ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

CIVIL ENGINEERING

B.TECH 4 YEAR UG COURSE

(Applicable for the batches admitted from 2020-2021)

REGULATION: R20

(I, II, III- & IV-Year Syllabus)

J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad Mandal, R.R. District,
Hyderabad – 500 075, Telegana State, India
Email: principal@jbiet.edu.in, Website: www.jbiet.edu.in

Vision and Mission of the Institution

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

1. To provide world class engineering education, encourage research and development.
2. To evolve innovative applications of technology and develop entrepreneurship.
3. To mould the students into socially responsible and capable leaders

Vision and Mission of the Department

Department of Civil Engineering

Vision

To be a centre for excellence in civil Engineering education with a thrust on fundamentals, spirit of innovation and to meet the changing needs of local and global industry.

Mission

1. To achieve academic excellence by imparting sound technical knowledge based on strong fundamentals of science and engineering that leads to higher education and research
2. To imbibe the spirit of innovation by being responsive to the needs of industry and promoting industry institute interaction, ensuring social relevance and professional ethics
3. To equip students with leadership qualities to become entrepreneurs and take up technologies that cater to the changing demands of society.

PEOs:

The Graduates will

1. Demonstrate sound technical competency and professional ethics to become professional engineer leading to a successful career.
2. Pursue lifelong learning in generating innovative engineering solutions based on research outcomes and developing problem-solving skills.
3. Demonstrate leadership qualities in addressing changing needs of the society.

POs:

Engineering Graduates will be able to:

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

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solution**s: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

5. **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.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11**. Project management and finance:** Demonstrate knowledge and understanding of the 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.

12. **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.

PSOs:

1. Understand, analyze and design sub-structures and superstructures for residential and public buildings, industrial structures, irrigation structures, powerhouses, highways, railways, airways, docks and harbours.
2. Conduct surveys for infrastructural projects, prepare survey reports and project cost estimates, and apply the data for various infrastructural projects

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

B. Tech Course Structure - R20

I YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J110B	English	3	0	0	0	3
2	J110A	Differential Equations and Calculus	3	1	0	0	4
3	J110C	Engineering Physics	3	0	0	0	3
4	J115A	Programming for Problem Solving	3	0	0	0	3
5	J1101	English Language and Communication Skills Lab	0	0	2	0	1
6	J1102	Engineering Physics Lab	0	0	2	0	1
7	J1151	Programming for Problem Solving Lab	0	0	2	0	2
8	-	Induction Program	-	-	-	-	-
TOTAL			**12**	**1**	**6**	**0**	**17**

I YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J120A	Linear Algebra and Advanced Calculus	3	1	0	0	4
2	J120C	Applied Chemistry	3	0	0	0	3
3	J129A	Basic Electrical and Electronics Engineering	3	1	0	0	4
4	J123A	Engineering Mechanics	3	0	0	0	3
5	J1201	Chemistry Lab	0	0	2	0	1
6	J1291	Basic Electrical and Electronics Engineering Lab	0	0	2	0	1
7	J1292	Engineering and IT Workshop	0	0	4	0	2
8	J1231	Engineering Drawing	0	0	0	6	3
9	J12M1	Environmental Science	2	0	0	0	0
TOTAL			**14**	**2**	**8**	**6**	**21**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

B. Tech Course Structure - R20

II YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J211A	Surveying	3	0	0	0	3
2	J211B	Engineering Geology	2	0	0	0	2
3	J211C	Building Materials, Construction and Services	3	0	0	0	3
4	J211D	Strength of Materials	3	0	0	0	3
5	J211E	Fluid Mechanics	3	1	0	0	4
6	J2111	Surveying Lab	0	0	2	0	1
7	J2112	Strength of Materials Lab	0	0	2	0	1
8	J2113	Computer Aided Civil Engineering Drawing	0	0	0	2	1
9	J2114	Engineering Geology Lab	0	0	2	0	1
10	J2115	Internship – I	0	0	2	0	1
11	J21M1	Gender Sensitization	2	0	0	0	0
Total			**16**	**1**	**8**	**2**	**20**

II YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J22EA	Managerial Economics and Management Science	3	1	0	0	4
2	J220A	Statistics and Numerical Methods	3	1	0	0	4
3	J221A	Hydraulics and Hydraulic Machinery	3	0	0	0	3
4	J221B	Strength of Materials - II	3	0	0	0	3
5	J221C	Concrete Technology	3	0	0	0	3
6	J223E	Mechanical Engineering and Energy Sciences	3	0	0	0	3
7	J2211	Concrete Technology Lab	0	0	2	0	1
8	J2212	Fluid Mechanics and Hydraulic Machinery Lab	0	0	2	0	1
9	J22M1	Professional Ethics	2	0	0	0	0
10	J2201	Soft Skills	2	0	0	0	0
Total			**22**	**2**	**4**	**0**	**22**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

B. Tech Course Structure - R20

III YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J311A	Geotechnical Engineering	3	0	0	0	3
2	J311B	Structural Analysis-I	3	0	0	0	3
3	J311C	Structural Engineering –I **(RCC)**	3	0	0	0	3
4	J311D	Hydrology and Water Resources Engineering	3	0	0	0	3
5	J311F	Environmental Engineering	3	0	0	0	3
6	BTCEO1	Open Elective – I	3	0	0	0	3
7	J3111	Geotechnical Engineering Lab	0	0	2	0	1
8	J3112	Environmental Engineering Lab	0	0	2	0	1
9	J3113	Internship – II	0	0	2	0	1
10	J31M2	Cyber Security	2	0	0	0	0
11	J3101	Employability Skills	2	0	0	0	0
Total			**22**	**0**	**6**	**0**	**21**

III YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J321A	Transportation Engineering	3	0	0	0	3
2	J321B	Structural Engineering – II **(Steel)**	3	0	0	0	3
3	J321C	Foundation Engineering	3	0	0	0	3
4	BTCEE1	Professional Elective - I	3	0	0	0	3
5	BTCEE2	Professional Elective – II	3	0	0	0	3
6	BTCEO2	Open Elective – II	3	0	0	0	3
7	J3211	Transportation Engineering Lab	0	0	2	0	1
8	J3201	Life Skills and Professional Skills Lab	0	0	4	0	2
9	J32M1	Artificial Intelligence	2	0	0	0	0
10	J32A1	Building Bye Laws and Quality Standards	2	0	0	0	0
Total			**22**	**0**	**6**	**0**	**21**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

B. Tech Course Structure - R20

IV YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J411A	Estimation, Costing and Valuation	2	0	0	0	2
2	BTCEE3	Professional Elective – III	3	0	0	0	3
3	BTCEE4	Professional Elective – IV	3	0	0	0	3
4	BTCEE5	Professional Elective – V	3	0	0	0	3
5	BTCEO3	Open Elective-III	3	0	0	0	3
6	J4101	Computational Mathematics	2	0	0	0	2
7	J4112	Computational Mathematics Lab	0	0	2	0	1
8	J4111	Computer Aided Design and Drafting Lab	0	0	4	0	2
9	J4113	Industry Oriented Mini Project	0	0	4	0	2
10	J4114	Project Stage-I	0	0	4	0	2
Total			**16**	**0**	**14**	**0**	**23**

IV YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	BTCEE6	Professional Elective - VI	3	0	0	0	3
2	BTCEO4	Open Elective - IV	3	0	0	0	3
3	J4212	Project Stage - II	0	0	16	0	8
4	J4211	Seminar	0	0	2	0	1
Total			**6**	**0**	**18**	**0**	**15**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

B. Tech Course Structure - R20

List of Professional Elective Courses - R20

S. No	Code	Course Title	L	T	P	D	Credits
Professional Elective Course - I							
1	J321D	Structural Analysis - II	3	0	0	0	3
2	J321E	Ground Water Management	3	0	0	0	3
3	J321F	Structural Health Monitoring	3	0	0	0	3
Professional Elective Course - II							
1	J321G	Irrigation and Hydraulic Structures	3	0	0	0	3
2	J321H	Remote Sensing and GIS	3	0	0	0	3
3	J321I	Sustainable Materials & Green Buildings	3	0	0	0	3
Professional Elective Course - III							
1	J411B	Pavement Design	3	0	0	0	3
2	J411C	Elements of Earthquake Engineering	3	0	0	0	3
3	J411D	Ground Improvement Techniques	3	0	0	0	3
Professional Elective Course - IV							
1	J411E	Pre - Stressed Concrete Structures	3	0	0	0	3
2	J411F	FEM for Civil Engineering	3	0	0	0	3
3	J411G	Industrial Waste Water Treatment	3	0	0	0	3
Professional Elective Course - V							
1	J411H	Construction Technology and Project Management	3	0	0	0	3
2	J411I	Advanced Structural Engineering	3	0	0	0	3
3	J411J	Earth and Rock fill Dams and Slope Stability	3	0	0	0	3
Professional Elective Course - VI							
1	J421A	Urban Waste Management	3	0	0	0	3
2	J421B	Rehabilitation and Retrofitting of structures	3	0	0	0	3
3	J421C	Bridge Engineering	3	0	0	0	3

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

<u>Open Elective – I</u>

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	J31OA	Elements of CIVIL Engineering	CIVIL
2	J31OB	Environmental Impact Assessment	CIVIL
3	J31OC	Energy Engineering	EEE
4	J31OD	Sensors and Transducers	EEE
5	J31OE	Automotive Technology	MECH
6	J31OG	Principles of Sensors and their Application	ECE
7	J31OH	Principles of Communications	ECE
8	J31OI	Fundamentals of Database Management System	CSE
9	J31OJ	Principles of Operating Systems	CSE
10	J31OK	Introduction to Data Structures through Python	IT
11	J31OL	Introduction to Web Design	IT
12	J31OM	Basics of Object-Oriented Programming	ECM
13	J31ON	Fundamentals of Digital Logic Design	ECM
14	J31OP	Introduction to Mining Technology	MIE
15	J31OR	Numerical solution of Ordinary differential equations (Common to EEE,ECE,CSE,IT &ECM) OR Number Theory & Cryptography (Common to CE, EEE, ME, ECE, CSE,IT,ECM & MIE)	Mathematics
16	J31OS	Nano Materials	Physics
17	J31OT	Chemistry of Engineering Materials	Chemistry
18	J31OU	Technical Communication Skills	English
19	J31OV	Entrepreneurship	MBA

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – II

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	J32OA	Construction Management, Contracts and valuation	CIVIL
2	J32OB	Energy Audit & Green buildings	CIVIL
3	J32OC	Hybrid Electric Vehicles	EEE
4	J32OD	Energy Auditing Conservation and Managements	EEE
5	J32OE	Fundamentals of Operations Research	MECH
6	J32OG	Software Defined Radio	ECE
7	J32OH	Basics of IC Technology	ECE
8	J32OI	Fundamentals of Computer Networks	CSE
9	J32OJ	Introduction to Java Programming	CSE
10	J32OK	Computer Organization	IT
11	J32OL	Fundamentals of Human Computer Interaction	IT
12	J32OM	Introduction to Microprocessors and Microcontrollers	ECM
13	J32ON	Internet of Things	ECM
14	J32OP	Introduction to Surface Mining	MIE
15	J32OR	Numerical Solution of Partial Differential Equations	Mathematics
16	J32OS	Advanced Physics for Engineers	Physics
17	J32OT	Green Chemistry	Chemistry
18	J32OU	Technical Writing Skills	English
19	J32OV	Research Methodology	MBA

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – III

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	J41OA	Waste Management	CIVIL
2	J41OB	Road Safety Engineering	CIVIL
3	J41OC	Electrical Engineering Materials	EEE
4	J41OD	Non-Conventional Energy Sources	EEE
5	J41OE	Basics of Robotics	MECH
6	J41OG	Digital Systems Using VHDL	ECE
7	J41OH	MATLAB Programming Language	ECE
8	J41OI	Introduction to Python Programming	CSE
9	J41OJ	Introduction to Mobile Application Development	CSE
10	J41OK	Fundamentals of Object-Oriented Programming Through C++	IT
11	J41OL	Fundamentals of Data Science	IT
12	J41OM	Introduction to Neural networks	ECM
13	J41ON	IC Applications	ECM
14	J41OP	Introduction to Geology	MIE
15	J41OR	Integral Transforms And Integral Equations	Mathematics
16	J41OS	NDT And Vacuum Technology	Physics
17	J41OT	Nano Chemistry	Chemistry
18	J41OU	Teamwork and Team Building	English
19	J41OV	Intellectual Property Rights	MBA

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – IV

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

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code:
J110B</td><td rowspan="2">ENGLISH
(Common To CE, EEE, ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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

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:

On completion of the course, the students will be able to:

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J110A</td><td rowspan="2">DIFFERENTIAL EQUATIONS AND CALCULUS
(Common to All)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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:

Unit-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:

Unit-1: 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 e^{ax}, 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:

Unit-1: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

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

Unit-2: 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-1: 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 2: 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:

Unit-1: Functions of Multi Variables

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

Reference Books:

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

On completion of the course, the students 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. Analyse the improper integrals
5. Find the maxima and minima of multivariable functions.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	3	-	-	-	-	-	-	-	3	..	..
CO2	3	3	2	3	-	-	-	-	-	-	-	3	..	..
CO3	2	2	1	1	-	-	-	-	-	-	-	2	..	..
CO4	3	3	2	1	-	-	-	-	-	-	-	2	..	..
CO5	3	3	2	2	-	-	-	-	-	-	-	2	..	..
Average	3	3	1.9	1.6	-	-	-	-	-	-	-	2.4	..	..

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year –I Sem</td></tr>
<tr><td>Course Code: J110C</td><td rowspan="2">ENGINEERING PHYSICS
(Common to CE, ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study various crystal structures and probing methods like X-Ray diffraction.
2. Impart knowledge concerning the electrical behavior of dielectric & magnetic materials.
3. Understands the fundamentals of oscillations and ultrasonics.
4. Explain principles of physical optics.
5. Understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.

Module 1:

Unit-1: Crystal Structures:

Space lattice, crystallographic axes, Unit cell, Lattice parameters, Crystal systems, Bravais lattices, Atomic radius, Coordination number and atomic packing fraction of SC, BCC and FCC lattices, HCP structures. Miller indices, Crystal planes and directions, Inter-planar spacing of orthogonal crystal systems.

Unit 2: X-ray Diffraction:

Introduction, Bragg’s law, Laue and Powder methods, Application of XRD to analyze Cubic structure.

Module 2:

Unit-1: Dielectric Properties:

Basic definitions, electronic, ionic and orientation polarizations (quantitative treatment), Internal fields in Solids, Clausius - Mossotti equation, Applications – Piezo electricity and Ferro-electricity.

Unit-2: Magnetic Properties:

Basic definitions, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve.

Module 3:

Unit-1: Vibrations:

Simple harmonic vibrations and its solutions (quantitative), Damped, Forced vibrations (qualitative) and Resonance. Applications: Torsional Pendulum and Compound Pendulum.

Unit-2: Ultrasonic:

Production and properties of ultrasonics, piezoelectric effect Method., Applications of ultrasonics special reference to NDT.

Module 4: Wave Optics

Unit-1: Interference:

Principle of Superposition, coherence and methods to produce coherent sources, interference in thin film by reflected light, Newton's Rings.

Unit-2: Diffraction

Distinction between Fraunhofer and Fresnel Diffraction, Farunhofer diffraction due to single slit, Plane Diffraction Grating, resolving power of Grating.

Unit-3: Polarization

Introduction, Polarization of light waves, Plane of vibration, plane of polarization, Malus's law, Brewster's law.

Module 5: Lasers & Fibre Optics

Unit-1: Lasers:

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

Unit-2: Fibre Optics:

Introduction, Construction and working principle of Optical fibre, Acceptance angle, Acceptance cone and Numerical aperture, Types of optical fibres, Applications of optical fibres.

Text Books:

1. "Engineering Mechanics", 2nd edition. - MK Harbola, Cengage Learning.
2. "Engineering Physics", Gaur and Gupta, McGraw Hills.
3. "Optics", Ajoy Ghatak, McGraw Hill Education, 2012.

Reference Books:

1. "The physics of vibrations and waves", H. J. Pain, Wiley, 2006.
2. "Principles of Lasers", O.Svelto.
3. "Introduction to Mechanics", M.K.Verma, Universities Press.
4. "Engineering Physics", P.K.Palanisamy, Scitech Publications, Fourth edition.

E - Resources:

1. http://www.gistrayagada.ac.in/gist_diploma/PHYSICS-StudyMaterial.pdf
2. http://www.faadooengineers.com/threads/3300-Applied-Physics-Ebooks-pdf
3. free download?s=1b6cb6b1de4e7152298bd9d60156cd11
4. http://aip.scitation.org/journal/jap
5. http://www.springer.com/physics/journal/340 5. 5.
6. http://nptel.ac.in/courses/115101005/1
7. http://nptel.ac.in/courses/115106061/13.

Course Outcomes:

On completion of the course, the students will be able to:

1. familiar with Bragg's Law and explain its the relation to crystal structure
2. Explain the principles of physics in dielectrics, magnetic materials useful to engineering
   Applications.

