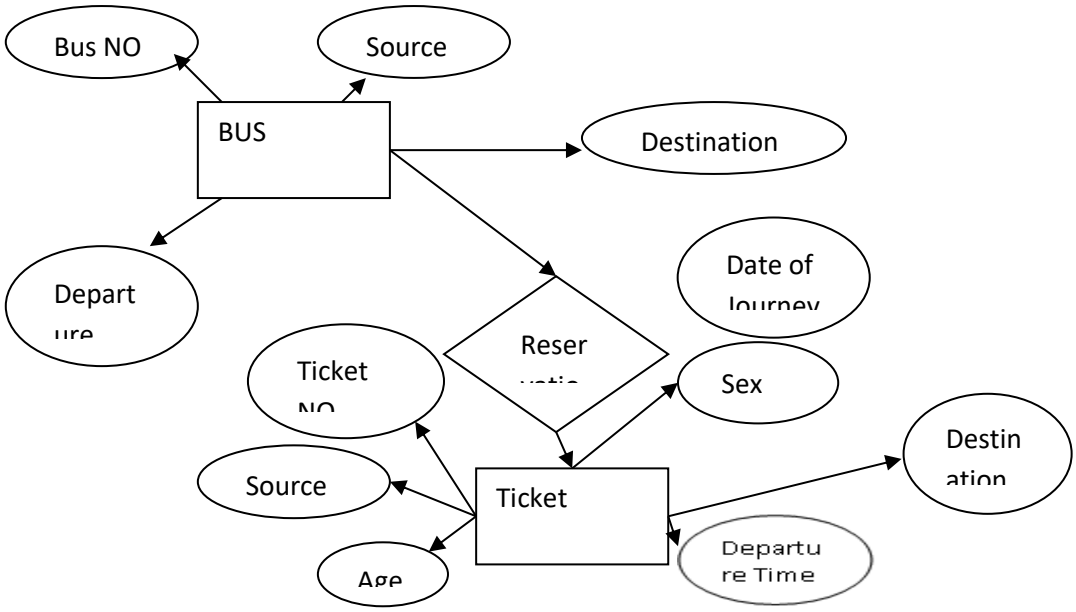
Experiment – 2.

Concept design with E-R Model

Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). Indicate the type of relationships (total / partial). Try to incorporate generalization, aggregation, specialization etc wherever required.

Example:

E-R diagram for bus



Note: The student is required to submit a document by drawing the E-R Diagram to the lab teacher.

Experiment – 3.

Relational Model

Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion. There are different ways of representing relationships as tables based on the cardinality. Represent attributes as columns in tables or as tables based on the requirement. Different types of attributes (Composite, Multi-valued, and Derived) have different way of representation.

Example:

The passenger tables look as below. This is an example. You can add more attributes based on your E-R model. This is not a normalized table.

Passenger

Name	Age	Sex	Address	Passport ID
				Ticket_id

Note:

The student is required to submit a document by Represent relationships in a tabular fashion to the lab teacher.

Experiment – 4.

Normalization

Database normalization is a technique for designing relational database tables to minimize duplication of information and, in so doing, to safeguard the database against certain types of logical or structural problems, namely data anomalies. For example, when multiple instances of a given piece of information occur in a table, the possibility exists that these instances will not be kept consistent when the data within the table is updated, leading to a loss of data integrity. A table that is sufficiently normalized is less vulnerable to problems of this kind, because its structure reflects the basic assumptions for when multiple instances of the same information should be represented by a single instance only.

For the above table in the First normalization we can remove the multi valued attribute Ticket_id and place it in another table along with the primary key of passenger.

First Normal Form: The above table can be divided into two tables as shown below.

Passenger

Name	Age	Sex	Address	Passport ID

Passport ID	Ticket_id

You can do the second and third normal forms if required. Any how Normalized tables are given at the end.

Experiment - 5.

Installation of Mysql and Practicing DDL and DML commands

Installation of MySql. In this week you will learn Creating databases, How to create tables, altering the database, dropping tables and databases if not required. You will also try truncate, rename commands etc.

Example for creation of a normalized “Passenger” table.

```
CREATE TABLE Passenger (Passport_id     INTEGER   PRIMARY KEY,
   Name  VARCHAR (50) Not NULL,
   Age     Integer Not NULL,
   Sex     Char,
   Address VARCHAR (50) Not NULL);
```

Similarly create all other tables.

Note: Detailed creation of tables is given at the end.

Insert data into the above tables.

DML commands are used to for managing data within schema objects. Some examples:

- SELECT - retrieve data from the a database
- INSERT - insert data into a table
- UPDATE - updates existing data within a table
- DELETE - deletes all records from a table, the space for the records remain

Inserting values into “Bus” table

```
Insert into Bus values (1234,’hyderabad’, ‘tirupathi’);
Insert into Bus values (2345,’hyderabd’,’Banglore’);
Insert into Bus values (23,’hyderabd’,’Kolkata’);
Insert into Bus values (45,’Tirupathi,’Banglore’);
Insert into Bus values (34,’hyderabd’,’Chennai’);
```

Inserting values into “Passenger” table:

```
Insert into Passenger values (1, 45,’ramesh’, 45,’M’,’abc123’);
Insert into Passenger values (2, 78,’geetha’, 36,’F’,’abc124’);
Insert into Passenger values (45, 90,’ram’, 30,’M’,’abc12’);
Insert into Passenger values (67, 89,’ravi’, 50,’M’,’abc14’);
Insert into Passenger values (56, 22,’seetha’, 32,’F’,’abc55’);
```

Few more Examples of DML commands

Select * from Bus; (selects all the attributes and display)

UPDATE BUS SET Bus No = 1WHERE BUS NO=2;

Experiment 6. Querying

In this week you are going to practice queries (along with sub queries) using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.

Practice the following Queries:

1. Display unique PNR_no of all passengers.
2. Display all the names of male passengers.
3. Display the ticket numbers and names of all the passengers.
4. Find the ticket numbers of the passengers whose name start with 'r' and ends with 'h'.
5. Find the names of passengers whose age is between 30 and 45.
6. Display all the passengers names beginning with 'A'
7. Display the sorted list of passengers names

Experiment – 7.Querying (continued...)

You are going to practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN),

GROUP BY, HAVING and Creation and dropping of Views.

1. Write a Query to display the Information present in the Passenger and cancellation tables. **Hint:** Use UNION Operator.
2. Display the number of days in a week on which the 9W01 bus is available.
3. Find number of tickets booked for each PNR_no using GROUP BY CLAUSE. **Hint:** Use GROUP BY on PNR_No.
4. Find the distinct PNR numbers that are present.
5. Find the number of tickets booked by a passenger where the number of seats is greater than 1.
   Hint: Use GROUP BY, WHERE and HAVING CLAUSES.
6. Find the total number of cancelled seats.
7. Display the details of passengers who travelled within the last 3 months.
8. Create a view for the details of passengers who cancelled their tickets.

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

In this session you are going to learn Creation of stored procedure, Execution of procedure and modification of procedure. Practice procedures using the above database.

Eg: CREATE PROCEDURE myProc()

BEGIN

SELECT COUNT(Tickets) FROM Ticket WHERE age>=40;

End;

Course outcomes:

The student will be able to:

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – I Sem			
Course Code: J2154	PYTHON PROGRAMMING LAB (Common to AI & ML, AI&DS, CSE & IT)	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. Categorize Class and objects.
5. Implement the various File handling operations.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: J225B	OPERATING SYSTEMS (Common to AI & ML, AI&DS, CSE & IT)	L	T	P	D
Credits: 3		3	0	0	0

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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: J22AA	ARTIFICIAL INTELLIGENCE & ITS APPLICATIONS	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisites:

1. A solid understanding of mathematics, including calculus, linear algebra, probability, and statistics.
2. Basic programming skills in at least one language, such as Python, Java, or C++.
3. Familiarity with Data structures and algorithms.

Course Objectives:

1. To introduce students to the fundamental concepts of Artificial Intelligence (AI) and its applications in various domains, including business.
2. To provide students with a comprehensive understanding of AI problem-solving techniques, search algorithms, and knowledge representation and reasoning.
3. To help students gain knowledge and experience in developing AI systems that can solve problems efficiently and effectively.
4. To expose students to advanced topics in AI, including reasoning under uncertainty, learning, and expert systems.
5. To equip students with the knowledge and skills needed to design and implement AI-based solutions for real-world problems, including those related to fraud detection, customer relationship management, supply chain optimization, and human resource management.

Module 1:

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening),Heuristic Search(Hill Climbing, Generic Best-First, A*),Constraint Satisfaction (Backtracking, Local Search)

Module 2:

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

Module 3:

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes.

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

Module 4:

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving. Learning from Examples, Winston's Learning Program, Decision Trees.

Expert Systems: Representing and Using Domain Knowledge. Shell, Explanation, Knowledge Acquisition.

Module 5:

Introduction to AI in Business and its impact: Common business applications of AI- Chatbots, including their definition, applications, and design and implementation- Personalized Recommendations, including their definition, applications, and design and implementation

Fraud Detection: Definition, Applications, and Design and Implementation of Fraud Detection Systems Other Applications of AI in Business:- Predictive Analytics- Supply Chain Optimization- Customer Relationship Management- Human Resource Management- Ethical Considerations in AI Applications in Business: Bias in AI Applications- Data Privacy Concerns- Responsibility and Accountability.

Text Books:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall,2010

Reference Books:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, The McGraw Hill publications, Third Edition,2009.

2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 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:

1. Students will be able to identify different AI problems and apply various search algorithms to solve them.
2. Students will be able to construct and analyze search trees, apply A* search implementation and minimax search, and perform alpha-beta pruning.
3. Students will be able to represent knowledge using propositional logic and first-order logic and apply forward and backward chaining techniques to reason with that knowledge.
4. Students will be able to represent and reason with uncertain knowledge using basic probability and Bayesian Networks.
5. Students will be able to design and implement AI systems for solving real-world problems related to fraud detection, customer relationship management, supply chain optimization, and human resource management.
6. Students will be able to understand and evaluate the ethical considerations related to AI applications, including bias in AI applications, data privacy concerns, and responsibility and accountability.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&ML II Year / II Sem			
Course Code: J224G	DIGITAL IMAGE PROCESSING	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites: NIL

Course Objectives:

The student will

1. Understand fundamental concepts of digital image processing.
2. Analyze images infrequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image Restoration.
4. Learn the fundamental DIP algorithms and implementation.
5. Gain experience in applying image processing algorithms to real problems.

Module-I DIGITAL IMAGE FUNDAMENTALS:

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, Linear and Nonlinear Operations.

Module-II 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-III 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-IV 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-V Colour 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.

TEXTBOOKS:

1. "Digital Image Processing", Rafael C.Gonzalez,RichardE.Woods,etal,TMH,2ndEdition.

REFERENCEBOOKS:

1. "FundamentalsofDigitalImageProcessing",AnilK.Jain,PearsonEducation, 2001.
2. "Digital Image Processing and Analysis",B.Chandaand D.DuttaMajumdar,PHI,2003.

Course Outcomes:

The Student will be able to:

1. Identify 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. Assess 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 & ML II Year – II Sem			
Course Code: J22DC	INTRODUCTION TO DATA SCIENCE	L	T	P	D
Credits: 2		2	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

UNIT-I - Introduction to Data Science

Introduction to core concepts and technologies: Introduction, Terminology,
Data science Process, data science toolkit, Types of data, Example applications

UNIT-II - Data collection and management:

Introduction, Sources of data, Data collection and APIs, Exploring and fixing data.
Data storage and management, using multiple data sources

UNIT-III - 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.

UNIT-IV - Data visualization:

Introduction, Types of data visualization, Data for visualization:
Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

UNIT-V - 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:

The student will be able to

- Identify the basic concepts of data science and identify the types of data.
- Analyse about how to collect the data, manage the data, explore the data, store the data.
- Implement the basic measures of central tendency and classify the data using SVM and navie Bayesian.
- Interpret the visualization of data and apply coding techniques to data for securing the data.
- Analyse the various concepts of data science and can be able to handle simple applications of data science using python.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: J225J	OBJECT ORIENTED PROGRAMMING THROUGH JAVA (Common to AI & ML, CSE & ECM)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

1. Knowledge on C programming language.
2. Fundamental knowledge on Data structures

Course objectives:
The Student will:

1. Familiar with OOPs, constructors and string handling functions
2. Understand inheritance and polymorphism
3. Gain knowledge of with packages and interfaces
4. Understand the with exception handling and multithreading
5. Know the applet programming, event handling and scripting.

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.
Multithreading: differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Module 4:

Applets: concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.

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

Module 5:

Layout manager: layout manager types-border, grid, flow, card and grid bag.

Swing: Introduction, limitations of AWT, components, containers,

Exploring swing- JApplet, JFrame and JComponent, Icons and Labels, Text fields, buttons – The JButton class, Checkboxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees and Tables.

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:

The student will be able to:

1. Identify OOP concepts in problem solving.
2. Demonstrate Inheritance and Polymorphism
3. Create user defined Packages and Interfaces
4. Illustrate the concept of Exception handling and Multithreading
5. Design GUI based applications using Applet Programming and Event Handling.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: J22AB	MACHINE LEARNING (Common to AI&ML, AI&DS, CSE, IT)	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 Neighbour 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 Presss, 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. Implement 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. Interpret inductive learning with analytical learning and deploy Reinforcement learning which supports dynamic programming.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: J22M1	PROFESSIONAL ETHICS (Common For All Branches)	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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: 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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML II Year – II Sem			
Course Code: J22A1	MACHINE LEARNING LAB (Common to AI & ML, AI&DS, CSE)	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.

List of Experiments

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. Implement ANACONDA framework and JUPYTER IDE.
2. Investigate 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. Analyse machine learning concepts for Text mining.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI& ML II Year – II Sem			
Course Code: J2253	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB (Common to AI&ML, AI&DS, CSE)	L	T	P	D
Credits: 1.5		0	0	3	0

Pre-Requisites:

1. Knowledge on C programming language.
2. Fundamental knowledge on Data structures.

Course objectives:

The Student will:

1. Learn the concepts of operators, control statements, type conversion, constructors and string handling
2. Understand the implementation of inheritance and polymorphism
3. Gain the knowledge of creation of user defined packages and interfaces
4. Familiar with exception handling, multithreading and event handling
5. Understand the concepts of applets, Swings in Java.