3. Describe the types of oscillations and analyze them.
4. Interpret the intensity variation of light due to interference, diffraction and polarization.
5. Analyze working principle of lasers and to summarize its applications.

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech I Year – I Sem			
Course Code: J115A	**PROGRAMMING FOR PROBLEM SOLVING (Common to CE, EEE ME & MIE)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Mathematical Knowledge, Analytical Skills.

Course Objectives:

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:

Unit-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.

In 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:

Unit-1: 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.***Practice:*** Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Module 3:

Unit-1: 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.

Unit-2: File Handling in C: 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:

Unit-1: Function:

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.

Unit-2: Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types.

Module 5:

Unit-1: 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)

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
3. Stephen G. Kochan, Programming in C, Fourth Edition, PearsonEducation.
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4thEdition
5. Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill

E - Resources:

1. https://fresh2refresh.com/c-programming/
2. https://www.studytonight.com/c/
3. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/
4. https://www.programiz.com/c-programming

5. http://www.gtucampus.com/uploads/studymaterials/Degree%20EngineeringSandip Fundaments_of_C.pdf
6. http://cs.indstate.edu/~cbasavaraj/cs559/the_c_programming_language_2.pdf

Course Outcomes:

On completion of the course, the students will be able to:

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

CO-PO/PSO Mapping Chart (Draft) **(3/2/1 indicates strength of correlation)** **3 – Strong; 2 – Medium; 1 – Weak**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	3
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	3
Average	2.8	2.0	2.3	2.0	2.0	-	-	-	-	-	-	1.0	2.0	2.8

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J1101</td><td rowspan="2">ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB (Common to CE, EEE ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning

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

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

a) Computer Assisted Language Learning (CALL) Lab:
b) Interactive Communication Skills (ICS) Lab:

Module 1:

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.

Module 2:

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.

Module 3:

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.
Module 4:
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.
Module 5:
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Interview Skills.
Practice: Mock Interviews.
Facilities:
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
Interactive Communication Skills (ICS) Lab:

1. **The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

Course Outcomes:
On completion of the course, the students will be able to:

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

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	..	..	..	..	2	..	..	..	3	3	..	2	..	..
CO2	..	..	..	..	..	..	..	..	3	3	..	2	..	..
CO3	..	..	..	..	..	..	..	..	3	3	..	2	..	..
CO4	..	..	..	..	..	..	..	..	3	3	..	2	..	..
CO5	..	..	..	..	..	..	..	..	3	3	..	2	..	..
Average	..	..	..	..	0.4	..	..	..	3	3	..	2	..	..

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J1102</td><td rowspan="2">ENGINEERING PHYSICS LAB
(Common to CE, ME &MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
2. Demonstrate competency and understanding of the concepts found in Mechanical, Electric and Electronic materials a broad base of knowledge in physics.
3. Solve Experimental problems that potentially draw an experimental knowledge in multiple are as of physics.
4. Upgrade practical knowledge in optics.
5. Analyze the behaviour and characteristics of various materials for its optimum utilization.

List of Experiments:

1. **Melde's Experiment**
   To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.
2. **Torsional Pendulum**
   To determine the rigidity modulus of the material of the given wire using torsional pendulum.
3. **Newton's Rings**
   To determine the radius of curvature of the lens by forming Newton's rings.
4. **Diffraction Grating**
   To determine the number of lines per inch of the grating.
5. **LCR Circuit**
   To determine the Quality factor of LCR Circuit (Series& Parallel).
6. **Stewart's and Gee's Method**
   To determine the Magnetic induction by using circular coil.
7. **Sonometer**
   To determine the frequency of AC Supply sonometer.
8. **LASER**
   To study the characteristics of LASER sources.
9. **Dielectric Constant**
   To determine the Dielectric constant of the given material.
10. **Optical fiber.**
    Determination of Numerical Aperture and Bending losses of an optical fibre.

Note: Any 8 experiments are to be performed.

Text Books:

1. "Experiments in Applied Physics", Dr. Narendra, L. Mathakari, (Physics Lab Manual 4th edition)
2. "Engineering Physics Lab Resources", by Department of Physics JBIET.

Course Outcomes:

On completion of the course, the students will be able to:

1. Learn the experimental concepts on in Mechanical, Electric and Electronic materials.
2. Understand principle, concept, working, application and comparison of results with theoretical calculations.
3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
4. Understand measurement technology.
5. Use new instruments and real time applications in engineering studies.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	1	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	2	-
Average	3	1.5	1.33	-	-	-	-	-	-	-	-	-	1.2	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech I Year – I Sem			
Course Code: J1151	**PROGRAMMING FOR PROBLEM SOLVING LAB** (Common to all branches)	**L**	**T**	**P**	**D**
Credits: 2		**0**	**0**	**4**	**0**

Pre-requisite: Mathematical Knowledge, Analytical Skills.

Course Objectives:

This course will enable students to:

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.

List of Experiments:

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 filename 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 numberispalindrome.
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 xis5, 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 dimensionarray.

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

Reference Books:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,Prentice Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
4. Stephen G. Kochan,Programming in C, Fourth Edition, PearsonEducation.
5. Herbert Schildt, C: The Complete Reference, McGrawHill, 4thEdition

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:

On completion of the course, the students will be able to:

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code: J120A</td><td rowspan="2">LINEAR ALGEBRA AND ADVANCED CALCULUS
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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: Matrices and System of Equations

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

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:

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

Module 4: Vector Differential Calculus:

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:

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

Text Books:

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

Reference Books:

1. "A text book of Engineering Mathematics", N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008.
2. **"Higher Engineering Mathematics", Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11^{th}Reprint, 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:

On completion of the course, the students will be able to:

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

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

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

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code:
J120C</td><td rowspan="2">APPLIED CHEMISTRY
(Common to CE, ME & MINING)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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

Module 1:

Unit-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 N_2, O_2, F_2, 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:

Unit-1: 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: Electrochemistry:

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 Lithium ion battery).

Unit-2: Corrosion

Corrosion- Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors effecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. techniques of coating-hot dipping, cementation and electroplating of Copper ,electroless plating of Nickel.

Module 4:

Unit-1: Spectroscopic Techniques and Applications:

Principles of spectroscopy, molar-extinction co-efficient, types of transitions in UV, selection rules, important terms in UV spectra and applications of electronic spectroscopy. Vibratinal spectroscopy-principle, stretching 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:

Unit-1: Reaction Mechanism and Synthesis of Drug Molecules:

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff's 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 $LiAlH_4$& $NaBH_4$. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin

Text Books:

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

Reference Books:

1. "Engineering Chemistry", M.Thirumalachary and Laxminarayan, Scitech Publications.
2. "Engineering Chemistry", B. L. Tembe, Kamaluddin and M.S.Krishnan ,NPTEL web book).
3. "Stereochemistry of organic compounds" , 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 Outcomes:

On completion of the course, the students will be able to:

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

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: I Year – II Sem			
Course Code: J129A	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING** (Common to CE, ME and MINING)	**L**	**T**	**P**	**D**
Credits: 4		**3**	**1**	**0**	**0**

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To introduce the concept of electrical circuits using network laws and theorems.
2. To outline and analyse single phase A.C and three phase A.C circuits.
3. Learn in recognizing of basic electronic devices such as Diodes, Transistors, to build circuits like amplifiers and oscillators etc.
4. Get knowledge on the various parameters useful for designing electronic system.
5. Acquire the knowledge of various configurations, characteristics and applications

Module 1

UNIT-1: DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Analysis of simple circuits with DC excitation. Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel combinations.

Star to Delta and Delta to Star Transformations, Source transformations, Superposition, Thevenin and Norton Theorems.

Module 2

Unit-1: AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor.

Unit -2: 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

Unit -1: P-N Junction Diode:

P-N junction as a Diode, Symbol, Volt-Ampere characteristics, , Ideal versus practical Diode, static and dynamic resistances, Diffusion and Transition Capacitances(qualitative analysis).

Unit -2: Rectifiers and Filters:

Diode rectifier: Half wave Rectifier, Ripple Factor-Full Wave Rectifier, Bridge Rectifier, Rectifiers with Filters: Capacitive Filters, L-section Filters, π- section Filters.

Module -4:

Unit -1: Bipolar Junction Transistor (BJT):

Symbol, Construction, principle of Operation, Current Components in a junction transistor Common Emitter, Common Base and Common Collector configurations. Transistor Biasing -Operating point, DC and AC load lines, Fixed Bias, Collector to Base bias, Self-Bias (Voltage divider bias), Bias stability.

Unit -2:

Small signal Transistor Analysis, h- Parameters, Definitions, Determination of h-parameters from CE transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters and their Comparison.

Module -5:

Unit -1: Junction Field Effect Transistor

Construction, Principle of Operation, Volt-Ampere characteristics, comparison of BJT and JFET, small signal Model, MOSFET: Depletion and Enhancement MOSFET-construction and characteristics.

Unit-2: Special Purpose Devices:

Zener Diode, Construction, operation & characteristics, Zener diode as a simple regulator, principle of operation and Characteristics of Tunnel Diode, Principle of operation of SCR.

Text Books:

1. V.K. Mehta and Rohith Mehta, "Basic Electrical Engineering", S. Chand Publications,2012.
2. S.Salivahan, R. Rengaraj"Basic Electrical Engineering",Tata McGrawHill,2018.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill,2009.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford UniversityPress,2011
5. Electronic Devices and circuits –S.Salivahana&N.Suresh Kumar, Mc Graw

Reference Books:

1. Dr. Ramana Pilla, Dr. M. Suryakalavathi, "Basic Electrical Engineering",S. Chand,2018.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India,1989.
3. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
4. Network Theory by N.C.Jagan and C.Lakshminarayana, B.S.Publications.
5. Electronic Devices and Circuits- R.L.Boylestad and Louis Nashelsky, PEI/PHI, 9^{th} Ed, 2006.

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:

On completion of the course, the students will be able to:

1. Illustrate and solve electrical circuits using network laws and theorem.
2. Acquire knowledge about the single phase and three phase electrical circuits
3. learn in recognizing of basic electronic devices such as Diodes, Transistors, to build circuits like amplifiers and oscillators etc.
4. given thorough knowledge on the various parameters useful for designing

electronic system.

5. acquire the knowledge of various configurations, characteristics and applications

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	-
CO2	3	3	2	2	2	-	-	-	-	-	-	2	3	-
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	-
CO4	3	2	3	2	2	-	-	-	-	-	-	2	2	-
CO5	3	2	2	2	2	-	-	-	-	-	-	2	2	-
Average	3	2.6	2.4	2.2	2	-	-	-	-	-	-	2	2.6	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: I Year – II Sem</td></tr>
<tr><td>Course Code: J123A</td><td rowspan="2">ENGINEERING MECHANICS
(Common to CE, ME, MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Physics.

Course Objectives:

This course will enable students to:

1. Learn to determine resultant of force systems and solve problems using equations of equilibrium.
2. Perform analysis of bodies lying on rough surfaces, the basics structural analysis of trusses and principles of virtual work.
3. Obtain the centroid, Centre of Gravity and moment of inertia for various standard & composite sections.
4. Understand the basic concepts of dynamic and analysis as a particle and rigid bodies.
5. Understand the work energy principles & its applications and to know the concept of simple harmonic motions, free & forced vibration.

Module 1

Unit 1: Resultant Force system: Concepts of force, System of forces, components of forces in a plane and in space systems. Resultant of force systems. Moment of forces and its applications. Couples and its applications

Unit 2: Equilibrium of Force System: Free body diagram, equation of equilibrium of coplanar and spatial force systems.

Module 2

Unit 1: Friction: Laws of friction, application of friction to a single body & connecting system, wedge friction.

Unit 2: Analysis of Trusses: Analysis of perfect trusses using method of joints and method of sections.

Unit 3: Virtual Work: Virtual displacements, Principle of virtual work for particle and ideal system of rigid bodies- problems on determinate beams only.

Module 3

Unit 1: Centroid & Centre of Gravity: Centroid of simple planes (from first principles), Centroid of Composite sections, Centre of gravity and its implications, Pappu’s theorems.

Unit 2: Area & Mass moment of Inertia: Definition of Area moment of Inertia, Moment of inertia of plane section from first principles, Theorems of moment of inertia, moment of inertia of standard sections and composite sections, Mass moment of inertia of rectangular and circular plates, cylinder, cone & sphere.

Module 4

Unit 1: Kinematics: Rectilinear and Curvilinear motion, Velocity and Acceleration, Types of Rigid body motion, Kinematics of fixed axis rotation and Plane Motion.

Unit 2: Kinetics: Kinetics of Particle and Rigid Body in Translation, Fixed Axis Rotation, Equations of Plane Motion, Rolling Bodies.

Module 5

Unit 1: Work Energy Method: Work Energy Principle and its application to Translation, Fixed axis rotation and plane motion.

Unit 2: Mechanical Vibrations: Introduction to vibration, free and forced vibrations, simple harmonic motion, simple pendulum and compound pendulum.

Text Books:

1. Timoshenko & Young, “Engineering Mechanics”,
2. Vijaykumar K. and J. Suresh Kumar, “Engineering Mechanics Statics and Dynamics”, B. S. Publications. 2011.

Reference Books:

1. Basudev Bhattacharya, “Engineering Mechanics”, Oxford University Press, New Delhi, 2nd Edition, 2014
2. S.S. Bhavikatti & J.G. Rajasekharappa, “Engineering Mechanics”, 2010.
3. Irving. H. Shames, “Engineering Mechanics”, Prentice–Hall, 2012.

E - Resources:

1. i) https://rb.gy/6nbwyl ii) https://rb.gy/s5qltu
2. https://nptel.ac.in/courses/122/104/122104015/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Solve** problems dealing with forces in plane and space force system, draw free body diagrams to analyze various problems in equilibrium.
2. **Analyze** for smooth and frictional surface, simple trusses for forces and virtual work.
3. **Determine** the Centroid, centre of gravity and moment of inertia for elementary.
4. **Solve** problem in kinematics and kinetics of particles and rigid bodies.
5. **Analyze** body motion using work energy principles and able to apply the concept of simple harmonic motion and free vibrations in dynamics.

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code: J1201</td><td rowspan="2">CHEMISTRY LABORATORY
(Common to CE, ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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

List of Experiments:

1. Determination of total hardness of water by complexometric 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 Conductometric 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. Eg.ortho 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.

Text Books:

1. "Senior practical physical chemistry", B.D. Khosla, A. Gulati and V. Garg ,(R. Chand & Co., Delhi)
2. "An introduction to practical chemistry", K.K. Sharma and D. S. Sharma, (Vikas publishing, N. Delhi)

3. "text book of practical organic chemistry ",Vogel's ,5th edition.
4. "Text book on Experiments and calculations in engineering chemistry",S.S. Dara-

Course Outcomes:

On completion of the course, the students 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 student to apply to various systems like communications, solar cell, photo cells and so on.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	2	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.5	-	-	-	-	0.4	-	-	-	-	-	0.4	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code: J1291</td><td rowspan="2">BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (CE, ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To analyse a given network by applying various electrical laws and network theorems.
2. To know the response of electrical circuits for different excitations.
3. To calculate, measure and know the relation between basic electrical parameters.
4. Study the Operation of basic Instruments & electronic components and their Applications.
5. Study the characteristics of Diodes and Transistors.

List of Experiments:

1. Verification of Ohms Law.
2. Determination of unknown resistance.
3. Verification of KVL and KCL.
4. Transient response of series RL and RC circuits using DC excitation.
5. Transient response of RLC series circuit using DC excitation.
6. Resonance in series RLC circuit
7. Forward & Reverse Bias Characteristics of a PN Junction Diode
8. Zener diode Characteristics and Zener diode as a voltage Regulator
9. Input & Output Characteristics of Transistor in CB Configuration.
10. Input & Output Characteristics of Transistor in CE Configuration.
11. Half Wave Rectifier with & without filters
12. Full Wave Rectifier with & without filters
13. Bridge Rectifier with & without filters

Course Outcomes:

On completion of the course, the students 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. Measure the voltage, frequency and phase of any waveform using CRO.
5. Perform experiment to study the characteristics of Diodes and Transistor

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

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: I Year – II Sem</td></tr>
<tr><td>Course Code: J1292</td><td rowspan="2">ENGINEERING AND IT WORKSHOP
(Common CE, MIE, EEE, ME)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 2</td><td>0</td><td>0</td><td>4</td><td>0</td></tr>
</table>

Pre-requisite: Basic knowledge about tools and different trades

Course Objectives:

This course will enable students to:

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

(A) ENGINEERING WORKSHOP

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

(B) 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

TEXT BOOKS:

1. P. N. Rao, “Manufacturing Technology”, Tata McGraw Hill, 4th Edition, 2013.
2. K. C. John, “Mechanical Workshop Practice”, PHI Publishers, 2nd Edition, 2010.
3. IT Essentials PC Hardware and Software Companion Guide Third Edition by Davis Anfinson and Ken Quamme CISC Press, Pearson Education.
4. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

Course Outcomes:

On completion of the course, the students 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

Note: *The work load for this to be distributed in 75:25 for Engineering workshop and IT workshop*

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: I Year – II Sem</td></tr>
<tr><td>Course Code: J1231</td><td rowspan="2">ENGINEERING DRAWING
(Common to CE, MIE, EEE, ME)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>0</td><td>0</td><td>0</td><td>6</td></tr>
</table>

Pre-requisite: Engineering Mathematics.

Course Objectives:

This course will enable students to:

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

Module 1

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

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

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

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

Module 2

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

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

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

Module 3

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

Module 4

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

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

Module 5

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

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

(First Angle Projection Convention to be followed)

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

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing House,2014.
2. K. Venugopal & V. Prabhu Raja, "Engineering Drawing + Auto CAD", New Age International Publishers. Fifth Edition, 2011.
3. AutoCAD Software Theory and User Manuals

Reference Books:

1. Narayana, K.L. & P Kannaiah, "Text book on Engineering Drawing", Scitech Publishers, 2008
2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH Publication, 2012.

E - Resources:

1. https://nptel.ac.in/courses/112/103/112103019/
2. http://www.autocadtutorials.net/
3. https://urlzs.com/fLJ3T
4. https://urlzs.com/zky46

Course Outcomes:

On completion of the course, 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

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	2	-	-	-	-	-	-	3		
CO2	3	3	2	1	2	-	-	-	-	-	-	3		
CO3	3	3	2	1	2	-	-	-	-	-	-	3		
CO4	3	3	3	1	2	-	-	-	-	-	-	3		
CO5	3	3	3	1	2	-	-	-	-	-	-	3		
Average	3	3	2.4	1	2	-	-	-	-	-	-	3		

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech I Year – II Sem			
Course Code: J12M1	**ENVIRONMENTAL SCIENCE (Common to CE, EEE, ME, and MIE)**	**L**	**T**	**P**	**D**
Credits:0		**2**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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, Greenhouse 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. “Textbook of Environmental Science And Technology” by M Anji Reddy, BS Publications, 2007.
2. “Principles of Environmental Science and Engineering” by Rao P. Venugopala, Prentice Hall India Learning Private Limited (1 January 2006)

3. “Environmental Studies (A Text Book for Undergraduates)” by Dr. K Mukkanti, S. Chand, 2010
4. “Environmental Studies” by Kaushik Anubha, C P Kaushik, New Age International Private Limited 1st August 2018

Reference Books

1. **“Environmental Studies” by Benny Joseph, McGraw Hill Education 2008.**
2. **“Textbook of Environmental Studies for Undergraduate Courses” by Erach Bharucha 2005, University Grants Commission, University Press**

Web Resources

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

Course Outcomes

On completion of the course, the students will be able to:

1. **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.

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

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – I Sem</td></tr>
<tr><td>Course Code: J211A</td><td rowspan="2">SURVEYING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Explain the Principles and Methods of Surveying.
2. Decribe the field applications and concepts of Levelling Survey and different methods of calculation of Area, Contouring and Measurement of Volumes.
3. Apply the basics of Theodolites survey in Elevation and Angular Measurements and understand Tachometric Surveying in distance and height measurements.
4. Discuss with different types of curves and curve setting.
5. Describe the use modern surveying equipment for obtaining accurate results.

Module 1:

Unit-1: Introduction:

Objectives, Principles and Classification of Surveying, Scales, Shrinkage of Map, Conventional Symbols and Code of Signals, Surveying Accessories, Phases of Surveying.

Unit-2: Linear Measurements:

Approximate Methods, Direct Methods- Chains- Tapes, Ranging, Tape Correction, Errors and Obstacles in Chaining.

Unit-3: Angular Measurements

Compass, Bearings, Included Angles, Local Attraction, Magnetic Declination, and Dip.

Module 2:

Unit-1: Levelling and Contouring:

Types of levels and Levelling staves, Temporary Adjustments, Methods of levelling, Booking and Determination of levels, Effect of Curvature of Earth and Refraction. Characteristics and uses of Contours, Methods of Contour surveying.

Unit-2: Areas and Volumes:

Determination of Areas consisting of Irregular Boundary and Regular Boundary. Determination of Volume of Earth work in cutting and embankments for level section, Volume of Borrow pits, Capacity of Reservoirs.

Unit-3: Principles of Plane Table Survey:

Principles, Adjustment, Working operations, Methods of Plane Table surveying, Two-point problem, Three-point problem.

Module 3:

Unit-1: Theodolite Surveying: Types of Theodolites, Fundamental Lines, Temporary Adjustments, Measurement of horizontal angle by Repetition Method and Reiteration Method, Measurement of vertical angle, Trigonometrical levelling when base is accessible and inaccessible. Methods of Traversing, Traverse Computations and Adjustments, Omitted measurements.

Unit-2: Tachometric Surveying:

Principles of Tachometry, Stadia and Tangential Methods of Tachometry.

Module 4:

Unit-1: Setting Out Curves:

Elements of simple and compound curves, Method of setting out, elements of reverse curve, Transition curve, length of curve, elements of transition curve, vertical curves. Types of Curves and their necessity, Simple curves, Elements of Compound, Reverse, Transition and Vertical Curves.

Module 5:

Unit-1: Astronomical Surveying:

Astronomical terms and definitions, Motion of sun and stars, Celestial coordinate systems, different time systems, Apparent altitude and corrections, Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method.

Unit-2: Hydrographic Surveying:

Tides, MSL, Sounding methods.

Unit-3: Total Station:

Introduction, advantages, Fundamental quantities measured, Parts and accessories, working principle, on board calculations, Field procedure, Errors and Good practices in using Total Station.

Unit-4: Global positioning System:

Introduction, Types of GPS and uses.

TEXT BOOKS:

1. "Plane Surveying and Higher Surveying" by Chandra A M New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition Jan 2014.
2. "Surveying (Vol – 1 & 2), by Duggal S K Tata McGraw Hill Publishing Co. Ltd. New Delhi. 12th Edition oct 2016.

REFERENCES:

1. "Elements of Plane Surveying" by Arthur R Benton and Philip J, Taety McGraw Hill Publishers, New Delhi, 13th Edition Jan 2010.
2. "Surveying and levelling" by R. Subramanian, Oxford university press, New Delhi, 9th Edition, oct 2012.

E- Resources:

1. https://nptel.ac.in/courses/105/104/105104101/
2. https://nptel.ac.in/courses/105/107/105107122/
3. https://nptel.ac.in/courses/105/104/105104100/

Course outcomes:

On completion of the course, the students will be able to:

1. **Apply** the basic principles of chain surveying.
2. **Evaluate** survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the methodologies.
3. **Apply** the measurements of angles, distances, and levels.
4. **Design** simple and compound Curves for highways.

5. **Illustrate** on advanced technology like Hydrographic Surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	1	-	1	-	-	-	-	-	-	2	2	1
CO2	3	3	2	-	1	-	-	-	-	-	-	3	3	1
CO3	3	3	1	-	1	-	-	-	-	-	-	3	2	1
CO4	2	2	2	-	1	-	-	-	-	-	-	2	3	1
CO5	2	2	1	-	3	-	-	-	-	-	-	3	2	1
Average	2.6	2.6	1.4	-	1.4	-	-	-	-	-	-	2.6	2.4	1

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE II Year – I Sem			
Course Code: J211B	**ENGINEERING GEOLOGY**	**L**	**T**	**P**	**D**
Credits:2		**2**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the basic knowledge of Geology that is required for constructing various Civil Engineering Structures.
2. Describe the earth structure materials (Minerals, rocks, faults & folds).
3. Emphasize the core activities of geologist's site characterization, geologic hazard identification and mitigation.
4. Study the importance of different geological elements with respect to earth pressure.
5. Describe the geological aspects in planning and construction of major Civil Engineering projects.

Module 1:

Unit-1: Introduction to Geology

Different branches of Geology and the Importance of geology from Civil Engineering point of view. Case Studies on some of failure Civil Engineering constructions due to geological drawbacks.

Unit-2: Mineralogy

Introduction and Importance of minerals. Different methods to identify minerals. Physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite Garnet, Talc and Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

Module 2:

Unit-1: Petrology

Importance of Petrology from Civil Engineering point of view. Weathering of Rocks. Weathering process of granite. Geological classification and Common structures and textures of rocks. Megascopic study of following rocks Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

Module 3:

Unit-1: Structural Geology

Introduction to Structural Geology, Indian stratigraphy, geological time scale**,** out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and their case studies.

Unit-2: Rock Mechanics

Sub surface investigations in rocks and engineering characteristics and Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and shear strength of rocks, bearing capacity of rocks.

Module 4:

Unit-1: Geological Hazards

Earthquakes **-** Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides-Causes and effects. Measures to be taken to prevent their occurrence. Land Subsidence and Environmental Geology.

Unit-2: Geophysical Studies and Ground water

Importance of Geophysical Studies. Geophysical methods-Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radio metric methods and geothermal method. Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement and ground water exploration.

Module 5:

Unit-1: **Geological Considerations in Civil Engineering Structures**

Dam types and geological considerations in the selection of dam site. Case Studies on dam failures due to geological draw backs. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs

Unit-2: Tunnelling:

Purpose of tunnelling, Effects of Tunnelling on the ground, Role of Geological Considerations (i.e. Litho logical, structural, and ground water) in tunnelling over break and lining in tunnels. Grouting methods.

Text Books:

1. "Engineering Geology" by N. Chennakesavulu, McMillan, India Ltd, 4thEdition Oct 2005
2. "Principles of Engineering Geology" by K.V.G.K Gokhale- B.S. Publications, 3rd Edition Jan 2010.

Reference Books:

1. "Engineering Geology" by P C Varghese, PHI Learning Private limited, 2nd Edition Dec 2012
2. "Engineering Geology" by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd, 2nd Edition Nov 2014.

E-Resources

1. http://nptel.ac.in/courses/105105106/
2. http://www.geologypage.com/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Perform** Site characterization to collect, analyze, and report geologic data using Standards in engineering practice.
2. **Evaluate** the fundamentals of the engineering properties of Earth materials and fluids.

3. **Analyze** Rock mechanics characterization and ground water applications.
4. **Examine** geological hazards and mitigation methods.
5. **Identify** geological aspects in planning and construction of major Civil Engineering projects.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	2	-	1	-	-	-	-	-	1	1	-
CO2	3	-	2	2	-	1	-	-	-	-	-	1	1	-
CO3	2	-	-	1	-	1	-	-	-	-	-	1	1	-
CO4	2	-	-	2	-	2	-	1	-	-	-	1	1	-
CO5	2	-	-	-	-	2	-	1	-	-	2	2	1	2
Average	2.4	-	0.4	1.4		1.4		0.4			0.4	1.4	1	0.4

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year - I Sem</td></tr>
<tr><td>Course Code: J211C</td><td rowspan="2">BUILDING MATERIALS, CONSTRUCTION AND SERVICES</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study a basic idea about the Stones, Bricks and Tiles used in building material.
2. Study about the basic building material properties and their applications.
3. Study smart building materials, types of paints and varnishes.
4. Identify different types of masonries and their applications.
5. Describe the various services provided to buildings.

Module 1:

Unit-1: Stones and Bricks:

Building stones, classification of building stones, quarrying procedures, structural Requirement, dressing, and tools for dressing of stones. Bricks-Composition of brick earth, manufacturing of brick, structural requirements, field and lab test. AAC blocks-Other types of building blocks.

Unit-2: Tiles:

Types of tiles, manufacturing of tiles, structural requirements of tiles.

Unit-3: New construction materials ceramics - sustainable and eco-friendly materials, nano materials.

Module 2:

Unit-1: Cement and Admixtures:

Cement, Lime-Various ingredients of lime, constituents of limestone and classification of lime, manufacturing of lime. Mineral admixtures, chemical admixtures.

Unit-2: Ferrous Metals and Nonferrous Metals:

Types, properties and uses and advantages of ferrous metals and non-ferrous metals.

Unit-3: Alloys:

Types, properties and uses - aluminum alloys, copper alloys and steel alloys.

Module 3:

Unit-1: Auxiliary Materials:

Structure, types of wood, properties of wood, seasoning, defects, alternative material for wood. Glass Types of glasses, manufacturing of glass. Paints-Constituents of paints, types of paints.

Unit-2: Building Components:

Building Components: Lintel, arches, staircase, floors, roofs, foundation, and damp-proof course. Joinery-Doors, windows, materials, and types.

Module 4:

Unit-1: Masonry, Wall Elements and Formwork:

Brick masonry: Types, bonds. Stone Masonry: Types, composite masonry, concrete reinforced bricks, and glass -reinforced brick. Finishing slope: plastering, pointing, and cladding- Types of ACP (Aluminium composite panel), High pressure laminations, composites - FRP, wall panelling elements -Types of roof sheeting -cold formed & light gauge steel.

Formwork: requirements, standards, scaffolding, shoring, under pinning.

Module 5:

Unit-1: Building Services:

Introduction to MEP (Mechanical electrical plumbing), Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics, lifts, escalators. characteristics-Absorption, fire protections, fire hazards, classification of fire resistance materials and construction.

Text Books

1. **"Building materials and Construction" by Rangwala, Sushil Kumar, Bindra, kamala Standard Publishers, 33rd edition, Jan 2019.**
2. **"Building Construction", by B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd., New Delhi, 11th Edition, 2016.**

REFERENCES:

1. "Construction Technology" Vol. – 1 & 2, by R. Choudly 2nd Edition, Longman, UK, 1987.
2. "Building Construction", by P C Varghese, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.
3. National Building Code of India, 2006.
4. "Advance in Building Materials and construction", CBRI Rookie.

E-Resources

1. https://nptel.ac.in/courses/105/102/105102088/
2. https://www.mepcentre.com/course/fire-protection-design
3. https://nptel.ac.in/courses/124/105/124105013/

Course outcomes:

On completion of the course, the students will be able to:

1. **Identify** various building materials and select suitable type for given situation.
2. **Gain** Knowledge on different properties of building materials.
3. **Compare** the different types of doors, windows, roofs, staircase used in building works.
4. **Explain** different types of masonries and their applications.
5. **Evaluate** various building services required for construction.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	2	-	-	-	2	2	1	-	-	2	2	-
CO2	2	1	2	-	-	-	3	2	1	-	-	2	2	-
CO3	2	1	2	-	-	-	1	2	1	-	-	2	2	-
CO4	2	1	3	-	-	-	3	3	1	-	-	3	3	-
CO5	3	2	3	-	-	-	3	3	1	-	-	3	3	-
Average	2.2	1.2	2.4	-	-	-	2.4	2.4	1	-	-	2.4	2.4	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – I Sem</td></tr>
<tr><td>Course Code: J211D</td><td rowspan="2">STRENGTH OF MATERIALS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mechanics

Course Objectives:

This course will enable students to:

1. Explain the stress, strain, elasticity, and strain energy of engineering materials.
2. Determine the shear force and bending moment for various types of structures.
3. Calculate the bending stresses with the use of simple bending theory.
4. Analyze the structures by using slope deflection method.
5. Study the Transformation of Stresses and strains.

Module 1:

Unit-1: Stresses and Strains:

Concepts of stress and strain - Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Generalized Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Unit-2: Strain Energy:

Strain Energy – Resilience – Gradual, sudden, and impact loadings – simple applications.

Module 2:

Unit-1: Shear Force & Bending Moment:

Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between intensity of loading, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to point load, uniformly distributed load, uniformly varying load, couple, and their combinations.

Module 3:

Unit-1: Bending Stresses:

Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I, T and Channel sections – Design of simple beam sections.

Unit-2: Shear Stresses:

Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, I, T and channel sections

Module 4:

Unit-1: Slope and Deflection of Beams – Analytical Methods:

Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and couple.

Unit-2: Geometrical methods:

Moment area method and conjugate beam methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and couple.

Module 5:

Unit-1: **Principal Stresses and strains:**

Normal and tangential stresses on a plane element, their transformation to a different coordinate axes in the same plane, principal stresses & strains.

Unit-2: Mohr's Circle:

Analytical and graphical solution technique. Mohr's circle of stresses and strains.

Text Books:

1. "Strength of Materials" Vol – I & II, Elementary theory and problems, by S.Timoshenko. 3rd edition Jan 2015.
2. "Mechanics of Materials" by C. Ferdinand, P. Beer & E. Russell Johnston Jr & John T. Dewolf & David F. Mazurek. 6^{th} edition Apr 2018.

Reference Books:

1. "Mechanics of material" by R.C.Hibbeler, Printice Hall publications. 4th edition Jan 2014.
2. "Engineering Mechanics of Solids" by EgorP. Popov, Printice Hall publications. 2^{nd} edition 2015.
3. "Strength of Materials" Vol –I & II by S S Bhavikatti, Vikas Publications, 4^{th} edition, Oct 2010.