Experiment 1:

Write java programs that implement the following

a) Constructor b) Parameterized constructor

c) Method overloading d) Constructor overloading.

Experiment 2:

a) Write a Java program that checks whether a given string is a palindrome or not.

Ex: MADAM is a palindrome.

b) Write a Java program for sorting a given list of names in ascending order.

c) Write a Java Program that reads a line of integers, and then displays each integer and the sum of all the integers (Use String Tokenizer class of java.util

Experiment 3:

Write java programs that uses the following keywords

a) this b) super c) static d) final

Experiment 4:

a) Write a java program to implement method overriding

b) Write a java program to implement dynamic method dispatch.

c) Write a Java program to implement multiple inheritance.

d) Write a java program that uses access specifiers

Experiment 5:

a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

c) Write a Java program that displays the number of characters, lines and words in a text file

Experiment 6:

a) Write a Java program for handling Checked Exceptions.

b) Write a Java program for handling Unchecked Exceptions

Experiment 7:

a)Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

b)Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication

Experiment 8:

a) Develop an applet that displays a simple message.

b) Develop an applet that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked

Experiment 9:

Write a Java program that works as a simple calculator. Use a grid layout to arrange button for the digits and for the +, -,*, % operations. Add a text field to display the result

Experiment 10:

a) Write a Java program for handling mouse events.

b) Write a Java program for handling key events.

Experiment 11:

1. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num 2.

The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception and display the exception in a message dialog box.

Experiment 12:

a) Write a java program that simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No l Light is on when the program starts.

b) Write a Java program that allows the user to draw lines, rectangles and ovals

Experiment 13:

Create a table in Table.txt file such that the first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using JTable component.

Course outcomes:

The Student will be able to:

1. Implement arithmetic operators, control statements, type conversion, constructors and string handling.
2. Apply the OOP concepts using java.
3. Create user defined Packages and Interfaces.
4. Implement Exception handling and Multithreading.
5. Design GUI using Applets and AWT.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – I Sem			
Course Code: J31EA	MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE (CE, ME, MIE & EEE)	L	T	P	D
Credits: 4		3	1	0	0

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 analysing 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 analysing quality management issues in the industry and suggest implement able solutions to those.

AY2022-23 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI& ML III Year– I Sem			
Course Code: J315D	DESIGN AND ANALYSIS OF ALGORITHMS (Common to AI & ML, AI&DS, CSE)	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 ascertain the NP-Hard and NP-Complete Problem

Module- I:
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 Bi connected Components.

Module-II:
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, HuffmanCodes.

Module -III:
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 -IV:
Backtracking
General Method, Applications: Nqueen Problem, Recursive Permutation Generator, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles.

Module -V:

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.

TEXTBOOKS:

1. FundamentalsofComputerAlgorithms-EllisHorowitz,SatrajSahniandRajasekharam,Galgotia Publications Pvt.Ltd.
2. IntroductiontoAlgorithms-T.H.Cormen,C.E.Leiserso,R.L.RivestandC.Stein,2ndEdition,PearsonEducation, PHIPvt.Ltd.

REFERENCEBOOKS:

1. Algorithm Design: Foundations, Analysis and Internet Examples-M.T.GoodrichandR.Tomassia,JohnWileyandSons.
2. IntroductiontoDesignandAnalysisofAlgorithmsAstrategicApproach-R.C.T.Lee,S.S.Tseng,R.C.ChangandT.Tsai,Mc-Graw Hill.
3. DesignandanalysisofAlgorithms-S. Sridhar, OxfordHigherEducation.

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-connected components.
2. Apply divide and conquer method for solving sorting and searching problems and greedy method to solve variety of problems.
3. Design dynamic programming concepts to solve a collection of problems.
4. Utilize back tracking to solve different types of problems.
5. Choose branch and bound to unravel diverse forms of predicaments.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AIDS/AIML III Year – I Sem			
Course Code: J315E	INFORMATION SECURITY (Common to AI&ML, CSE)	L	T	P	D
Credits: 3		3	0	0	0

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-I:

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-II:

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-III:

Authentication Applications: Kerberos, X.509 Directory Authentication Service.

Electronic Mail Security: Pretty Good Privacy (PGP) and Secure /Multipurpose Internet Mail Extension (S/MIME)

MODULE-IV:

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-V:

Network Management Security: Basic concepts of SNMP, SNMPv1 CommModuley 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 IdoDubrawsky, 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

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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – I Sem			
Course Code: J31AA	DEEP LEARNING	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Probability Statistics, linear algebra. Machine learning .

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 analyse 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, RMS Prop, Adam.

Module 3:

Neural Network

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Auto encoders, 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 Modeling with Deep Learning,

Variational Auto encoder, 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 Books:

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.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105215/

2. https://www.slideshare.net/LuMa921/deep-learning-a-visual-introduction

3. https://yiqiaoyin.files.wordpress.com/2018/02/deep-learning-notes.pdf

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 & ML III Year – I Sem			
Course Code: J31M2	COMPUTER VISION	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites: Python, Machine Learning, Digital Image Processing.

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 I 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 II SHAPES AND REGIONS
Binary shape analysis – connectedness – object labelling 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 III HOUGH TRANSFORM
Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – Random sample consensus(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 IV 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 V 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. Synthesize 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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – I Sem			
Course Code: J3101	EMPLOYABILITY SKILLS (COMMON TO ALL)	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 &Behavioural 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 Outcomes:
The student will be able to:
1. Predict the importance of Listening skills.
2. Learn how reading skills help an individual.
3. Analyse and practice session on speaking effectively.
4. Inspect why proper writing skills are important.
5. Implement business Etiquette in day to day life.

AY2020-21 onwards	J.B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI& ML 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 analyse 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. Familiarise with cloud-based computing tools like google colab.

Lab Experiments:

1. Basic image processing operations : Histogram equalization, thresholding, edge detection, data augmentation, morphological operations
2. Implement Support Vector Machines (SVM) /SoftMax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network
3. Study the effect of batch normalization and dropout in neural network classifier
4. Familiarization of image labelling tools for object detection, segmentation
5. Image segmentation using Mask Regional Convolutional Neural Network(Mask RCNN), UNet,semantic segmentation model(SegNet)
6. Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)
7. Image Captioning with Vanilla Recurrent neural network(RNNs)
8. Image Captioning with Long Short-Term Memory(LSTMs)
9. Network Visualization: Saliency maps, Class Visualization
10. Generative Adversarial Networks
11. Chatbot using bi-directional Long Short-Term Memory(LSTMs)
12. Familiarization of cloud-based computing like Google Colab.

Software And Hardware Requirements:

- SOFTWARE: Python pre-installed, Anaconda Navigator with all python libraries, Online Google collab.
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard disk with Windows System.