E-Resources

1. http://www.aboutcivil.org/solid-mechanics.html
2. https://nptel.ac.in/courses/112/106/112106141/
3. http://nptel.ac.in/courses/105105108/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Analyze** stress, strain, elasticity, and the relation between all elastic constants for homogenous, isotropic materials.
2. **Solve** the shear force and bending moment for basic types of Beams.
3. **Analyze** Bending Stresses and Shear Stresses of beam section.
4. **Analyze** Slope and Deflection of Beams using Analytical methods & Geometrical methods.
5. **Analyse** stress at a point in 2 dimensions and draw Mohr's circle for stress at a point.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	-	-	-	-	-	-	-	-	-	2	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	2	1	-
CO3	2	2	1	-	-	-	-	-	-	-	-	2	2	-
CO4	2	3	-	-	-	-	-	-	-	-	-	2	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	2	1	-
Average	2	2.4	0.6	-	-	-	-	-	-	-	-	2	1.2	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE II Year – I Sem			
Course Code: J211E	**FLUID MECHANICS**	**L**	**T**	**P**	**D**
Credits:4		**3**	**1**	**0**	**0**

Pre-requisite: Basics of Mathematics, Physics and Engineering Mechanics

Course Objectives:

This course will enable Students to:

1. **Explain** the properties of the fluid, pressure exerted by the fluid, fluid Measurement and buoyancy and floatation.
2. **Describe** the different types of fluid flows.
3. **Apply** the laws of conservation of mass, energy, and momentum for fluid flow.
4. **Analyse** the phenomenon of flow in pipes.
5. **Explain** the concept of Laminar and Turbulent flows.

Module 1:

Unit-1: Introduction:

Purpose of study of fluid mechanics for design and operation of engineering systems in the fields of Civil Engineering and its allied branch of Engineering, Fundamental difference between a solid and fluid, constituent relationships for solids and fluids, conservation principles applied in fluid mechanics. Definition of Fluid, difference between Ideal fluid and Real fluid, concept of Fluid Continuum.

Unit-2: Fluid properties:

Density, Specific weight, Specific gravity, Specific volume, Viscosity, Capillarity, Vapor pressure, Compressibility, Surface tension, Cohesion and Adhesion.

Unit-3: Fluid Statics:

Pressure at a point, Pascal’s Law, Hydrostatic Law, Measurement of Pressure, Atmospheric, Gauge and Absolute pressures, Manometers - Principle of Manometry, Piezometer, U-tube differential manometer, Inverted differential manometer, Mechanical gauges - Bourdons tube pressure gauge, Hydrostatic forces on Submerged plane and Curved surfaces, Total pressure and Center of pressure.

Unit-4: Buoyancy and Floatation:

Archimedes principle, Stability of floating and submerged bodies. Metacenter, Metacentric height.

Module 2:

Unit-1: Fluid Kinematics:

Introduction, Velocity of fluid particles, Classification of fluid flows, Description of the flow pattern, Acceleration of Fluid particle. Continuity equation in one, two- and three-dimensional flow, Circulation and Vorticity, Rotational and Irrotational flow, Conditions for irrotational flow, Velocity potential and Stream function, streamlines, Equipotential lines and Flow Nets.

Module 3:

Unit-1: Fluid Dynamics:

Forces causing motion, Euler's equation of motion and its integration, Bernoulli's equation, Linear momentum equation, Application of Linear momentum equation, Forces on pipe bend.

Unit-2: Flow measurements

Venturi meter, Orifice meter, Pitot tube, Orifices, Mouthpieces, Notches and Weirs.

Module 4:

Unit-1: Flow Through Pipes:

Energy losses in pipes - Major and Minor losses - Expression for head loss due to Friction – Darcy's Weisbach equation, Expressions for head loss due to Pipe Expansion and Pipe Contraction, Hydraulic Gradient and Total Energy Lines, Pipes in Series and parallel, Equivalent pipe, Power transmission through pipes. Design of Pipeline Networks by Hardy Cross and Equivalent Pipe Methods.

Unit-2: Water Hammer in Pipes:

Water hammer phenomenon, Gradual and sudden closure of valves, Expression for pressure rise considering elasticity of pipe and fluid, Pressure relieving devices.

Module 5:

Unit-1: Laminar Flow:

Characteristics of Laminar flow, Reynolds experiment, Critical Reynold's number, Critical velocity, Steady laminar flow through a circular pipe, Hagen Poiseuille equation.

Unit-2: Turbulent flow in Pipes:

Characteristics of Turbulent flow, Shear stress due to Turbulence, Reynolds stresses, Prandtl's mixing length theory, Universal velocity distribution law near a solid boundary, Smooth and Rough boundaries, Nikuradse's experiment, Karman – Prandtl resistance equations, Variation of friction factor with Reynold's number – Moody's Chart.

Text Books:

1. "Fluid Mechanics" by Victor Streeter and E. Benjamin Wylie, K.W.Bedford, McGraw Hill, 9th Edition, 2017.
2. "Hydraulics and Fluid Mechanics Including Hydraulic Machines" by **P.** N. Modi and M. Seth, ", Standard Book House, Raj sons Publications Private Limited, 21st edition 2017.
3. "Fluid mechanics and Hydraulic Machines" by D.S Kumar, Sk.kataria and sons publications New Delhi 2009.

Reference Books:

1. 'Fluid Mechanics including Hydraulic Machines" by A.K. Jain,", Khanna Publications, 2010
2. "Fluid Mechanics" by M Frank White, Tata McGraw Hill, New Delhi, Seventh Edition, 2015.

E-Resources

1. https://nptel.ac.in/courses/105/103/105103192/

Course Outcomes:

On completion of the course, the student will be able to:

1. **Describe** the properties of a fluid and analyze the hydrostatic forces on plane and curved surfaces.
2. **Discuss** the various aspects of Fluid kinematics.
3. **Formulate** equations based on conservation of mass, energy and momentum and analyse forces on nozzles and describe devices use for discharge.
4. **Compute** Reynolds number formulates equations for laminar and turbulent flow through pipes and water hammer in pipes.
5. **Describe** and solve the problems on Laminar and Turbulent flows.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO3	1	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	1	1	-	-	-	-	-	-	-	-	3	-
average	1.4	2.2	0.2	0.2	-	-	-	-	-	-	-	0.4	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – I Sem</td></tr>
<tr><td>Course Code: J2111</td><td rowspan="2">SURVEYING LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Apply the basic principles of engineering surveying and measurements.
2. Apply the field applications and concepts of Levelling Survey and different methods of calculation of Area, contouring and measurement of volumes.
3. Explain the basics of Theodolites survey in Elevation and Angular Measurements and Tachometric Surveying in distance and height measurements.
4. Identify the field procedures required for a professional surveyor.
5. Study techniques, skills, and modern engineering tools necessary for engineering practice.

EXPERIMENT 1: Surveying of an Area by Chain Survey (closed traverse) & Plotting.

EXPERIMENT 2: Determination of Distance between two inaccessible points with Compass.

EXPERIMENT 3: Survey of a given Area by Prismatic Compass (closed traverse) and plotting after adjustment.

EXPERIMENT 4: Radiation method, Intersection methods by Plane Table Survey.

EXPERIMENT 5: Levelling- Plotting of Longitudinal and Cross-section.

EXPERIMENT 6: Height and Distances using principles of Tachometric Surveying.

EXPERIMENT 7: a) Measurement of Horizontal angle and vertical angle.
b) Measurement of distance between inaccessible Theodolite.

EXPERIMENT 8: Determine of area using total station.

EXPERIMENT 9: Contouring using total station.

EXPERIMENT 10: Curve setting using total station.

EXPERIMENT 11: Stake out by Total station.

EXPERIMENT 12: Finding position of stations using G.P.S.

Note: At least any Ten (10) experiments have to be conducted out of available Twelve (12) experiments.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Apply** the basic principles of Engineering surveying for linear and angular measurements.
2. **Describe** the survey data and compute areas and volumes, levels by different type of equipment and relate to the methodologies.
3. **Apply** the knowledge to calculate angles, distances, and levels.
4. **Complete** comprehend the field procedures required for a professional surveyor.

5. **Use** techniques, skills, and modern engineering tools necessary for engineering practice

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	1	-	1	-	-	-	-	-	-	2	2	1
CO2	3	3	2	-	1	-	-	-	-	-	-	3	3	1
CO3	3	3	1	-	1	-	-	-	-	-	-	3	2	1
CO4	2	2	2	-	1	-	-	-	-	-	-	2	3	1
CO5	2	2	1	-	3	-	-	-	-	-	-	3	2	1
Average	2.6	2.6	1.4	-	1.4	-	-	-	-	-	-	2.6	2.4	1

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – I Sem</td></tr>
<tr><td>Course Code: J2112</td><td rowspan="2">STRENGTH OF MATERIALS LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mechanics.

Course Objectives:

This course will enable students to:

1. Study the mechanical properties of structural materials.
2. Apply the techniques, skills, and modern engineering tools necessary for engineering.
3. Summarize the professional and ethical responsibility in the areas of material testing.
4. Determine the various strength parameters of Wood and Concrete.
5. Identify the Hardness and tensile strength of given specimen.

EXPERIMENT 1: Tension test.

EXPERIMENT 2: Bending test on steel (Simply supported beam and Cantilever beam).

EXPERIMENT 3: Continuous beam – Deflection test.

EXPERIMENT 4: Bending test on wooden and concrete beams.

EXPERIMENT 5: Torsion test.

EXPERIMENT 6: Hardness test (Brinell and Rockwell).

EXPERIMENT 7: Spring test.

EXPERIMENT 8: Compression test on wood and concrete.

EXPERIMENT 9: Compression test on brick.

EXPERIMENT 10: Impact test (Izod and Charpy).

EXPERIMENT 11: Shear test.

EXPERIMENT 12: Use of electrical resistance strain gauges.

Note: At least any Ten (10) experiments have to be conducted out of available Twelve (12) experiments.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Examine** the mechanical properties of structural materials.
2. **Illustrate** the techniques, skills and modern engineering tools necessary for engineering.
3. **Evaluate** the professional and ethical responsibility in the areas of material testing.
4. **Compare** the various strength parameters of Wood and Concrete.
5. **Analyse** the Hardness and tensile strength of given specimen.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	-	3	1	-	-	-	-	-	-	2	1	-
CO2	2	1	-	3	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	2	1	-	-	-	-	-	-	2	1	-
CO4	2	2	-	2	-	-	-	-	-	-	-	2	1	-
CO5	2	2	-	2	-	-	-	-	-	-	-	2	1	-
Average	2	1.4	-	2.4	0.4	-	-	-	-	-	-	2	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – I Sem</td></tr>
<tr><td>Course Code: J2113</td><td rowspan="2">COMPUTER AIDED CIVIL ENGINEERING DRAWING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Drawing

Course Objectives:

This course will enable students to:

1. Understand the fundamentals of graphics and drafting that are appropriate for developing functional skills in computer aided drafting.
2. Acquire adequate knowledge and experience in preparing engineering drawings using CAD software.
3. Acquire the skills pertinent to the production of properly detailed, formatted, and dimensioned civil engineering drawings.
4. Evaluate 2D and 3D commands in CAD.
5. Gain knowledge on different components of building.

LIST OF EXPERIMENTS:

EXPERIMENT 1: Introduction to Computer Aided Drafting.

EXPERIMENT 2: To open and set up software in system.

EXPERIMENT 3: Introduction and Exercise on coordinate systems.

EXPERIMENT 4: Introduction and exercise on drawing commands.

EXPERIMENT 5: Introduction and exercise on modify commands.

EXPERIMENT 6: Introduction and exercise on Dimensions, Texting, and Layers.

EXPERIMENT 7: Drawing of building components like Doors, Windows, and Walls, using CAD commands.

EXPERIMENT 8: Drawing a plan of a given building and Dimensioning.

EXPERIMENT 9: Developing Sections and Elevations from a given plan.

EXPERIMENT 10: Drawing a plan of a Residential Building and developing its sections and elevations.

EXPERIMENT 11: Drawing a plan of a Commercial Building and developing its sections and elevations.

EXPERIMENT 12: Introduction and Exercises on 3-D commands.

Note: At least any Ten (10) experiments must be conducted out of available Twelve (12) experiments.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Memorize** different CAD commands.
2. **Develop** plans, sections, and elevations of residential and commercial buildings.
3. **Develop** different components of buildings.
4. **Develop** working drawings of buildings with detailed layout.
5. **Create** 2D and 3D drawings in AUTOCAD environment.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3	-	3	-	-	-	-	-	-	-	3	3
CO2	2	2	2	-	3	-	-	-	-	-	-	-	2	3
CO3	2	1	3	-	2	-	-	-	-	-	-	-	2	3
CO4	1	1	1	-	1	-	-	-	-	-	-	-	1	2
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	2
Average	1.6	1.2	1.8	-	2	-	-	-	-	-	-	-	1.8	2.2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE II Year – I Sem</td></tr>
<tr><td>Course Code: J2114</td><td rowspan="2">ENGINEERING GEOLOGY LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Geology

Course Objectives:

This course will enable students to:

1. Study different methods to identify minerals and rocks.
2. Study of physical properties of Minerals.
3. Identify diffrent types of rock and there importance in construction.
4. Determine the Megascopic Identification of Rocks.
5. Solve the geological stucture problems (Folds, Faults & Unconformities).

EXPERIMENT 1: Study of physical properties of Minerals.

EXPERIMENT 2: Study of different group of Minerals.

Study of physical properties and identification of following minerals:

EXPERIMENT 3: Feldspar, Quartz, Flint, Jasper, Olivine.

EXPERIMENT 4: Augite, Hornblende, Muscovite, Biotite.

EXPERIMENT 5: Chlorite, Kyanite.

EXPERIMENT 6: Garnet, Talc, Calcite.

EXPERIMENT 7: Pyrite, Hematite, Magnetite.

EXPERIMENT 8: Chlorite, Galena, Pyrolusite.

EXPERIMENT 9: Graphite, Magnesite, and Bauxite.

EXPERIMENT10: Megascopic description and identification of Rocks. Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

EXPERIMENT11: Simple structural Geology Problems (Folds, Faults & Unconformities).

EXPERIMENT 12: Interpretation and drawing of sections for geological maps showing Tilted beds, Faults and Uniformities.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Examine** different methods to identify minerals and rocks.
2. **Identify** the physical properties of different minerals.
3. **Categorize** the rock formation.
4. **Compare** the Megascopic Identification of Rocks.
5. **Analyze** the geological stucture problems (Folds, Faults & Unconformities).

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	2	-	-	1	-	-	-	-	1	1	-
CO2	2	-		3	-	-	1	-	-	-	-	1	2	-
CO3	2	-	-	3	-	-	2	-	-	-	-	1	1	-
CO4	3	2	-	2	-	-	2	-	-	-	-	1	1	-
CO5	3	3	-	2	-	-	1	-	-	-	-	1	1	-
Average	2.2	1	-	2.4.	-	-	1.4	-	-	-	-	1	1.2	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech II Year – I Sem			
Course Code: J21M1	GENDER SENSITIZATION (An Activity-based Course) (Common to CE, EEE, ME & MIE)	L	T	P	D
Credits: 0		2	0	0	0

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

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:

Unit-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:

Unit-1: 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:

Unit-1: 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:

Unit-1: 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:

Unit-1: 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 brave heart.

Text Books:

1. **Essential Reading**: All the Units in the Textbook, “Towards a World of Equals: A Bilingual Textbook on Gender” written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Course Outcomes:

On completion of the course, the students will be able to:

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

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	..	..	..	..	..	..	..	..	..	2	..	..	..	-
CO2	..	..	..	..	..	..	..	..	..	..	2	..	..	-
CO3	..	..	..	..	..	..	..	..	..	2	..	1	..	-
CO4	..	..	..	..	..	..	..	..	..	2	..	..	..	-
CO5	..	..	..	..	..	..	..	..	..	2	..	..	..	-
Average	..	..	..	..	..	..	..	..	..	2.6	0.4	0.2	..	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
II Year – II Sem</td></tr>
<tr><td>Course Code: J22EA</td><td rowspan="2">MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE
(CE, ME, MIE & EEE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course objectives:

This course will enable students to

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:

Unit-1: Introduction to managerial economics, concepts of Managerial Economics: Demand Analysis: Law of Demand, Elasticity of demand & Demand forecasting.

Unit – 2: 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:

Unit-1: Market Structures: Different types of Markets.

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

Unit-2: Capital Budgeting:

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:

Unit-1: 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.

Unit-2: Human Recourse Management:

Recruitment, Selection, Training and Development and Performance.

Module 4:

Unit-1: 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.

Unit-2: Project Management:

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

Module 5:

Unit-1: Material Management: objectives, need for inventory control, EQC, ABC Analysis, VED Analysis, Purchase procedure, Store Management.

Unit- 2: 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 book:

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

E-resources:

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

Course outcomes:

The Student will be able to:

1. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.
2. Develop in-depth understanding on continuous process improvement & benchmarking process.
3. Learn the applications of quality tools and techniques in both manufacturing and service Industry.
4. Develop in-depth knowledge on various tools and techniques of quality management.
5. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	3	3	-	-	-	-	-	-	-	-	-	-
Average	2.4	2.0	2.5	2.67	-	-	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
II Year – II Sem</td></tr>
<tr><td>Course Code: J220A</td><td rowspan="2">STATISTICS AND NUMERICAL METHODS
(Common to ME, CE and MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Basic properties of probability and random variables.
2. Types of hypothesis and hypothesis testing.
3. Numerical methods to solve non-linear systems.
4. Various methods of interpolation and its application.
5. Concepts of numerical differentiation and integration.

Module 1:

Unit-1: **Probability and Distributions**:

Introduction to Probability, Random Variables-Definitions of Random variables, Discrete and continuous Distributions- Binomial-Poisson and normal distributions-related properties.

Module 2:

Unit-1: **Sampling Theory and Testing of Hypothesis:**

Sampling distributions –Sampling distribution of means (σ known and Unknown)-Estimation-Point estimation-interval estimation-confidence interval estimates of parameters.

Unit-2: Tests of hypothesis -Large samples- Null hypothesis – Alternate hypothesis type I, & type II errors – critical region, confidence interval for mean testing of single variance, Difference between the means.

Module 3:

Unit-1: **Solutions of Non-linear Systems:**

Introduction, Mathematical preliminaries, Solution of algebraic and transcendental equations–bisection method, the method of false position, Fixed point iterative method, Newton - Raphson method, and their order of convergence.

Module 4:

Unit-1: **Interpolation**

Introduction; Errors in polynomial interpolation; Finite differences; Forward differences; Backward differences; Central differences; Symbolic relations and separation of symbols; Differences of a polynomial; Newton's formulae for interpolation; Central difference interpolation formulae; Gauss's central difference formulae and Lagrange's interpolation formulae.

Module 5:

Unit-1: **Numerical Differentiation and Integration**

Solution of initial value problems by Taylor's series - Picard's method of successive approximations, Euler's method, Modified Euler's method and Runge - Kutta methods.

Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule, Gaussian quadrature 2 & 3-point formulae.

Text Books:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and Sons, 8^{th} Edition, 2008.
2. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publications, 2017

Reference Books:

1. "Numerical methods for Scientific and Engineering Computation", M. K. Jain, S.R.K.Iyengar and R.K.Jain, New Age International Publications,2008.
2. "Fundamentals of Mathematical Statistics", C.Gupta and V.K.Kapoor, S.Chand& Co,2006

E - Resources:

1. https://nptel.ac.in/courses/111/105/111105041/https://nptel.ac.in/courses/111/105/111105041/
2. https://www.sagepub.com/sites/default/files/upm-binaries/40007_Chapter8.pdf
3. https://link.springer.com/content/pdf/10.1007/978-3-642-61074-5_14.pdf
4. https://link.springer.com/content/pdf/bbm%3A978-3-319-69407-8%2F1.pdf
5. https://stackoverflow.com/questions/19290455/interpolation-in-a-link

Course Outcomes:

On completion of the course, the students will be able to:

1. Find mean and variance of a given probability distribution.
2. Test the hypothesis for small and large samples.
3. Solve numerically algebraic and transcendental equations.
4. Interpret an experimental data using interpolation.
5. Solve numerically ordinary differential equations and integrations.

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

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – II Sem</td></tr>
<tr><td>Course Code:
J221A</td><td rowspan="2">HYDRAULICS AND HYDRAULIC MACHINERY</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Fluid Mechanics.

Course Objectives:

This course will enable students to:

1. **Introduce** to the concept of Open channel flows.
2. **Develop** concept in boundary layer theory.
3. **Study** the concept of dimensional analysis and Model studies.
4. **Develop** knowledge in the basics of hydro-machinery and its components, function and use of different types of turbines.
5. **Develop** knowledge in Pump installation details and speed losses.

Module 1:

Unit1: Flow in Open Channels:

Distinction between Pipe flow and Channel flow, Characteristics of open channels, Classification of flow, Manning's and Chezy's equations, Most economical cross sections of channels - Rectangular, Trapezoidal, Triangular and Circular shapes, Velocity distribution in channel section.

Unit-2: Non-Uniform Flows:

Energy concepts in open channel flow, Specific Energy curve, Critical depth, and Critical velocity, Condition for Critical, Subcritical and Super critical flows. Hydraulic jump - expressions for depth of Hydraulic jump and Loss of energy due to Hydraulic jump. Channel transitions, Equation for gradually varied flow, Classification of surface profiles, Rapidly varied flow.

Module 2:

Unit 1: Boundary Layer Theory:

Concept of Boundary layer, Boundary layer growth over a flat plate, Boundary layer thickness, Displacement thickness, Momentum thickness and Energy thickness, Laminar and Turbulent boundary layers, Integral momentum equation for boundary layer, Separation of Boundary layer and its Control.

Unit-2: Fluid Flow around Submerged Bodies:

Drag and Lift - Basic concepts and expressions, drag and lift forces on Sphere and Cylinder.

Module 3:

Unit1: Dimensional Analysis:

Dimensions and Dimensional Homogeneity, Dimensional analysis by Rayleigh's method and Buckingham's Theorem, Dimensionless numbers and their consequences in Fluid Mechanics.

Unit 2: Model Analysis:

Forces Influencing Hydraulic phenomena, Types of Similarities, Model Analysis, Similitude studies and Modeling, Classification of Models, Model Laws - Reynolds and Froude's Model laws.

Unit 3: Basics of Turbo Machinery:

Impact of Jets - Force exerted by a liquid jet on a stationary and moving body (only flat plates and curved vanes).

Module 4:

Unit 1: Hydroelectric power plant:

Layout of Typical Hydro power plant installations, Heads and Efficiencies, Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

Unit 2: Hydraulic Turbines:

Classification - Impulse and Reaction turbines, Pelton, Francis and Kaplan turbines Specific speed, Draft tube, Cavitation, unit quantities, Geometric similarity Characteristic curves and Selection of turbines.

Module 5:

Unit 1: **Pumps:**

Introduction, Centrifugal pump - Heads and Efficiencies, Specific sped, characteristic curves, Net positive suction head, Priming, Selection and Operational difficulties.

Unit 2: Reciprocating pump:

Single and Double acting Reciprocating pumps, Coefficient of discharge and Slip, Use of Air vessels and Characteristic curves.

Text Books:

1. "Hydraulics and Fluid Mechanics Including Hydraulic Machines" by P**.** N. Modi and M. Seth, ", Standard Book House, Raj sons Publications Private Limited, 21st edition 2017.
2. "Fluid mechanics and Hydraulic Machines" by Ds Kumar, Sk.kataria and sons publications New Delhi 2009.

Reference Books:

1. "Open Channel Hydraulics" by VenTeChow, McGraw-Hill Black burn press illustrated reprint, 2009.
2. "Fluid Mechanics" by Victor Streeter and E. Benjamin Wylie, K.W.Bedford McGraw Hill, 9th Edition, 2017.

E-Resources:

1. https://nptel.ac.in/courses/105/103/105103096/
2. https://nptel.ac.in/courses/112/103/112103249/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Identify** the most economical channel section.
2. **Explain** the boundary layer concept.
3. **Discuss** and solve dimensional analysis and Model study problems.
4. **Demonstrate** the characteristic curves of turbines.
5. **Demonstrate** the characteristic curves of pumps.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	-	-	-	1	-	-	-	-	-	-	1		-
CO3	3	-	2	1		-	-	-	-	-	-	2	3	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-	3	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.8	0.6	0.4	0.2	0.2	-	-	-	-	-	-	0.6	1.4	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – II Sem</td></tr>
<tr><td>Course Code:
J221B</td><td rowspan="2">STRENGTH OF MATERIALS-II</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mechanics

Course Objectives:

This course will enable students to:

1. Study the Theory of pure torsion.
2. Calculate the stability and elastic deformation occurring in columns and struts for different types of loading.
3. Discuss the concept of direct and bending stresses.
4. Demonstrate the nature of stresses developed in circular shafts, columns, and cylindrical shells for various types of loads.
5. Describe the unsymmetrical bending and shear centre.

Module 1:

Unit 1: Torsion

Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Combined bending and torsion

Power transmitted by shafts - Shaft of varying sections – Composite shaft – strain energy due to torsion.

Unit 2: Springs

Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

Module 2:

Unit 1: Columns and Struts

Introduction–Types of columns–Short, medium and long columns – Axially loaded compression members – Crushing load – Euler’s theorem for long columns- assumptions- derivation of Euler’s critical load formulae for various end conditions– Equivalent length of a column – slenderness ratio - Limitations of Euler’s theory. Rankine-Gordon’s formula for columns - Long columns subjected to eccentric loading.

Unit 2: Laterally loaded struts

struts subjected to uniformly distributed and concentrated lateral loads – Maximum B.M. and stress due lateral loading.

Module 3:

Unit 1: Direct and Bending Stresses

Introduction – Eccentric loading – Columns with eccentric loading – Symmetrical columns with eccentric loading about one axis and two axes. Unsymmetrical columns with eccentric loading – limit of eccentricity.

Module 4:

Unit 1: Thin Cylinders

Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

Unit 2: Thick Cylinders

Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

Module 5:

Unit 1: Unsymmetrical bending

Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis - Deflection of beams under unsymmetrical bending.

Unit 2: Shear Centre

Introduction - Shear Centre for symmetrical and unsymmetrical (channel, I, T and L) sections.

Text Books:

1. "Strength of Materials" Vol – I & II, Elementary theory and problems, by S.Timoshenko. 3rd edition Jan 2015.
2. "Mechanics of Materials" by C. Ferdinand, P. Beer & E. Russell Johnston Jr & John T. Dewolf & David F. Mazurek. 6th edition Apr 2018.
3. "Strength of Materials" Vol –I & II by S S Bhavikatti, Vikas Publications, 4th edition, Oct 2010.

Reference Books:

1. "Mechanics of material" by R.C.Hibbeler, Printice Hall publications. 4th edition Jan 2014.
2. "Engineering Mechanics of Solids" by EgorP. Popov, Printice Hall publications. 2nd edition 2015.

E-Resources

1. http://www.aboutcivil.org/solid-mechanics.html
2. http://nptel.ac.in/courses/105105108/
3. http://nptel.ac.in/downloads/112106141/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** the concepts and principles of theory of torsion.
2. **Evaluate** the strains and deformation that will result due to the elastic stresses developed within the materials for all types of loading conditions.
3. **Analyze** the strength and stability of structural members subjected to direct and bending stresses.
4. **Evaluate** the shear center and unsymmetrical bending.

5. **Analyze** the thin and thick cylinders.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	-	-	-	-	-	-	-	-	-	2	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO4	2	1	2	-	-	-	-	-	-	-	-	1	1	-
CO5	2	1	2	2	-	-	-	-	-	-	-	2	1	-
Average	2	1.8	1.4	0.4	-	-	-	-	-	-	-	1.4	1.2	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE II Year – II Sem			
Course Code: J221C	**CONCRETE TECHNOLOGY**	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Engineering Geology, Building Materials, Construction and Services.

Course Objectives:

This course will enable students to:

1. Study the properties of cement and different grades of cement.
2. Explain the classification of aggregates and characteristics.
3. Study the behaviour and properties of fresh concrete, factors effecting fresh properties.
4. Study about Hardened concrete, creep, and shrinkage properties of concrete.
5. Explain the design of concrete and its ingredients, special concretes.

Module 1:

Unit 1: Cement:

Types of cement, Portland cement – chemical composition – Manufacturing process– Hydration, Water requirement for hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement**.**

Module 2:

Unit 1: Aggregates:

Classification of aggregate –Recycled Aggregates – Introduction to M-Sand and manufacturing process of M-Sand – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse aggregates – Gap graded aggregate – Maximum aggregate size.

Module 3:

Unit 1: Fresh Concrete:

Workability – Factors affecting workability – Measurement of workability by different tests – Segregation & Bleeding – Setting times of concrete – Effect of time and temperature on workability –Rheology of Fresh Concrete– Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water, Admixtures: Types of admixtures – mineral and chemical admixtures.

Water / Cement ratio – Abram's Law – Gel Space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Methods of curing.

Module 4:

Unit 1: Testing of Hardened Concrete:

Compression tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test (Bond Strength), Non-destructive testing methods – codal provisions for NDT.

Hardened Concrete: Elasticity, Creep & Shrinkage Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

Module 5:

Unit 1: Mix Design:

Factors in the choice of mix proportions – Durability of concrete (Factors affecting & Measures to improve) – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Unit 2: Special Concretes:

Introduction to Light weight concrete – Cellular concrete – No-fines concrete (Pervious Concrete) – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete – Geopolymer Concrete – Bacterial Concrete. Introduction to Precast concrete, applications, advantages, and disadvantages.

Text Books:

1. "Properties of Concrete" by A.M.Neville – Low priced Edition – 4th edition.
2. "Concrete Technology" by M.S.Shetty – S.Chand& Co,2004.
3. "Concrete Technology" by Bhavikatti S S - I K International Publishing House Pvt. Ltd.

Reference Books:

1. "Concrete Technology" by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.
2. "Concrete Technology" by A.R. Santha Kumar, Oxford university Press, New Delhi.
3. "Concrete: Micro structure, Properties and Materials" – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers.

E-Resources

1. https://www.cement.org/learn/concrete-technology
2. https://www.cement.org/cement-concrete-applications/how-cement-is-made
3. https://www.constrofacilitator.com/different-types-of-concrete-admixtures/
4. https://www.concretenetwork.com/aggregate/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Discuss** the properties of concrete ingredients i.e. cement, sand and coarse aggregate.
2. **Explain** the mechanical performance of cement-based materials.
3. **Discuss** the effects of the rheology and early age properties of concrete on its long-term behaviour.
4. **Apply** the usage of laboratory tests to characterize hardened concrete and its properties.
5. **Explain** the mix design and engineering properties of special concretes such as high-performance, self-compacting and fiber reinforced concrete, etc.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	2	2	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	3	-	-	3	1	-	-	-	-	-	3	2
CO3	1	2	3	-	-	2	1	-	-	2	-	2	2	2
CO4	2	1	2	-	-	2	-	-	-	-	-	2	2	2
CO5	2	3	2	-	-	2	-	-	-	-	-	2	2	2
Average	2	2	2.4	-	-	1.8	0.4	-	-	0.4	-	1.2	2.2	2

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: CE
II Year – II Sem</td></tr>
<tr><td>Course Code:
J223E</td><td rowspan="2">MECHANICAL ENGINEERING AND ENERGY SCIENCES</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Physics, Engineering Chemistry, Engineering Mechanics.

Course Objectives:

This course will enable students to:

1. Understand various engineering materials and their applications, ways of power transmission and material handling systems used in engineering.
2. Apply the concepts of thermodynamics and heat transfer in IC Engines and refrigeration.
3. Understand manufacturing processes and their applications.
4. Understand present scenario of fossil and renewable energy sources.
5. Understand Construction aspects of power plants.

Module: 1

Unit 1: Introduction to Engineering materials:

Types of materials- Ferrous materials, Non-Ferrous materials, Composite materials, Ceramic materials (Properties and their applications.). Heat treatment Processes and their applications.

Unit-2: Power Transmission Elements:

Gear terminology, Types of gears - spur, helical and bevel gears; Gear trains; Belt drives (types); Chain drives. Applications of screw and lever.

Unit-3: Material Handling systems:

Introduction, Material Handling systems, Material Handling principles, Classification of Material Handling Equipment, Belt conveyors, cranes, industrial trucks, bull dozers.

Module: 2

Unit-1: Thermodynamics:

Thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work. Zeroth law of thermodynamics, First Law of Thermodynamics, Second Law of Thermodynamics.

Unit-2: IC Engines:

Types, working principle, components, advantages, disadvantages & applications.

Unit-3: Heat Transfer & Refrigeration:

Modes of heat transfer, Basic laws of heat transfer, Refrigeration - working principle, types, Applications.

Module: 3

Unit-1: Manufacturing Processes:

Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages).

Unit-2: Welding:

Types – Equipments – Tools and accessories–applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

Unit-3: Casting:

Types - Equipments – Tools and accessories–applications, advantages and disadvantages.

Module: 4

Unit-1: Present Scenario of Energy sources and Fossil fuels:

Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels.

Unit-2: Renewable energy sources:

Biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries).

Module: 5

Unit-1: Power Plant Engineering:

Solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems.

Text Books:

1. Kumar, T., Leenus Jesu Martin and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai,2007
2. Material science & Metallurgy by Kodgire
3. Manufacturing Technology by P.N. Rao, TMH
4. Non-Conventional Energy Sources by G.D Rai
5. V.B. Bhandari, Machine Design, Tata Mc Graw Hill Publication, 2010

Reference Books:

1. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.
2. Hajra Choudhary, S.K. and HajraChoudhary, A. K., Elements of Workshop Technology Vols.I& II, Indian Book Distributing Company Calcutta, 2007.
3. Nag, P.K., Power Plant Engineering, Tata McGraw-Hill, New Delhi, 2008.
4. Rattan, S.S., Theory of Machines, Tata McGraw-Hill, New Delhi, 2010.