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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&ML III Year / II Sem			
Course Code: J31D2	DATA SCIENCE THROUGH PYTHON LABORATORY	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. Recognise the powerful data manipulations using Pandas.
5. Classify about data Pre processing 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 DataFrame 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 disk with 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. Recommend efficient storage and data operations using NumPy arrays.
4. Apply powerful data manipulations using Pandas.
5. Identify data Pre-processing and visualization using Pandas

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J325L	CLOUD COMPUTING	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. A course on “Computer Networks”.
2. A course on “Operating Systems”.
3. A course on “Data base management 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:

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

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. Prioritize various marketing strategies for an online business.
5. Justify the infrastructure and multimedia concepts.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AIML III Year – II Sem			
Course Code: J326J	AUTOMATA AND COMPILER DESIGN (Common to AI&ML, IT)	L	T	P	D
Credits: 3		3	0	0	0

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 regularexpressions, Finite Automata-DFA, NFA

Conversions: Conversion of regular expression to NFA, NFA to DFA, Epsilon NFA to NFA, Epsilon NFA to DFA, Phases of compilation, Lexical Analyzergenerator(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 Intermediate code 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 oflanguages 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. Construct object code for natural language representations.

AY2020-21 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI& ML III Year– II Sem			
Course Code: J326C	SOFTWARE ENGINEERING (Common to AI&ML, CSE)	L	T	P	D
Credits:3		3	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 - I:

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 - II:

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 - III:

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 - IV:

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 - V:

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, IvarJaccobson.
2. Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008

Course outcomes:

The Student will be able to:

1. Compare and Analyse the different Process models
2. Analyse 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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J32M2	**CYBER SECURITY** (Common to ECE, CIVIL, ME & MIE in III-I) and (Common to AI & ML, IT, EEE& ECM in III-II)	**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 SunitBelpure, 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. Recommend Computer Forensics and its related matters
5. Identify Cyber Security-Organizational Implications

AY 2021-22 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI& ML III Year– II Sem			
Course Code: J3261	SOFTWARE ENGINEERING LAB (Common to AI & ML, CSE)	L	T	P	D
Credits: 1		0	0	2	0

Course Objectives:

The student will:

1. Analyzeproblemstatementanddevelopsoftwarerequirementsheetforsystem.
2. Describe the functional oriented diagrams: Data flow diagram
3. Design test plan document and specification of a system
4. Describe the test cases for web application
5. Demonstrate the use of selenium with different browsers.

Experiment1.

Write down the problem statement for a suggested system of relevance

Experiment2.

Do requirement analysis and develop software requirement specification sheet for any system.

Experiment3.

Draw the e-r diagram for the suggested system

Experiment4.

Toper form the function- oriented diagram: Data Flow Diagram(DFD)

Experiment5.

Create a test plan document for any application (e.g. Library Management System).

Experiment6.

Study the specifications of ATM System and Write functional test cases

Experiment7.

Study the specification of different type of insurance policies, write the functional test cases.

Experiment8.

Write the test cases for any Web application.

Experiment9.

a) Write the test cases for java program using relational operators.
b) Write the test cases for java program using string compressions.

Experiment10.

a) Write the test cases for java program using multi-dimensional array.
b) Write the test cases for java program using method overloading.

Experiment11.

Write a program to launch selenium tool with different browsers

Case Study Experiment:

Experiment 12.
Study any Web Application using Selenium ID.

Software And Hardware Requirements:

- SOFTWARE: Argo UML, Dia, Selenium preinstalled using Tomcat.
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard disk with Windows System.

Course outcomes:

The Student will be able to:

1. Apply software principles and techniques for software requirement specification.
2. Design data flow diagram
3. Apply different test plan cases.
4. Construct programs for various testing scenarios.
5. Use selenium for web applications.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: CSE III Year – II Sem			
Course Code: J3201	LIFE SKILLS & PROFESSIONAL SKILLS LAB (COMMON TO ALL)	L	T	P	D
Credits: 2		0	0	4	0

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:

The students will be able to:

1. Assess the importance of self-awareness and assessment.
2. Prioritize the needs of others and themselves.
3. Practice being social, possessing positive energy.
4. Identify leadership Traits and skills in day to day life.
5. Justify the importance of Thinking- out- of - the-Box.

AY2020-21 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year– I Sem			
Course Code: J41AA	REINFORCEMENT LEARNING	L	T	P	D
Credits:3		3	0	0	0

Pre-Requisites: Maths for Machine Learning, Deep 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

Text 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.

Reference Books:

1. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016.
2. Goodfellow, Ian, YoshuaBengio, and Aaron Courville. "Deep learning." MIT press, 2016.
3. 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. Design Reinforcement Learning concepts for solving different types of problems.
2. Identify Tabular based solutions for cracking glitches.
3. Apply Function approximation solutions for resolving complications.
4. Implement Model based Reinforcement Learning to unravel variety of issues.
5. Apply Meta learning to work out distinctive varieties of setbacks.

AY2020-21 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML 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.

Experiment1:

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?

Experiment2:

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.

Experiment3:

Make a plot of the reward values from automatic parking policies over time. These are stored in the columns called 'reward0' and so on.

Experiment4:

Make a plot of the best resp for each trial of the task.

Experiment5:

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:
Ceate 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?

Experiment7:

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.

Experiment8:

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.

```
Class Smarter Exploring Agent():
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?

Experiment10:
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
```

Case Study Experiment:

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?

Experiment 13:
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.

Software And Hardware Requirements:

- SOFTWARE: Python pre-installed, Anaconda Navigator with all python libraries, Online Google collab.
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard disk with Windows System.

Course outcomes:
The Student will be able to:

1. Identify the Reinforcement Learning concepts for solving different types of problems.
2. Design Tabular based solutions for cracking glitches.
3. Apply Function approximation solutions for resolving complications.
4. Implement the Model based Reinforcement Learning to unravel variety of issues.
5. Assess Meta learning concepts to work out distinctive varieties of setbacks

AY2020-21 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year– I Sem			
Course Code: J4154	INFORMATION SECURITY LAB	L	T	P	D
Credits: 2		0	0	4	0

Course objectives:

The student will:

1. Provideanunderstandingofprincipleconceptsandbasicapproachesin InformationSecurity.
2. Understand the use of the three types of cryptographic techniques namely secret-key, public key, and hash function for secure communication.
3. Develop a basic understanding of commonly used cryptography algorithms.
4. Develop an understanding about how to protect the integrity of piece of data to detect changes or alterations to any part of a message over network communication using message digest concepts.
5. Demonstrate the health of network and diagnose network related issues with sniffing software.

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character inthisstringwith127 and display the result.
3. Write a C program to implement format string vulnerabilities.
4. WriteaJavaprogramtoperformencryptionanddecryptionusingthefollowingalgorithms a. Ceaser cipher b.Transposition cipher
5. WriteaJavaprogramtoperformencryptionanddecryptionusingthefollowingalgorithms a. HillCipher b.Playfair Cipher
6. Write a C/JAVA program to implement the DES algorithm logic.
7. Write a C/JAVA program to implement the Rijndael algorithm logic.
8. Write a C/Java program to implement RSA algorithm.
9. Write a C/Java program to implement the Diffie-Hellman Key Exchange mechanism.
10. Calculate the message digest of atextusingtheSHA-1 algorithm inC/JAVA.

11. Calculate the message digest of atextusingtheMD5algorithminC/JAVA.

12. Demonstrate how sniffing software(Wire shark)works.

Software And Hardware Requirements:

- SOFTWARE: C/C++ Preinstalled, Wireshark.
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard disk with Windows System.