E - Resources:

1. https://nptel.ac.in/courses/113/106/113106032/,
2. https://www.cedengineering.com/userfiles/mechanical_power_transmission_fundamentals_2670.pdf
3. https://nptel.ac.in/courses/112/108/112108148/ ,
4. https://rb.gy/8m3bt1
5. https://soaneemrana.org/onewebmedia/Manufacturing%20Processes%20By%20H.N.%20Gupta.pdf
6. https://iiasa.ac.at/web/home/research/Flagship-Projects/Global-Energy-Assessment/GEA_Chapter11_renewables_lowres.pdf
7. https://rb.gy/tfpvn6

Course Outcomes:

On completion of the course, the students will be able to:

1. **Choose** appropriate materials, power transmission and material handling systems for various engineering applications.
2. **Familiarize** with IC engines and Refrigeration equipment used in engineering applications.
3. **Familiar** with manufacturing processes and their applications.
4. **Realize** the importance of renewable energy usage.
5. **Analyze** Construction aspects of power plants.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	1	-	-	1	-	-	-	-	2	-	-
CO3	2	1	2	-	-	-	-	-	-	-	-	2	-	-
CO4	1	2	-	-	-	1	2	-	-	-	-	2	-	-
CO5	1	1	1	-	-	2	2	-	-	-	-	2	-	-
Average	2	1.8	1.5	1	-	1.5	1.6	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year – II Sem</td></tr>
<tr><td>Course Code: J2211</td><td rowspan="2">CONCRETE TECHNOLOGY LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Building Materials, Construction and Services

Course Objectives:

This course will enable students to:

1. Study the test procedures to find Physical properties of Cement.
2. Study test procedures to find Specific Gravity of cement.
3. Perform test to find properties of Fresh Concrete.
4. Discuss the properties of Hardened Concrete.
5. Compare the destructive and non-destructive test of concrete with advanced equipment's.

LIST OF EXPERIMENTS:

EXPERIMENT 1: Fineness of cement and Normal Consistency.

EXPERIMENT 2: Initial setting time and Final setting time of cement.

EXPERIMENT 3: Soundness of Cement and Specific gravity of Cement.

EXPERIMENT 4: Compressive strength of cement.

EXPERIMENT 5: Workability test on concrete by compaction factor & slump cone test.

EXPERIMENT 6: Workability test on concrete by Vee-bee consistometer.

EXPERIMENT 7: Compressive strength of concrete Cube & cylinder.

EXPERIMENT 8: Modulus of elasticity of Concrete.

EXPERIMENT 9: Split Tensile test of Concrete.

EXPERIMENT 10: Sieve analysis & specific gravity of sand.

EXPERIMENT 11: Bulking of sand.

EXPERIMENT 12: Non-Destructive testing on concrete.

Note: At least any Ten (10) experiments must be conducted out of available Twelve (12) experiments.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Analyze** the consistency and fineness of cement and setting times of cement.
2. **Find** the specific gravity and soundness of cement.
3. **Examine** properties of concrete material, behaviour of concrete & properties of fresh & hardened concrete.
4. **Describe** destructive and non-destructive test on concrete.
5. **Examine** bulking of sand.

CO-PO/PSO Mapping Chart (Draft) **(3/2/1 indicates strength of correlation)** **3 – Strong; 2 – Medium; 1 – Weak**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	3	-	-	-	2	-	-	-	2	2	-	-	2	2
CO3	-	2	-	-	-	-	-	-	2	1	-	-	2	1
CO4	1	3	-	-	-	-	-	-	2	2	-	-	1	2
CO5	1	2	-	-	-	-	-	-	-	-	-	-	1	1
Average	0.6	1.4	-	-	0.4	-	-	-	1.5	1.4	-	-	1.2	1.2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
II Year -II Sem</td></tr>
<tr><td>Course Code: J2212</td><td rowspan="2">FLUID MECHANICS AND HYDRAULICS MACHINERY LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Course Objectives:

This course will enable students to:

1. **Develop** practical knowledge in verification of principles of fluid flow.
2. **Calculate** pressure, discharge, and velocity of fluid flow and Understand Major and Minor Losses.
3. **Develop** knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head.
4. **Describe** the performance of turbines.
5. **Describe** the performance of pumps.

EXPERIMENT 1: Calibration of Venturi meter & Orifice meter.
EXPERIMENT 2: Calibration of contracted Rectangular Notch / Triangular Notch.
EXPERIMENT 3: Determination of Coefficient of discharge for a small orifice by constant head method.
EXPERIMENT 4: Determination of Coefficient of discharge for a mouthpiece by constant head method.
EXPERIMENT 5: Determination of friction factor of a pipe.
EXPERIMENT 6: Verification of Bernoulli's equation.
EXPERIMENT 7: Impact of jet on vanes.
EXPERIMENT 8: Performance test on Pelton wheel turbine.
EXPERIMENT 9: Performance test on Francis turbine.
EXPERIMENT 10: Performance characteristics of a single stage centrifugal pump.
EXPERIMENT 11: Performance characteristics of a multi-stage centrifugal pump.
EXPERIMENT 12: Performance characteristics of a reciprocating pump.
Note: At least any Ten (10) experiments must be conducted out of available Twelve (12) experiments.

Course outcomes:

On completion of the course, the students will be able to:

1. **Demonstrate** fluid flow principles.
2. **Apply** the knowledge in calculating performance analysis in turbines and pumps that can be used in power plants and Analyse practical problems in all power plants.
3. **Measure** discharge in pipes and Demonstrate the characteristics curves of turbines and pumps.
4. **Measure** discharge in pipes.
5. **Demonstrate** the characteristics curves of turbines.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	1	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	1	-	-	-	-	-	-	2	-
CO3	2	3	-	-	-	1	-	-	-	-	-	-	1	1
CO4	2	3	-	-	-	1	-	-	-	-	-	-	-	-
CO5	2	2	1	-	-	1	-	-	-	-	-	-	1	-
Average	2.2	2.4	0.6	-	-	1	-	-	-	-	-	0.2	1	0.2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
II Year – II Sem</td></tr>
<tr><td>Course Code: J22M1</td><td rowspan="2">PROFESSIONAL ETHICS
(Common for All Branches)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to

1. Know the importance of corporate social responsibility and values.
2. Understand ethics as a professional responsibility.
3. Corporate ethical course and ethical audit.
4. Understand importance of values and ethical living.
5. Ensure safety at work place.

Module 1:

Unit-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:

Unit-1: Professional and Professionalism:

Introduction to profession, professional associations, professional's roles and professional risks. Professional accountability, successful professional, ethics and profession.

Module 3:

Unit-1: 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:

Unit-1: Human Values and Ethical Living:

Introduction, terminology, domains of learning, human values, attitudes, behavior 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, engineer's 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 book:

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 university press.

E-Resources:

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

Course outcomes:

The Student will be able to:

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

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

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech II Year – II Sem			
Course Code: J2201	SOFT SKILLS (Common to All)	L	T	P	D
Credits: 0		2	0	0	0

Pre-requisite: 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. Know about self- concept and self- reliance.

Module 1:

Unit-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:

Unit-1: 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:

Unit-1: 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. Dr Ravikanth 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=SmartDra
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:

On completion of the course, 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. **Grab** knowledge on Self-awareness and time management.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	3	-	-	-	-	3	3	-	3	3	-	-
CO2	-	-	2	-	-	-	-	3	3	-	3	3	-	-
CO3	-	-	2	-	-	-	-	3	2	-	3	2	-	-
CO4	-	-	2	-	-	-	-	2	2	-	3	2	-	-
CO5	-	-	2	-	-	-	-	2	2	-	2	1	-	-
Average	-	-	2.2	-	-	-	-	2.6	2.4	-	2.8	2.2	-	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – I Sem</td></tr>
<tr><td>Course Code:
J311A</td><td rowspan="2">GEOTECHNICAL ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mechanics, Fluid Mechanics

Course Objectives:

This course will enable students to:

1. Discuss the importance of Geotechnical Engineering and its applications in civil engineering.
2. Identify the role of water flow in soil.
3. Discuss the stress distribution in the soil due to different types of loading
4. Study the process of compaction, and time-rate of settlement due to consolidation
5. Formulate the shear strength properties of the soil.

Module 1:

Unit 1: Introduction and Properties of soil

Introduction, Origin and formation of soil, Phase Diagram, phase relationships, Definitions and their inter relationships. Determination of Index Properties-Specific gravity, water content, in-situ density, and particle size analysis (sieve and sedimentation analysis) Atterberg's Limits, Consistency indices, Relative density, Plasticity chart, Unified and BIS soil classification. Soil structure and Clay mineralogy.

Module 2:

Unit 1: Permeability

Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, superficial velocity and coefficient of percolation, Capillary Phenomena.

Unit 2: Seepage Analysis

Laplace equation, assumptions, limitations, and its derivation. Flow nets, characteristics and applications.

Module 3:

Unit 1: Stress distribution in soils

Boussinesq and Westergaards theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical plane and horizontal plane, Newmark-s influence chart for irregular areas.

Module 4:

Unit 1: Compaction of Soils

Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control, compactive effort & method of compaction. Lift thickness and number of passes, Proctor's needle, Compacting equipment's and their suitability.

Unit 2: Consolidation of soil

Definition, Mass spring analogy, Terzaghi's one dimensional consolidation theory-Assumption and limitations. Normally consolidated, under consolidated and over consolidated soils. Consolidation characteristics of soil (Cc, av, mv and Cv).

Module 5:

Unit 1: **Shear Strength of Soil**

Concept of shear strength, Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion factors affecting shear strength of soils. Thixotropy and sensitivity, Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions.

Text Books:

1. "Basic and Applied Soil Mechanics" by Gopal Ranjan & ASR Rao, New Age International Publishers, 3rd edition (Jan 2016).
2. "Soil Mechanics and Foundation Engineering".by K.R. Arora, Standard Publishers and Distributors, 7th edition (Jan 2019).

Reference Books:

1. "Principles of Geotechnical Engineering" by Braja M. Das, Cl engineering publishers, 9th edition (Jan 2017).
2. "Geotechnical Engineering" by Manoj Dutta & Gulati S. K, Tata McGraw-Hill Publishers,3rd edition (Jan 2011).

E-Resources

1. https://nptel.ac.in/courses/105/101/105101201/
2. https://www.btechguru.com/courses--nptel--civil-engineering--advanced-geotechnical-engineering-video-lecture--CE--CE105101001V.html

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the origin of soil, classification of soil.
2. **Identify** the role of water in soil behaviour.
3. **Analyze** the practical problems related to soil stress.
4. **Estimate** the amount of compaction and consolidation of soil to increase engineering properties.
5. **Evaluate** the practical problems related to shear strength of soil.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	1	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	1	-	-	-	-	-	-	2	-
CO3	2	3	-	-	-	1	-	-	-	-	-	-	1	1
CO4	2	3	-	-	-	1	-	-	-	-	-	-	-	-
CO5	2	2	1	-	-	1	-	-	-	-	-	-	1	-
Average	2.2	2.4	0.6	-	-	1	-	-	-	-	-	0.2	1	0.2

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE III Year – I Sem			
Course Code: J311B	**STRUCTURAL ANALYSIS-I**	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Engineering Mechanics

Course Objectives:

This course will enable students to:

1. Study the deflection of beams and trusses using Castigliano's theorems and Perform of graphical method of analysis for plane truss.
2. Apply the method of consistent deformation to propped cantilever beam and Fixed beam.
3. Study the Clapeyron's theorem of three moments equation for analysis of statically indeterminate structures.
4. Apply knowledge of mathematics and engineering in calculating slope, deflection using moment distribution method.
5. Discuss the structural problems on beams and frames by Kani's method.

Module 1:

Unit 1: Energy Theorems

Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem and Castigliano's second theorem -Unit Load Method. Deflections of simple beams and pin- jointed plane trusses. Deflections of statically determinate bent frames.

Module 2:

Unit 1: Propped Cantilever and Fixed Beams

Analysis of Propped Cantilever and Fixed beams, including the beams with varying moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads- shear force and bending moment diagrams for Propped cantilever and Fixed beams, effect of sinking of support, effect of rotation of a support.

Module 3:

Unit 1: Continuous Beams

Introduction-Fixed Beams-Continuous beams. Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports.

Unit 2: Slope Deflection Method

Introduction, Sign convention, Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

Module 4:

Unit 1: Moment Distribution Method

Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding. Analysis of frames with and without side sway. Shear force and bending moment diagrams and Elastic curve.

Module 5:

Unit 1: Kani's Method

Introduction, Basic concept, Analysis of continuous beams with and without settlement of supports, Shear force and bending moment diagrams. Elastic curve.

Analysis of Single Bay-single story portal frames with and without sway. Shear force and bending moment diagrams. Elastic curve.

Text Books:

1. "Structural Analysis" Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers,8th edition Nov 2015.
2. "Structural Analysis" Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.6th edition Jan 2012.
3. "Structural Analysis" Vol –I & II by S S Bhavikatti, Vikas Publications, 4th edition, Oct 2010.

Reference Books:

1. "Structural Analysis" by Hibbeler, pearson Education Ltd, 9th edition Oct 2017.
2. "Structural Analysis" by by R. Vaidyanathan and P. Perumal, Naveen Publishing House. 3rd edition, April 2017.
3. "Basic Structural Analysis" by C S Reddy, I K International Publishing House Pvt, Ltd, 4th edition, July 2017.

E-Resources

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Analyze** the deflection of beams and trusses using Castigliano's theorems.
2. **Construct** the Shear Force and Bending Moment diagram of propped cantilever beam and fixed beam.
3. **Analyze** the continuous beam using theorem of three moment equation and slope deflection method.
4. **Determine** the moment in indeterminate beams and frames having variable moment of inertia and subsidence using moment distribution method.
5. **Construct** the bending moment diagram for beams and frames by Kani's method.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	1	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2.2	1.2	-	-	-	-	-	-	-	-	0.6	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – I Sem</td></tr>
<tr><td>Course Code: J311C</td><td rowspan="2">STRUCTURAL ENGINEERING –I (RCC)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Strength of Materials, Concrete Technology.

Course Objectives:

This course will enable students to:

1. Apply the basic design philosophies and explain important basic clauses in IS 456-2000.
2. Explain the design steps and technical aspects in the design of singly and doubly reinforced rectangular beams.
3. Elucidate design of columns subjected axial loads and moments.
4. Differentiate the behavior of one-way, two-way slabs and continuous slabs.
5. Study the design steps of rectangular, square, and circular isolated footings, and combined footing.

Module 1:

Unit 1: Concepts of Reinforced Concrete:

Design-Basic concepts of working stress method. Limit state method-Assumptions-Material stress-strain curves-Partial safety factors-Characteristic values. Concepts of under-reinforced, over-reinforced and balanced sections. Stress block parameters-Loads and Load combinations and important clauses in IS 456-2000.

Unit 2: Beams:

Limit state analysis and design of singly reinforced and doubly reinforced rectangular beams.

Module 2:

Unit 1: Limit state analysis and design:

Limit state analysis and design for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Limit state analysis and design of T and L beam sections. Design examples in simply supported and continuous rectangular beams, detailing.

Module 3:

Unit 1: Design of columns:

Design of short and long columns-under axial loads, uniaxial bending and biaxial bending conditions- Design aids to IS 456- SP16 charts and provisions.

Module 4:

Unit 1: **Design of slabs & staircase:**

Design of one-way slab, Two-way slab and Continuous slab using IS Coefficients. Design of dog-legged staircase.

Unit 2: **Limit state of serviceability**:

Limit state of serviceability for deflection, cracking and codal provision.

Module 5:

Unit 1: **Design of footings:** Different types of footings – Design of isolated footings - square, rectangular and circular footings. Design of combined footings.

Shear wall definition, structural significance and applications in multi-story buildings.

Text Books:

1. ‘’Limit state designed of reinforced concrete’’ – P.C.Varghese, Prentice Hall of India, New Delhi.
2. ‘’Reinforced concrete design’’ by S. Unnikrishna Pillai & Devdas Menon, TataMc.Graw Hill, New Delhi.
3. ‘’Reinforced concrete design’’ by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi.

Reference Books:

1. ‘’Fundamentals of Reinforced concrete design’’ by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.
2. ‘’Design of concrete structures’’ by J.N.Bandhyopadhyay PHI Learning Private Limited.
3. ‘’Design of Reinforced Concrete Structures’’ by I.C.Syal and A.K.Goel, S.Chand & company.
4. ‘’Limit state design of reinforced concrete’’ by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications, Hyderabad.

E-Resources

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/105/105/105105104/

Course Outcomes:

On completion of the course, the students will be able to:

1. Formulate the basic design constants and loadings on RC sections as per limit state method of IS 456
2. Analyze singly and doubly reinforced rectangular concrete beams using the limit state method &Design rectangular, L& T beams using IS codal provisions and show reinforcement details.
3. Design short and long columns for axial load and moments using IS code and show reinforcement details.
4. Design the one-way slab and two-way slabs, and compute deflections and crack widths for a given section and loading conditions.
5. Design isolated and combined footings and draw reinforcement details.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – I Sem</td></tr>
<tr><td>Course Code: J311D</td><td rowspan="2">HYDROLOGY AND WATER RESOURSE ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Fluid Mechanics

Course Objectives:

This course will enable students to:

1. Discuss about the hydrology and its applications, rainfall measurements, computation of average rainfall, empirical formulas, and rational methods.
2. Study on flood hydrograph, effective rainfall, base flow, unit hydrograph and direct runoff.
3. Study on ground water occurrence, types of aquifers, Darcy's law and well hydraulics.
4. Acquire the knowledge of water sources and various water treatment methods.
5. Discuss the various joints and pipelines for the pipeline systems.

Module 1:

Unit-1: Introduction to Engineering hydrology and its applications:

Hydrologic cycle, types and forms of precipitation, rainfall measurements, types of rain gauges, computation of average rainfall over a basin, Processing of rainfall data, adjustment of record, rainfall double mass curve. Run off factors affecting run off over a catchment, empirical and rational formula.

Unit-2: Abstraction from rainfall: Evaporation, factors affecting evaporation, measurement of evaporation, evapotranspiration, consumptive use, Penman and Balney and criddle methods –Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

Module 2:

Unit-1: Distribution of runoff: Hydrograph analysis flood hydrograph- effective rainfall- baseflow separation-direct runoff-unit hydrograph, definitions, and limitations of application of unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph and vice versa S-hydrograph, synthetic unit hydrograph. Peak flow determination, empirical formula for flood discharge, flood frequency studies, flood discharge by rational formula, flood routing.

Module 3:

Unit-1: Ground Water Occurrence: Types of aquifiers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcys law, radial flow to wells in unconfined and unconfined aquifiers, types of wells, well construction-well development.

Module 4:

Unit-1: Introduction: Sources of Water, Population Forecast, Design Period, Water Demand, Fire Demand. Water Quality, Characteristics and Testing, Drinking Water Standards. Water Borne Diseases.

Unit-1: Water treatment units: Sedimentation, Coagulation, Flocculation – Principles and Design. Filtration – Theory, Working and Design of Slow, Rapid Gravity and Multi-Media Filters, Troubles in Operation Comparison of Filters. Disinfection and Miscellaneous Treatment Methods.

Module 5:

Unit 1: **Reservoirs and Pipelines:** Service Reservoirs, Joints and Valves. Fire Hydrants, Water Meters, Laying and Testing of Pipelines and Pump House.

Text Books-

1. "Irrigation and waterpower engineering" by Dr.B.CPunmia, Dr. Pande B Lal 16thedition, laxmi publications pvt ltd, 2009.
2. "Water Supply & Sanitary Engineering" By J.S. Birdie, G.S. Birdie, Dhanpat Raj Publications 2018 9th edition.

Reference Books:

1. ''Environmental Engineering- I'' (Water Supply Engineering) by Dr. B.C Punmia, Er. Ashokkumar Jain, Dr Arun.K.Jain,laxmi publications pvt ltd, 2016.
2. "Irrigation water resources and water power engineering" by Dr.PN Modi Standard book house Publications 2019 ,11th edition.

Web Resources:

1. https://nptel.ac.in/courses/105/106/105106119/
2. https://nptel.ac.in/courses/105/104/105104103/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Compute** average rainfall over a basin and understand recording and non-recording type rain gauges and to determine infiltration indices and runoff from a basin.
2. **Construct** the unit hydrograph and determine the peak flood discharge.
3. **Determine** the aquifer parameters and their discharge from wells.
4. **Select** the most appropriate technique for the treatment of water.
5. **Design** the components of the distribution systems.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	3	-	-		-
CO3	3	-	-	-	3	-	-	-	-	-	-		3	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	0.8	0.2	0.4	-	-	-	-	-	-	0.6	-	-	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year -I Sem</td></tr>
<tr><td>Course Code: J311F</td><td rowspan="2">ENVIRONMENTAL ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the characteristics of sewage and its disposal methods.
2. Discuss the possible methods of wastewater treatment.
3. Discuss the operation and maintenance aspects of advanced wastewater treatment.
4. List out the various advance techniques of wastewater treatment.
5. Emphasize the importance of air pollution and its control.

Module 1:

Unit-1: Sewage Treatment:

Introduction to Sewage. Collection and Conveyance of Sewage, Wastewater flow rates, Design of Sewers, Shapes and Materials. Sewer Appurtenances, Characteristics of Sewage-cycles of Decay-Decomposition of Sewage, Examination of Sewage, BOD-COD Equations.

Unit-2: Sewage Disposal:

Drainage Components Requirements. Sanitary Fitting Traps, One Pipe and Two Pipe Systems of Plumbing, Ultimate Disposal of Sewage.

Module 2:

Unit-1: Wastewater Treatment:

Units-Principles and Design of Screens, Grit Chambers, Skimming Tanks, Sedimentation Tanks, Trickling Filters-Standard and High Rate.

Unit-2: Disposal Methods:

Construction and Design of Oxidation Ponds, Sludge Digestion Tanks and The Factors That Decide the Design. Sludge Disposal by Drying, Septic Tanks and Their Working Principles and Design of Soak Pits.

Module 3:

Unit-1: Wastewater Treatment Plants and Advanced Wastewater Treatment-Treatment Plants: Site selection, plant design, Hydraulic Profiles, operation, and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection, and polishing.

Module 4:

Unit-1: Advanced Wastewater Treatment:

removal of suspended solids, dissolved solids, nitrogen removal, phosphorous removal, adsorption, refractory organics and their treatment, reuse and recycle of wastewater. Wastewater treatment from specific industries sources, characteristics, and methodology for the treatment of industrial wastewater, flow diagram for the treatment methods, sugar industry, distilleries, tannery textile and paper and pulp mills.

Module 5:

Unit-1: **Air Pollution:**

Classification and Their Effects. Meteorological Parameters Affecting Air Pollution, Atmospheric Stability. Plume Behaviour. Control of Particulates by Gravity Settlers, Cyclone Filters, Electrostatic Precipitators. Control of Gaseous Pollutants and Automobile Pollution.

Unit-2: Noise Pollution: Basic Concepts, Measurement and Various Control Methods.

Text Books:

1. ‘’Water Supply & Sanitary Engineering’’ by Dhanpatraj J.S. Birdie, G.S. Birdie, Publications.
2. ‘’Environmental Engineering-I’’ and II by, SK Garg Khanna Publications.

Reference Books:

1. ‘’Environmental Engineering, I and II’’ by BC Punmia, Std. Publications.
2. ‘’Wastewater Engineering, Treatment, Disposal and Reuse’’, Metcalf and Eddy.Tata McGraw-Hill, New Delhi.
3. ‘’Environmental Pollution and Control Engineering’’, CS Rao, Wiley Publications.

E-Resources

1. https://nptel.ac.in/courses/105/105/105105178/
2. https://nptel.ac.in/courses/105/106/105106119/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Identify** the different sewage water treatment and disposal methods.
2. **Explain** different components of wastewater treatment plants.
3. **Apply** the different mode of operation and maintenance of wastewater treatment plants.
4. **Apply** the different modes of waste water treatment in the industry.
5. **Identify** the effect of the behaviour of air pollutants on the environment.

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	2	3	-	-	-	3	-	-	-	-	2	2	1
CO2	-	-	3	2	2	-	-	-	-	-	-	-	2	1
CO3	-	-	3	2	2	-	-	-	-	-	-	-	2	1
CO4	-	-	3	2	2	-	-	-	-	-	-	-	2	1
CO5	2	3	-	-	-	3	-	-	-	-	-	2	2	1
Average	0.6	1	2.4	1.2	1.2	0.6	0.6	-	-	-	-	0.8	2	1

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE III Year – I Sem</td></tr>
<tr><td>Course Code: J3111</td><td colspan="4" rowspan="2">GEOTECHNICAL ENGINEERING LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Geotechnical Engineering

Course Objectives:

This course will enable students to:

1. Apply the basic knowledge of Geotechnical Engineering to carry out field investigations and to identify soil basic properties.
2. Perform and interpret laboratory tests for evaluating sub grade performance and for pavement design.
3. Study the different tests to determine index properties.
4. Study the characteristics of flow of water through soil.
5. Perform the different laboratory tests to determine Engineering properties.

EXPERIMENT 1: Liquid Limit Test.

EXPERIMENT 2: Plastic Limit test.

EXPERIMENT 3: Field density by core cutter method.

EXPERIMENT 4: Field density by sand replacement method.

EXPERIMENT 5: Grain size distribution by sieve analysis.

EXPERIMENT 6: Determination of specific gravity by pycnometer.

EXPERIMENT 7: Permeability of soil by constant and variable head test methods.

EXPERIMENT 8: Standard Proctor’s Compaction Test.

EXPERIMENT 9: California Bearing Ratio Test (CBR Test).

EXPERIMENT 10: Unconfined compression test.

EXPERIMENT 11: Direct shear test.

EXPERIMENT 12: Differential free swell index (DFSI) test.

Note: At least any Ten (10) experiments have to be conducted out of available Twelve (12) experiments.

Course outcomes: The student will be able to:

1. **Demonstrate** site specific field investigations including collection of soil Samples for testing and observation of behavior/building damage.
2. **Perform** identify and classify soils based on standard geotechnical engineering practice.
3. **Perform** laboratory compaction and in-place density tests for fill quality control.
4. **Evaluate** unsoaked and soaked California Bearing Ratio (CBR) tests used to estimate subgrade behavior during construction and beneath permanent structures.
5. **Determine** engineering properties of soils.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	-	3	-	1	-	-	-	-	-	2	1	-
CO2	2	-	-	3	-	1	-	-	-	-	-	2	2	-
CO3	1	1	-	2	-	1	-	-	-	-	-	1	-	1
CO4	2	2	-	2	-	1	-	-	-	-	-	1	1	-
CO5	2	2	-	-	-	1	-	-	-	-	-	1	1	-
Average	1.8	1	-	2	-	1	-	-	-	-	-	1.4	1	0.2

<table>
<tr><td>\AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE III Year – I Sem</td></tr>
<tr><td>Course Code: J3112</td><td rowspan="2" colspan="4">ENVIRONMENTAL ENGINEERING LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Chemistry**.**

Course Objectives:

This course will enable students to:

1. Perform the experiments to determine water and wastewater quality.
2. Study the water and wastewater sampling, their quality standards.
3. Estimate quality of water, wastewater, and industrial water.
4. Estimate Most Probable Number of given water sample.
5. Estimate optimum dosage of coagulant (Alum).

LIST OF EXPERIMENTS:

EXPERIMENT 1: Determination of pH.

EXPERIMENT 2: Determination of Electrical Conductivity and Turbidity.

EXPERIMENT 3: Determination of Total Solids (Organic and inorganic).

EXPERIMENT 4: Determination of Acidity.

EXPERIMENT 5: Determination of Alkalinity.

EXPERIMENT 6: Determination of Hardness (Total, Calcium and Magnesium Hardness).

EXPERIMENT 7: Determination of Chlorides content.

EXPERIMENT 8: Determination of Optimum Coagulant Dosage by JAR Test.

EXPERIMENT 9: Determination of Dissolved Oxygen (Winkler Method).

EXPERIMENT 10: Determination of Chemical Oxygen Demand& Biological Oxygen Demand.

EXPERIMENT 11: Determination of Residual Chlorine.

EXPERIMENT 12: Determination of Noise level measurement.

Note: At least any Eight (10) experiments have to be conducted out of available Twelve (12) experiments.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the equipment used to conduct the test procedures.
2. **Identify** the various water standards through the experiments conducted in the lab.
3. **Examine** and estimate water, wastewater quality.
4. **Compare** the water quality with prescribed standards set by the local governments.
5. **Develop** a report on the quality aspect of the environment.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	2	-	2	3	2	2	1	-	-	-	-	2	1
CO2	-	2	-	2	2	2	1	1	-	-	-	-	1	2
CO3	-	1	-	2	3	2	2	1	-	-	-	-	1	1
CO4	-	2	-	2	3	2	2	1	-	-	-	-	1	1
CO5	-	2	-	1	3	2	2	1	-	-	-	-	2	2
Average	-	1.8	-	1.8	2.8	2	1.8	1	-	-	-	-	1.4	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31M2</td><td rowspan="2">CYBER SECURITY
(Common to CE, EEE, ME, and MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To familiarize various types of cyber-attacks and cyber-crimes
2. To give an overview of the cyber laws
3. To study the defensive techniques against these attacks.
4. To understand security issues in organizations.
5. To know data privacy.

Module 1:

Unit-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,

Unit-2 Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Module 2:

Unit-1: Cyberspace and the Law & Cyber Forensics:

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Unit-2: 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:

Unit-1: 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:

Unit-2: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Module 4:

Unit-1: 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

Unit-2: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Module 5:

Unit-1: Privacy Issues, Cybercrime: Examples and Mini-Cases

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.

Unit-2: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text Books

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F

Web Resources

1. http://uou.ac.in/foundation-course
2. http://uou.ac.in/progdetail?pid=CEGCS-17

Course Outcomes

On completion of the course, the students will be able to:

1. Understand cyber-attacks and types of cybercrimes.
2. Summarize Cyber Laws and Cyber Forensics.
3. Understand frauds in Wireless era.
4. Analyze and evaluate the cyber security needs of an organization.
5. Outline Data Privacy and privacy policies.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	2	2	1	-	-	-	-	1	-	-
CO2	-	-	2	-	1	2	-	-	-	-	-	1	-	-
CO3	2	3	1	-	2	1	1	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	1	-	-	-	-	1	-	-
CO5	-	-	-	-	-	1	2	-	-	-	-	2	-	-
Average	1.2	1.4	1.4	-	1	1.2	1	-	-	-	-	1	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J3101</td><td rowspan="2">EMPLOYABILITY SKILLS
(COMMON TO ALL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Understand the importance of Listening skills.
2. Know how reading skills help an individual.
3. Obtain the knowledge and practice session on speaking effectively
4. Understand why proper writing skills are important
5. Implement business Etiquettes 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

Course Outcomes:

On completion of the course, the students will be able to:

1. Practice listening and probing any problem.
2. Understand the importance of reading skills.
3. Understand how to speak effectively.
4. Write essays and letter using proper vocabulary.
5. Practice creativity in day to day life

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE III Year – II Sem</td></tr>
<tr><td>Course Code: J321A</td><td rowspan="2">TRANSPORTATION ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the Necessity for Highway Planning and Highway alignment.
2. Solve different aspects of geometric elements.
3. Discuss Basic parameters of traffic, parking studies and Traffic Signals.
4. Explain the Importance of Intersection design.
5. Study basic aspects of railway and airport engineering.

Module 1:

Unit –1 Highway Development and Planning:

Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

Module 2:

Unit – 1 Highway Geometric Design:

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping Sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves Design of Vertical Alignment Gradients- Vertical curves.

Module 3:

Unit – 1 Traffic Engineering:

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording –Traffic regulation and management: Road Traffic Signs – Types and Specifications – Road Markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method.

Module 4:

Unit - 1 Intersection Design:

Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design Criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection. Introduction to Intelligent Transport System.

Module 5:

Unit -1 Introduction to Railway Engineering:

Component parts of railway track-ballast-sleepers-rails- Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Crossings and Turnouts.

Unit -2 Introduction to Airport Engineering:

Airport layout - Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram.

Text Books:

1. “Highway Engineering” by S.K.Khanna, C.E.G.Justo& A Veeraragavan , Nem Chand & Bros., 10th edition June 2017.
2. “A Textbook of Transportation Engineering” by S.P. Chandola – S.Chand& Co. Ltd. (January 2016).

References:

1. ’Principles of Transportation Engineering’’ by ParthaChakroborty&Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).
2. “Transport planning and Traffic Engineering” by Dr. L. R. Kadiyali, Khanna Publications 9th Edition (2017).
3. “Airport Planning and Design”- S.K. Khanna and Arora,Nemchand Bros,10th Edition (2017).

E-Resources:

1. https://nptel.ac.in/courses/105/101/105101087/

Course outcomes:

On completion of the course, students will be able to:

1. **Explain** the Factors affecting Highway Alignment.
2. **Design** geometric elements of a highway network.
3. **Analyze** traffic volume studies.
4. **Apply** the concept of traffic signals and intersections.
5. **Formulate** the basic concept of railway engineering and Design the airport runway.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	2	-	-	-	-	-	-	-	-	-	1	2
CO2	2	3	3	-	-	3	2	-	-	-	-	-	3	3
CO3	2	2	3	-	-	3	1	-	-	2	-	2	2	1
CO4	2	2	3	-	-	2	-	-	-	-	-	2	2	2
CO5	2	2	3	-	-	2	-	-	-	-	-	2	3	3
Average	2	2	2.8	-	-	2	0.6	-	-	0.4	-	1.2	2.2	2.2

<table>
<tr><td>AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE III Year – II Sem</td></tr>
<tr><td>Course Code: J321B</td><td rowspan="2">STRUCTURAL ENGINEERING –II (STEEL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Strength of Materials, Structural Analysis, SE-I

Course Objectives:

This course will enable students to:

1. Describe the manufacturing process of steel, types of steel and their properties. and the salient features of Limit State Method of design of Steel structures.
2. Summarize the various codal provisions given in IS.800. Connections in steel structures.
3. Acquire the Knowledge on the behaviour of steel structures under tension, compression, and flexure.
4. Explain the design procedures as per IS 800, for tension, compression and bending members.
5. Provide with the details of joints in steel structures and design detailing of bolted and welded joints in beams &other members.