Course outcomes:

The student will be able to:

1. Identify basic approaches in Information Security.
2. Categorize types of cryptographic techniques namely secret-key, public key, and hash function. for secure communication.
3. Implement commonly used cryptography algorithms using java programming/C.
4. Implement message digest concepts.
5. Identify the health of network and diagnose network related issues with sniffing software.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J32D1	NO SQL DATABASE (Professional Elective Course - I)	L	T	P	D
Credits: 3	(Common to AI & ML, AI&DS)	3	0	0	0

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-I

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-II

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-III

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-IV

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-V

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 UseCases.

TEXTBOOKS:

1. Sadalage, P.&Fowler, *NoSQLDistilled: A Brief Guide to the Emerging World of Polyglot Persistence*, 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:

The student will be able to

1. Compare and contrast different types of NoSQL Databases
2. Categorize RDBMS with different NoSQL databases.
3. Implement the architecture and its performance tuning of Document-oriented NoSQL databases.
4. Evaluate performance of Key-Value Pair NoSQL databases.
5. Apply NoSQL development tools on different types of NoSQL Databases.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J325K	WEB SERVICES (Professional Elective – I) (Common to AI & ML, AI&DS)	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. Identify internet trading relationships including business-to-business, intra organizational.
3. Recommend the infrastructure for E-Commerce.
4. Compare and contrast Web Services and service discovery mechanisms, UDDI.
5. Inspect Web Services Interoperability and Web Services Security.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J325M	DESIGN THINKING (Professional Elective-I)	L	T	P	D
Credits: 3	(Common to AI & ML, AI&DS)	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 commModuley.
4. Students develop a portfolio of work to set them apart in the job market.
5. Provide an authentic Moduley for students to develop teamwork and leadership skills.

UNIT -I 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.

UNIT-II 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.

UNIT -III 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.

UNIT -IV 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.

UNIT -V 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

The student will be able to:

1. Construct 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. Invent the unique needs of a company around specific challenges performing research.
3. Compose building empathy for target audiences from different “cultures”.
4. Design and test innovative ideas through a rapid iteration cycle.
5. Create physical prototypes / a visual representation of an idea and test it.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J32D3	INFORMATION RETRIEVAL SYSTEMS (Professional Elective – II)	L	T	P	D
Credits: 3	(Common to AI & ML, AI&DS)	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://AI & ML.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. Prioritize the 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. Synthesize various retrieval systems for web search tasks.
5. Identify the concepts of Multimedia Information Retrieval and Libraries.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J325E	MOBILE COMPUTING (Professional Elective – II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Knowledge on computer networking.
2. Programming experience on mobile devices.

Course objectives:

The Student will:

1. Gain the knowledge the Global System for Mobile communication
2. Understand about the medium access control layer and multiplexing techniques
3. Describe the mobile IP and transport layer protocols
4. Understand about various kind of database issues
5. illustrate about routing algorithms

Module 1:

GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and Calling, Handover, Security, and New Data Services.
Mobile computing (MC): Introduction to MC, Novel Applications, Limitations and Architecture.

Module 2:

(Wireless) Medium Access Control (MAC):

Motivation for a Specialized MAC (Hidden and Exposed Terminals, Near and Far Terminals), SDMA, FDMA, TDMA, CDMA, MAC Protocols for GSM.

Module 3:

Mobile IP Network Layer:
IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

Mobile Transport Layer:
Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Module 4:

Database Issues:
Database Hoarding& Caching Techniques, Client –Server Computing & Adaptation, Transactional Models, Query Processing, Data Recovery Process & QoS Issues.
Data Dissemination and Synchronization:
Communications Asymmetry Classification of Data Delivery Mechanisms , Data Dissemination Broadcast Models , Selective Tuning and Indexing Methods ,Digital Audio and Video Broadcasting (DAB & DVB).Data Synchronization –Introduction ,Software ,and Protocols.

Module 5:

Mobile Ad hoc Networks (MANETs):
Introduction, localization, MAC issues, Routing protocols, global state routing(GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, Applications & Challenges of a MANET.

Text Books:

1. "Mobile Communications", Jochen Schiller, Addison-Wesley, Second Edition, 2004
2. Stojmenovic andCacute, "Handbook of Wireless Networks and Mobile Computing",Wiley, 2002.

E - Resources:

1. https://www.tutorialspoint.com/mobile_computing/index.htm
2. https://www.sciencedirect.com/topics/engineering/medium-access-control
3. https://docs.oracle.com/cd/E19455-01/806-7600/6jgfbep0v/index.html
4. http://www.psnacet.edu.in/courses/AI & ML/Mobilecomputing/Lecture9.pdf
5. http://www.faadooengineers.com/online-study/post/AI & ML/mobile-computing/185/database-hoarding
6. https://www.dauniv.ac.in/public/frontassets/coursematerial/mobilecomputing/MobileCompChap02DataDissSyncMobMgt.pdf
7. https://www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/

Course outcomes:

The Student will be able to:

1. Analyze the basic concepts and principles in mobile computing on different platforms.
2. Categorize the structure and components for mobile IP, mobility management, and technologies for location-aware computing.
3. Identify positioning techniques and location-based services and applications.
4. Implement mobile applications to realize location-aware computing.
5. Design a system components and its processes as per needs and specification.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML III Year – II Sem			
Course Code: J32D2	SOFTWARE ARCHITECTURE AND DESIGN PATTERN (Professional Elective-II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives

The Student will:

1. Understand that design patterns are standard solutions to common software design problems
2. Discuss to know how to use systematic approach that focus and describe that describe abstract systems of interaction between classes, objects and communication flow
3. Understand the architecture evaluation and design decision making
4. Understand how to apply these patterns on various platforms.
5. Understand the responsibilities for developing software.

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. Architecture in Practice, Len Bass, Paul Clements, Rick Kazman.
2. Software Documenting Software Architectures: Views and Beyond Paul Clements, Felix Bachmann, Len Bass, David Garlen, James Ivers, Reed Little, Robert Nord, Judith Stafford.

E - Resources:

1. http://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Architecture/Design_Patterns.

Course Outcomes

The student will be able to:

1. Apply a deeper knowledge of the principles of Object Oriented Design.
2. Identify Design patterns that are common in software applications.
3. Illustrate various patterns that are related to object –oriented design.
4. Analyze various architectural patterns.
5. Predict the various architectural patterns for developing a software.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&ML IV Year – I Sem			
Course Code: J41DA	BIG DATA ANALYTICS (Professional Elective – III)	L	T	P	D
Credits: 3		3	0	0	0

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. Recommend Big Data analytics Tools and its Approaches.
3. Identify Map Reduce fundamentals and HDFC Architecture.
4. Compare and Contrast Hadoop and RDBMS concepts.
5. Illustrate analytics on Structured and Unstructured Data.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – I Sem			
Course Code: J415N	ANDROID APPLICATION DEVELOPMENT (Professional Elective-III)	L	T	P	D
Credits: 3		3	0	0	0

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

Course Outcomes:

The students will be able to:

1. Identify the basic features of Android Platform and its application components.
2. Design concepts of user interface and event handling mechanisms.
3. Create and use broadcast activities for Android Application.
4. Create and use databases for Android Application
5. Implement Location based services in Android and Deploy mobile applications in various marketplaces for distribution.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – I Sem			
Course Code: J32AB	UI/UX DESIGN (Professional Elective-III)	L	T	P	D
Credits: 3	(Common to AI & ML, AI&DS)	3	0	0	0

Prerequisites

Research, Collaboration, Wireframing and prototyping, writing, Visual communication, User empathy, Interaction design, Coding, Analytics and Communication skills.

Course objectives:

The Student will:

1. Plunge into the global innovation as a systematic process of involving in relevant design.
2. Implement 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. 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.

Unit 1: Design:

Fundamentals of Design - Principles of Design - Visual Communication Empathy & User Study - Ethnography & People Design - Service Design - Design Thinking - Information & Data Study

Unit 2: Technologies & Process:

UI Design - Interaction Design - Design for Rural India - Design for Futuristic Technologies - Imagin 6D UX Process

Unit 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

Unit 4: Redesign process:

Heuristic Usability & complete UX process for responsive website optimized for Mobile, Tab & Desktop - redesign process using Figma

Unit 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 Jenny Preece, 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
7. https://xd.adobe.com/ideas/guides/ux-design-process-steps/#:~:text=The%20UX%20design%20process%20consists,analysis%2C%20design%2C%20and%20validation.
8. https://uxplanet.org/user-experience-design-process-d91df1a45916
9. https://www.netsolutions.com/insights/user-experience-design-process/
10. https://maze.co/collections/ux-ui-design/ux-design-process/
11. https://www.invisionapp.com/inside-design/6-stages-ux-process/
12. https://uxplanet.org/the-ux-redesign-process-688b4ee0d975
13. https://uxdesign.cc/how-to-redesign-step-by-step-guide-869379604734
14. https://careerfoundry.com/en/blog/ux-design/how-to-conduct-a-ux-redesign/
15. https://www.justinmind.com/blog/website-redesign-process-a-uxers-survival-guide/
16. https://spdload.com/blog/how-to-redesign-an-app-or-a-website-ux/
17. https://uxmag.com/articles/how-to-redesign-an-app-when-to-do-it-and-what-to-start-with
18. https://www.cronj.com/blog/user-interface-ui-design-process-in-graphic-design/
19. https://www.altexsoft.com/blog/uxdesign/ux-vs-ui-design-stages-participants-roles-and-skills/
20. https://maze.co/collections/ux-ui-design/ui-design/

Course Outcomes:

The Student will be able to:

1. Analyze the Design concepts and principles.
2. Implement the methods, processes, technologies and tools of Design and Innovation.
3. Apply the UX process Design and Innovation approaches and models to real world situations.
4. Evaluate the role of primary and secondary research in the discovery stage of UX process Design and Innovation that includes responsive website optimized for Mobile, Tab & Desktop as well.
5. Synthesize endeavors of the UI process Design and Innovation approaches and models in evolving and leading with accomplishment

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&ML IV Year / I Sem			
Course Code: J41AC	PREDICTIVE ANALYTICS (Professional Elective IV)	L	T	P	D
Credits: 3		3	0	0	0

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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – I Sem			
Course Code: J417E	INTERNET OF THINGS (Professional Elective-IV) (Common to AI & ML, AI&DS, CSE, IT & ECM)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives

The Student will:

1. Understand the current vision of the Internet of Things and its impact on the world
2. Classify basic concepts of IoT and M2M & IoT system management
3. Describe concepts of python language and different python packages.
4. Explain how to design IoT Physical devices with built-ins of python Programs
5. Identify the advanced concepts of IoT physical servers, cloud offerings.

Module 1:

Introduction to Internet of Things –Introduction, Definition and Characteristics of IoT,

Physical Design of IoT – Things in IoT, IoT Protocols, Logical Design of IOT- IoT Functional Blocks, IoT Communication Models, IoT Communication APIs

IoT Enabling Technologies – Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems.

Domain Specific IoTs – Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.

Module 2:

IoT and M2M – Introduction, M2M, Difference between IOT and M2M, **SDN and NFV for IoT**-Software Defined Networking, Network Function Virtualization,

IoT System Management with NETCONF-YANG- Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator Requirements, NETCONF, YANG, NETOPEER.

Module 3:

IoT Systems-Logical Design Using Python-Introduction, Installing Python, Data types and Data Structures, Control Flow, Functions, Modules, Packages, File handling, Date/Time Operations, Classes.

Python Packages of Interest for IoT- JSON, XML, HTTPLib, URLLib, SMTPLib

Module 4:

IoT Physical Devices and Endpoints – What is an IoT Device,Exemplary Device: Raspberry Pi,About the Board,Linux on Raspberry Pi, Raspberry PI-Interfaces (Serial, SPI, I2C),Programming

Raspberry Pi with Python-Controlling LED, Interfacing an LED and Switch and interfacing a light sensor with Raspberry Pi.

Module 5:

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage Models and communication APIs, WAMP-AutoBahn for IoT,Xively Cloud for IoT, Python web application framework Designing a RESTful web API.

Text book:

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

Reference Books:

1. Internet of Things by Jeeva Bose 1st edition, Khanna publishing.

E - Resources:

1. https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf
2. https://nptel.ac.in/courses/106/105/106105166/
3. https://www.slideshare.net/MohanKumarG/internetofthings-iot-aseminar-ppt-by-mohankumarg

Course Outcomes

The Student will be able to:

1. Analyze current vision of the Internet of Things and its impact on the world.
2. Implement the basic concepts of IoT and M2M & IoT system management.
3. Assess the concepts of python language using different python packages.
4. Design IoT Physical devices using python Programming.
5. Categorize advanced concepts of IoT physical servers, cloud offerings and Hadoop.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – I Sem			
Course Code: J41AD	AGILE METHODOLOGIES (Professional Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

Course objectives:
The Student will:

1. To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2. To provide a good understanding of software design and a set of software technologies and APIs.
3. To do a detailed examination and demonstration of Agile development and techniques.
4. To understand the benefits and pitfalls of working in an agile team.
5. To understand agile development and testing.

Module I AGILE METHODOLOGY

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

ModuleII AGILE PROCESSES

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

Module III AGILITY AND KNOWLEDGE MANAGEMENT

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

Module IV AGILITY AND REQUIREMENTS ENGINEERING

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements

Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

ModuleV AGILITY AND QUALITY ASSURANCE

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCES:

1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

Course outcomes:
The Student will be able to:

1. Apply agile software development practices even in a small team setup to create high-quality software.
2. Prioritize software design techniques, software technologies and APIs to create user friendly GUIs in software applications.
3. Recommend Agile development and testing techniques in a software industry.
4. Categorize the merits of working in an Agile team.
5. Implement Agile development and testing methods for software development.

AY 2020-21 onwards	J.B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year– I Sem			
Course Code: J41DB	ARTIFICIAL INTELLIGENCE FOR BUSINESS (Professional Elective-V)	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.

Unit 1:

What Business Leaders Need To Know - Basic Terminology In Artificial Intelligence – The Machine Intelligence Continuum - The Promises Of Artificial Intelligence

Unit 2:

The Challenges Of Artificial Intelligence - Designing Safe And Ethical Ai - How To Develop An Enterprise Ai Strategy - Build An AI-Ready Culture

Unit 3:

Invest In Technical Talent - Plan Your Implementation - Collect And Prepare Data - Build Machine Learning Models

Unit 4:

Experiment And Iterate - AI For Enterprise Functions - Obstacles And Opportunities - General And Administrative

Unit 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. Identify AI and its promises for solving different types of problems.
2. Assess Designing and developing Safe and ethical AI for cracking glitches.
3. Apply Building ML Models for resolving complications.
4. Implement AI for Enterprise Functions to unravel variety of issues.
5. Apply Ethics of Enterprise AI to workout distinctive varieties of setbacks.

AY 2020-21 onwards	J.B.Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year– I Sem			
Course Code: J41AE	INTELLIGENT ROBOTICS (Professional Elective-V)	L	T	P	D
Credits:3		3	0	0	0

Pre-Requisites:

Knowledge in 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.

Unit 1: Robot mechanics

Engineering mechanics, Electromechanics, Kinematics, statics and dynamics of robots.

Unit 2: Design of robot and their control systems

Project of robotic system, Robot end effectors, Electric drives, Applied electronics

Unit 3: Programming of robots

Microprocessor systems, Image processing and recognition, Control systems and programming of robots, Automation devices and systems, Mobile robots

Unit 4: Modeling and experimental analysis I

Modeling of robotised systems, Computational intelligence methods

Unit 5: Modeling and experimental analysis II

Real time systems, Automatic control theory

Reference Books:

1. Francis X. Govers, Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, 30 August 2018
2. Maja Matarić, 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 Autonomous Mobile 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. Investigate Statics and Dynamics of Robots Mechanics concepts for solving different types of problems.
2. Design of robot and their control systems for cracking glitches.
3. Apply Programming concepts of robots for resolving complications.
4. Implement Computational Intelligence methods to unravel variety of issues.
5. Synthesize real time systems to workout distinctive varieties of setbacks.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML 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. Identify 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. Recommend the developing areas of new generation database system with different protection models.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – II Sem			
Course Code: J41AF	GENERATIVE ADVERSARIAL NETWORKS (Professional Elective - VI)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Math: Linear Algebra, Calculus, Probability and Statistics
2. Data Structures
3. Machine Learning
4. Deep Learning

Course objectives:

The student will:

1. Understand the difference between generative and discriminative models.
2. Identify problems that GANs can solve.
3. Understand the roles of the generator and discriminator in a GAN system.
4. Understand the advantages and disadvantages of common GAN loss functions.
5. Identify possible solutions to common problems with GAN training.

Module 1:

Introduction to GANs:-

What are GANs?- How do GANs work?- GAN Training- Reaching Equilibrium- Applications of GANs

Generative Modelling with encoders:-

Introduction to Generative Modelling- Working of Auto Encoders at high level- Auto Encoders to GAN- Usage of Auto Encoders

Module 2:

Convolutional Neural Networks:

Introduction to CNN- Convolutional Filters- Parameter sharing- ConvNets

Visualized.

Deep GAN:

Introduction to Deep GAN- Batch Normalization- Understanding Normalization- Computing Normalization.

Module 3:

Evaluation:

Evaluation Framework- Inception Score- Frechet Inception Distance

Challenges in Training:

Adding Network depth- Min-Max GAN- Non-Saturating GANs- When to Stop training?- Wasserstein GAN

Module 4:

Semi Supervised GAN:

What is Semi Supervised GAN?- Architecture- Training Process- Training Objectives- Implementation- Comparison to fully supervised Classifier

Conditional GAN:

Motivation- CGAN Generator- CGAN Discriminator- Architecture- Implementation

Module 5:

Cycle GAN:

Image to Image Translation- Cycle Consistency Loss- Adversarial Loss- Identity Loss- Architecture- Applications of Cycle GAN

Applications of GAN and Ethics:

GAN in Medicine- GAN in fashion- Ethics- GAN Innovations

Text Books:

1. GANs in Action, Deep learning with Generative Adversarial Networks, Jakub Langr, Vladimir Bok, Manning Publication
2. Generative Deep Learning by David Foster, O'Reilly Media, Inc.

Reference Book:

1. Learning Generative Adversarial Networks,Kuntal Ganguly, Packt Publishing
2. Generative Adversarial Networks Cookbook, Josh Kalin,Packt Publishing

Course outcomes:

The student will be able to:

1. Design generative and discriminative models.
2. Implement problems that GANs can solve.
3. Compare and contrast the roles of the generator and discriminator in a GAN system.
4. Inspect the challenges posed by common GAN loss functions.
5. Implement possible solutions to common problems with GAN training.

AY 2020-21 onwards	J.B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – II Sem			
Course Code: J426E	QUANTUM COMPUTING (Professional Elective-VI)	L	T	P	D
Credits:3		3	0	0	0

Pre-Requisites:

Knowledge on Theory of Computation, Linear algebra, Basic group theory (and generally basic abstract algebra), Basic probability and stochastic processes, Fourier transforms and basic algorithms and analysis of algorithms.

Course objectives:

The Student will:

1. Learn about Basics of Quantum Theory and Quantum Systems
2. Achieve knowledge in Basic Quantum Algorithms I.
3. Expand their knowledge in Basic Quantum Algorithms II.
4. Familiar with Quantum Information and Cryptography.
5. Realize the Noise and Quantum error correction as well as Applications of Quantum Computing.

Module 1:Introduction to Quantum Computing

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

Quantum computing — Quantum bits, Bloch sphere, representation of a qubit, multiple qubits

Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits.

Module 2:Basic Quantum Algorithms I

Classical computation on quantum computers.

Relationship between quantum and classical complexity classes.Deutsch's algorithm, Deutsch's-Jozsa algorithm.

Basic quantum algorithms I —analysing quantum algorithms, and implementing quantum circuits via QISKIT.

Module 3:Basic Quantum Algorithms II

Basic quantum algorithms II — Simon's problem and the Bernstein -V-azirani algorithm.

Grover's quantum search algorithm, the BBBV Theorem, and applications of Grover's algorithm. RSA, and Shor's integer factorisation algorithm.

Module 4:Quantum Information and Cryptography

Introduction to quantum information (superdense coding, nocloning theorem, Entanglement and Bell theorem. quantum teleportation)

Comparison between classical andquantum information theory.

Quantum Cryptography, Introduction to quantum cryptography (post-quantum security, quantum key distribution).
Open quantum systems
Quantum programming languages, Probabilistic and Quantum computations

Module 5:

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation Applications of Quantum Computing (AI&ML, Computational Chemistry, Drug Design & Development, Cybersecurity& Cryptography, Financial Modeling, Logistics Optimization, Weather Forecasting, Quantum Money, the Elitzur-Vaidman bomb).

Text Books:

1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008.

Reference Books:

1. Jack Hidary: Quantum computing: an applied approach. https://www.springer.com/us/book/9783030239213. The affiliatedsite is https://github.com/jackhidary/quantumcomputingbook
2. Michael A. Nielsen and Isaac L. Chuang, Quantum Computation and Quantum Information: 10th Anniversary Edition, 2010.
3. Abraham Asfaw et al, Learn Quantum Computation using Qiskit, http://qiskit.org/textbook, 2020.
4. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press, 2002.
5. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific, 2004.
6. Pittenger A. O., An Introduction to Quantum Computing Algorithms 2000.
7. An Introduction to Quantum Computing, P Kaye, R Laflamme and M Mosca, 2007.
8. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs103/preview
2. https://onlinecourses.nptel.ac.in/noc19_cy31/preview
3. https://www.ibm.com/quantum-computing/what-is-quantum-computing/
4. https://www.sciencealert.com/quantum-computers
5. https://uwaterloo.ca/institute-for-quantum-computing/quantum-101

Course out comes:

The Student will be able to:

1. Investigate Quantum Computing concepts for solving different types of problems.
2. Assess Basic quantum algorithms-I for cracking glitches.
3. Implement Basic quantum algorithms-II for resolving complications.
4. Predict Quantum Programming and Quantum Cryptography to unravel variety of issues.
5. Apply Quantum Computing to workout distinctive varieties of setbacks.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI & ML IV Year – II Sem			
Course Code: J426D	BLOCKCHAIN TECHNOLOGY (Professional Elective-VI)	L	T	P	D
Credits: 3		3	0	0	0

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. Identify the block chain Technology and its applications.
2. Analyse the history of money and working with Bitcoin and Bitcoin wallets.
3. Implement cryptography in bitcoin transactions.
4. Design philosophy of Block Chain Technology and Virtual Machine.
5. Construct Decentralized applications and Building ethereum Dapp

Course Outcomes:

The students will be able to:

1. Identify the basic features of Android Platform and its application components.
2. Design concepts of user interface and event handling mechanisms.
3. Create and use broadcast activities for Android Application.
4. Create and use databases for Android Application
5. Implement Location based services in Android and Deploy mobile applications in various marketplaces for distribution.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: Common III Year / I Sem			
Course Code: J310W	INTRODUCTION TO MACHINE LEARNING (Open Elective I)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Data Structures
2. Design and Analysis of Algorithms
3. Python Programming
4. Mathematics for Machine Learning

Course objectives:

The student will:

1. To introduce the fundamental concepts of machine learning and its applications.
2. To learn the classification, clustering, regression-based machine learning algorithms
3. To understand the deep learning architectures.
4. To understand the methods of solving real life problems using the machine learning techniques.
5. Understand the limitations of machine learning algorithms.

Module 1:

Introduction: Programming Vs Learning-Types of Learning- Statistical Decision Theory – Regression-Classification- Bias Variance-Linear Regression- Multivariate Regression- Subset Selection- Shrinkage Methods

Principal Component Regression- Partial Least squares- Linear Classification- Logistic Regression- Linear Discriminant Analysis-Perceptron- Support Vector Machines

Module 2:

Neural Networks-Introduction- Early Models- Perceptron Learning- Backpropagation- Initialization- Training & Validation- Parameter Estimation – MLE- MAP-Bayesian Estimation

Decision Trees- Regression Trees- Stopping Criterion & Pruning loss functions- Categorical Attributes- Multiway Splits- Missing Values- Decision Trees – Instability Evaluation Measures

Module 3:

Ensemble Learning-Bootstrapping & Cross Validation-Class Evaluation Measures- ROC curve- MDL- Ensemble Methods – Bagging- Committee Machines and Stacking- Boosting

Gradient Boosting- Random Forests- Multi-class Classification- Naive Bayes- Bayesian Networks

Module 4:

Undirected Graphical Models- HMM- Variable Elimination-Belief Propagation-Partitional Clustering, Hierarchical Clustering

Birch Algorithm, CURE Algorithm, Density-based Clustering- Gaussian Mixture Models Expectation Maximization

Module 5:

Introduction and Basics of Reinforcement Learning-Defining RL Framework and Markov Decision Process- Polices, Value Functions and Bellman Equations- Exploration vs. Exploitation

Dynamic Programming and Monte Carlo-Temporal-Difference learning methods- Q-Learning Deep Q-networks (DQN, DDQN)

Text Books:

1. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (2009). Springer-Verlag.
2. Pattern Recognition and Machine Learning, by Christopher Bishop, Springer 2006
3. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019
4. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.

Reference Books:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
2. Francois Chollet, "Deep Learning with Python, Manning Publications, Shelter Island, New York, 2018.
3. Navin Kumar Manaswi, Deep Learning with Applications using Python, Apress, New York, 2018.

Course outcomes:

The student will be able to:

1. Identify the basic concepts of machine learning.
2. Predict the various classification, clustering, and regression algorithms.
3. Apply the deep learning architectures for real world problems.
4. Implement a method for solving real life problem using a suitable machine learning technique.
5. Prioritize the various Machine Learning algorithms.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: Common III Year / II Sem			
Course Code: J320W	INTRODUCTION TO PREDICTIVE ANALYTICS (Open Elective II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

Data mining, Machine Learning

Course objectives:

The student will:

6. Know the basics of predictive analytics and summarize Data, Categorize Models, and techniques
7. Know about the Decision tree, Support Vector Machine for Data Classification
8. Describe Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
9. Study the predictive models for various Real-Time Applications.
10. 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:

4. Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling to solve all your data analysis problems, Pack Publisher, 2nd Edition, 2015.
5. Aurelien,"Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'Reilly Publisher, 5th Edition, 2017.
6. 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. Identify 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. Construct predictive models for various Real-Time Applications.
5. Analyze and Visualize predictive Model's results using Data Visualization tools.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: Common IV Year / I Sem			
Course Code: J410W	INTRODUCTION TO NEURAL NETWORKS (Open Elective III)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Data Structures
2. Design and Analysis of Algorithms
3. Python Programming
4. Mathematics for Machine Learning

Course objectives:

The student will:

1. Become familiar with the fundamental concepts of Neural Networks and its applications.
2. Learn various learning strategies for solving real world problems.
3. Demonstrate various architectures of Artificial neural networks.
4. Summarise the limitations of the perceptron model
5. Understand the paradigms of associative memories.

Module 1:

INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN

McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Module 2:

ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN

Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

Module 3:

SINGLE LAYER FEED FORWARD NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category

Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

Module 4:

MULTI- LAYER FEED FORWARD NETWORKS

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm

Kolmogorov Theorem, Learning Difficulties, and Improvements.

Module 5:

ASSOCIATIVE MEMORIES

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function.

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.

Text Books:

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education,2004..
2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.
3. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006.

Reference Books:

1. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.
2. Timothy J. Ross, " Fuzzy Logic with Engineering Applications", Tata McGraw-Hill Inc. 2000

Course outcomes:

The student will be able to:

1. Analyze Neural Networks and its applications.
2. Apply learning strategies for solving real world problems.
3. Implement various architectures of Artificial neural networks.
4. Categorize the merits of various perceptron models.
5. Construct the paradigms of associative memories.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: Common IV Year / II Sem			
Course Code: J420Q	INTRODUCTION TO DEEP LEARNING (Open Elective IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Probability Statistics, linear algebra. Machine learning .

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 analyse 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 Books:

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.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105215/

2. https://www.slideshare.net/LuMa921/deep-learning-a-visual-introduction

3. https://yiqiaoyin.files.wordpress.com/2018/02/deep-learning-notes.pdf

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. Implement 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.