Module 1:

Unit 1: Structural Steel:

Materials-Manufacturing of iron and steel-type of structural steel-mechanical properties of steel-concepts of plasticity-yield strength-load and combinations-local buckling behaviour of steel-concepts of limit state design-different limit states-serviceability stability check Bolted connections-IS:800-2007 specifications-Design strength-efficiency of joint prying action-welded connections-type of welded joints specifications-design requirements.

Module 2:

Unit 1: Design of tension & compression members:

Design of tension members-Design Strength-Design procedure-splice-lug angles Design of compression members-buckling-slenderness ratio-Load carrying capacity-laced columns battened columns-splice-column base slab base-Gusseted base.

Module 3:

Unit 1: Design of beams:

Design of beams-plastic moment-bending and shear strength/buckling-design of laterally supported beams –welded sections and built-up beams – Beam web and flange splices.

Module 4:

Unit 1: Connections:

Design of beam end connections – framed and seated type- welded and bolted connections- design of bracket connections- Eccentric connections.

Module 5:

Unit 1: Industrial buildings

-Structural elements -crane gantry girders and cranes

Unit 2: Steel Roof Trusses:

Types of roof trusses-Sizes, alignment, and dimensions of roof truss-loading on roof trusses-wind load calculations -purlin design-Analysis of Roof Trusses using graphical method-Design of connections.

Text Books:

1. ‘’Limit State design of Steel Structures’’ by S.K.Duggal, McGraw Hill Education,3rd Edition(1 July 2017).
2. ‘’Design of steel Structure’’ by N.Subramanian, Oxford University Press(1 January 2018)

Reference Books:

1. ‘’Design of Steel Structures’’ by S.S.BhaviKatti(By limit state methos), IK International Publishing House Pvt.Limited ,2nd Edition (28 july 2012).
2. IS.800:2007-Indian Code Practice for Construction in Steel.

E-Resources

1. https://nptel.ac.in/courses/105/105/105105162/

Course Outcomes:

On completion of the course, the students will be able to:

1. Examine the limit states and design principles in design of steel structural members as per IS Code.
2. Apply the different loads and load combination that come on steel structural elements and roof trusses.
3. Evaluate the design strength of tension, compression members and beams.
4. Analyze and design steel bolted and welded connections.
5. Design tension member, compression member, beam, simple and built-up sections.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	1	-	-	-	-	-	1	-	-
CO2	2	2	2	-	-	1	-	-	-	-	-	1	-	-
CO3	2	-	3	-	-	1	-	-	-	-	-	1	-	-
CO4	2	-	3	-	-	1	-	-	-	-	-	1	-	-
CO5	2	2	3	-	-	1	-	-	-	-	-	1	-	-
Average	2.2	1.4	2.2	-	-	1	-	-	-	-	-	1	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE III Year – II Sem			
Course Code: J321C	**FOUNDATION ENGINEERING**	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Geotechnical Engineering, Applied Mechanics

Course Objectives:

This course will enable students to:

1. Emphasize the importance of soil investigations including destructive and non-destructive methods.
2. Discuss the different slope failure mechanism and its stability analysis.
3. Study the earth pressure theory and its application in the design of retaining structure.
4. Study suitable shallow foundation system and deep foundation system for various site conditions and analysis of different foundation system.
5. Identify the different soil stabilization techniques to achieve the max strength.

Module 1:

Unit 1: Soil Exploration

Need, methods of soil exploration, boring and sampling methods, penetration tests, Geophysical methods, planning of soil exploration program and preparation of soil investigation report.

Module 2:

Unit 1: Slope Stability Infinite and finite earth slopes, types of failures, factor of safety of infinite slopes stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices, Taylor's Stability Number, stability of slopes of earth dams under different conditions.

Module 3:

Unit 1: Earth Pressure Theories: Rankine's theory of earth pressure, Active and passive earth pressure of cohesionless soil, Active and passive earth pressure of cohesive soil Coulomb's earth pressure theory, Comparison of Coulomb's Theory with Rankine's Theory, Culmann's graphical method.

Unit 2: Retaining Walls: Types of retaining walls, stability consideration for cantilever retaining walls against overturning, sliding, and bearing capacity.

Module 4:

Unit 1: Pile Foundation: Classification of piles, uses of piles, Pile driving, Load carrying capacity of piles based on static pile formulae, Dynamic pile formulae, Pile Capacity through static analysis and penetration tests, Group action of piles, Pile group efficiency, Settlement of pile and pile groups, negative skin friction.

Module 5:

Unit 1: **Soil Stabilization:** Introduction to stabilization, Mechanical stabilization, lime, cement, bitumen, chemical etc. Grouting: Injection and principles, grouting pressure criteria, grouting equipment, injection chemicals**.**

Unit 2: **Reinforced Earth Walls**

Introduction, Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken.

Text Books:

1. "Basic and Applied Soil Mechanics" by Gopal Ranjan & ASR Rao, New Age International Publishers, 3rd edition (Jan 2016).
2. "Soil Mechanics and Foundation Engineering" by V.N.S. Murthy, CBS Publishers, and Distributors, 10th edition (Jan 2018).

Reference Books:

1. "Analysis and Design of Substructures'', Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
2. "Geotechnical Engineering" by Manoj Dutta & Gulati S. K, Tata McGraw-Hill Publishers,3rd edition (Jan 2011).

E-Resources

1. https://nptel.ac.in/courses/105/105/105105176/
2. https://nptel.ac.in/courses/105/107/105107120/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Evaluate** soil investigation for any civil engineering construction.
2. **Analyze** the different failures due to slope and its control methods.
3. **Analyze** earth retaining structures for any kind of soil medium.
4. **Estimate** pile and pile group capacity for any kind of soil including group efficiency and negative skin friction.
5. **Identify** the different waste naturally or artificial materials available to enhance the strength properties of the soil.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	2	-	1	-	-	-	-	-	1	1	-
CO2	2	3	1	-	-	1	-	-	-	-	-	1	-	-
CO3	2	1	2	-	-	1	-	-	-	-	-	1	1	1
CO4	2	2	-	3	-	1	-	-	-	-	-	2	-	-
CO5	2	1	-	2	-	1	-	-	-	-	-	2	1	-
Average	2.2	1.8	0.6	1.4	-	1	-	-	-	-	-	1.4	0.6	0.2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – I Sem</td></tr>
<tr><td>Course Code: J321D</td><td rowspan="2">STRUCTURAL ANALYSIS-II
(Professional Elective Course – I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Structural Analysis-I

Course Objectives:

This course will enable students to:

1. Study the concept of Arches and analysis of statically determinate and indeterminate structures.
2. Describe the effect of moving loads on structural members using influence line diagrams.
3. Use the techniques, such as stiffness and flexibility methods to solve engineering problems.
4. Communicate effectively in design of structural elements.
5. Impart the principles of elastic structural analysis and behaviour of indeterminate structures.

Module 1:

Unit 1: Three Hinged Arches:

Introduction–Types of Arches–Comparison between Three hinged and two hinged Arches. Linear Arch. Eddy’s theorem. Analysis of Three hinged arches. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Normal Thrust and radial shear in an arch. Absolute maximum bending moment diagram for a three hinged arch. Effect of temperature. Analysis of two hinged arches-circular and parabolic – concentrated and UDL.

Module 2:

Unit 1: Moving Loads:

Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two-point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

Unit 2: Influence Lines:

Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Module 3:

Unit 1: Flexibility Matrix Method:

Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy.

Module 4:

Unit 1: Stiffness Matrix Method:

Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic indeterminacy.

Module 5:

Unit 1: **Plastic Analysis:**

Introduction – definitions of plastic hinge and plastic moment capacity and Assumptions – shape factors for various sections – Basic theorems for finding collapse loads – method of plastic analysis - static method and kinematic method - kinematic method applied to beams and frames.

Text Books:

1. "Structural Analysis" Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers,8th addition Nov 2015.
2. "Structural Analysis" Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.6th addition Jan 2012
3. "Structural Analysis" Vol –I & II by S S Bhavikatti, Vikas Publications, 4th addition, Oct 2010

Reference Books:

1. "Structural Analysis" by Hibbeler, pearson Education Ltd, 9th addition Oct 2017.
2. "Structural Analysis" by by R. Vaidyanathan and P. Perumal, Naveen Publishing House. 3rd, April 2017.
3. "Basic Structural Analysis" by C S Reddy, I K International Publishing House Pvt, Ltd, July 2017

E-Resources

1. https://nptel.ac.in/courses/105/105/105105109/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Analyze** two and three hinged arches.
2. **Apply** influence line diagrams for the analysis of structures under moving load.
3. **Construct** the bending moment diagram for beams and frames using flexibility method.
4. **Analyze** the beams and indeterminate frames by system stiffness method.
5. **Describe** the method of plastic analysis for structures

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	1	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2.2	1.2	-	-	-	-	-	-	-	-	0.6	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – II Sem</td></tr>
<tr><td>Course Code: J321E</td><td colspan="4" rowspan="2">GROUND WATER MANAGEMENT
(Professional Elective Course – I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Geology, Hydrology and Water resource Engineering

Course Objectives:

This course will enable students to:

1. Emphasize the importance of Ground Water Occurrence, Ground water hydrological cycle and ground water movement.
2. Determine the behavior of groundwater flow towards a well in confined and unconfined aquifers.
3. Study the various geophysical approaches for surface and subsurface investigation
4. Describe the ground water quality.
5. Study the importance of saline water intrusion in coastal aquifers and its control measures

Module 1:

Unit 1: Ground Water Occurrence and Movement

Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

Unit 2: Ground Water Movement

Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

Module 2:

Unit 1: Steady and Unsteady Ground Water Flow

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupuits and Theisms equations, Assumptions, Formation constants, yield of an open well, Well interface and well tests, Recuperation Test. Unsteady flow towards a well, On equilibrium equations, Thesis solution, Jacob and Chows simplifications, Leaky aquifers Well Interference.

Module 3:

Unit 1: Surface and Subsurface Investigation

Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods, Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

Unit 2: Artificial Recharge of Ground Water

Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and remote sensing-Artificial Recharge of Ground water along with Case studies.

Module 4:

Unit 1: Ground Water Survey and Ground Water Quality

Geophysical survey of ground water, Surface Geophysical techniques, Electrical logging, and Radioactive logging method, bore log, Interpretation of Bore log Results.

Unit 2: Ground Water Quality

Factors affecting ground water quality, water quality requirements, Ground water quality degradation, Reasons for ground water quality degradation.

Module 5:

Unit 1: **Saline Water Intrusion in Aquifer**

Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion.

Unit 2: **Groundwater Basin Management**

Concepts of conjunction use, Case studies.

Text Books:

1. "Ground water Hydrology" by David Keith Todd, John Wiley & Sons, 3rd edition (Jan 2004).
2. "Groundwater" by H. M. Raghunath, New Age International,15th edition (Jan 2003).

Reference Books:

1. "Groundwater Assessment Development & Management" by K. R. Karanth, Tata Mc Graw Hill Co. Ltd, 12th edition (Aug 2008).
2. "Applied Hydrogeology" by C. W. Fetta, CBS Publishers & Distributers, 7th edition, (Mar 2018).

E resources

1. https://nptel.ac.in/courses/105/103/105103026/
2. https://nptel.ac.in/courses/105/105/105105042/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Assess** the importance of Ground water hydrological cycle and Ground water movement.
2. **Explain** the behavior of steady and unsteady ground water flow.
3. **Interpret** the geophysical exploration data for scientific source finding of aquifers.
4. **Assess** the quality of the ground water.
5. **Justify** the effective measures taken for controlling saline water intrusion.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	1.6	0.2	-	-	-	-	-	-	-	-	0.2	1.2	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – II Sem</td></tr>
<tr><td>Course Code: J321F</td><td rowspan="2">STRUCTURAL HEALTH MONITORING
(Professional Elective Course - I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Concrete Technology.

Course Objectives:

This course will enable students to:

1. Study the fundamentals of structural health monitoring.
2. Discuss the application of SHM in civil engineering.
3. Study the quality control applications of concrete structures.
4. Discuss the different non-destructive tests on concrete.
5. Predict the damage assessment of concrete structures.

Module 1:

Unit 1: Introduction to Structural Health Monitoring

Definition of structural health monitoring (SHM) - Motivation for SHM - SHM as a way of making materials and structures smart - SHM and biomimetics - Process and pre- usage monitoring as a part of SHM - SHM as a part of system management - Passive and active SHM-NDE - SHM and NDECS - Variety and multidisciplinary - The most remarkable characters of SHM Birth of the SHM community.

Module 2:

Unit 1: Application of SHM in Civil Engineering

Introduction to capacitive methods, capacitive probe for cover concrete, SHM of a bridge, applications for external post tensioned cables, monitoring historical buildings.

Module 3:

Unit 1: Condition Survey and NDE of Concrete Structure

Definition and objective of Condition survey, stages of condition survey (Preliminary, Planning, Inspection and Testing stages), possible defects in concrete structures, quality control of concrete structures - Definition and need, Quality control applications in concrete structures, NDT as an option.

Module 4:

Unit 1: Non-Destructive Testing of Concrete Structures

Introduction to NDT - Situations and contexts, where NDT is needed, classification of NDT procedures, visual Inspection, half-Cell electrical potential methods, Schmidt Rebound Hammer Test, resistivity measurement, electromagnetic methods, radiographic Testing, ultrasonic testing, Infra-Red thermography, ground penetrating radar, radio isotope gauges, other methods.

Module 5:

Unit 1: Repair Rehabilitation & Retrofitting of Structures

Damage assessment of concrete structures, Materials and methods for repairs and rehabilitation, modelling of repaired composite structure, structural analysis, and design Importance of re-analysis, execution of rehabilitation strategy, Case studies.

Text Books:

1. "Structural Health Monitoring" by Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes John Wiley-ISTE, London, 6^{th} edition Oct 2015.
2. "Health Monitoring of Structural Materials and Components - Methods with Applications", by Douglas E Adams, John Wiley & Sons, New York, 3th edition Jan 2017.

Reference Books:

1. "Structural Health Monitoring and Intelligent Infrastructure" Vol.-1 by J.P. Ou, H. Li and Z. D. Duan, Taylor & Francis, London, 2^{nd} edition, Apr 2005.
2. "Structural Health Monitoring with Wafer Active Sensors" by Victor Giurglutiu, Academic Press Inc, 3^{rd} edition Nov 2015.

E-Resources

1. https://nptel.ac.in/courses/112/104/112104160/
2. https://nptel.ac.in/courses/105/106/105106202/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** the fundamentals of structural health monitoring.
2. **Describe** the applications in civil engineering.
3. **Explain** the quality control applications in concrete structures.
4. **Estimate** the quality and strength of concrete structures.
5. **Decide** the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	1	2	-	-	2	2	-	-	-	-	1	1	-
CO2	2	-	2	-	-	3	1	-	-	-	-	2	2	-
CO3	2	-	-	3	2	1	-	-	-	-	-	2	1	-
CO4	2	1	-	2	3	-	-	-	-	-	-	2	1	-
CO5	2	1	-	-	-	2	3	-	-	-	-	-	1	-
Average	1.	0.6	0.8	1	1	1.6	1.2					1.4	1.2	

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – II Sem			
Course Code: J321G	IRRIGATION AND HYDRAULIC STRUCTURES (Professional Elective-II)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Hydrology and Water Supply Engineering Fluid Mechanics

Course Objectives:

This course will enable students to:

1. Describe about the types of irrigation systems, the concepts of planning and design of irrigation systems and the relationships between soil, water and plant and their significance in planning an irrigation system.
2. Study the various design methods of canals.
3. Illustrate the principles of design of hydraulic structures.
4. Describe the concepts for analysis and design principles of storage and diversion head works.
5. Explain the design principles of canal structures

Module 1:

Unit1: Necessity and importance of irrigation:

Advantages and ill effects of irrigation, types of irrigation, methods of application of irrigation water, Indian agriculture soils, methods of improving soil fertility- crop rotation, preparation, land fall irrigation, standards of quality for irrigation water, Duty and Delta, factors affecting Duty-Design discharge for a water course. The depth and frequency of irrigation.

Module 2:

Unit 1: Classification of canals:

Design of irrigation canals by Kennedy's and Lacey's theories, Balancing, depth of cutting, IS standards for canal design, canal lining.

Unit 2: Design discharge over a catchment:

Completion of design discharge- rational formula, SCS curve number method, Flood frequency analysis, introductory part only. Stream gauging- measurement and estimation of upstream flow.

Unit 3: Storage works reservoirs:

Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, and estimation of capacity of reservoir using mass curve- reservoir sedimentation-life of reservoir-types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

Module 3:

Unit 1: Gravity dams:

Forces acting on a gravity dam, causes of failure of earth dam, elementary profile and particle profile of the gravity dam, limiting height of a low gravity dam, factors of safety- stability analysis, foundation of a gravity dam, drainage and inspection galleries.

Unit 2: Earth dams:

Types of earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam- in graphical method, measures for control of seepage.

Module 4:

Unit 1: Spillways: Types of spillways, design principles of ogee spillways-spillway gates. Energy dissipaters and stilling basins significance of jump, high curve and tail water rating curve-

USBR and Indian types of strolling basins.

Unit 1: Diversion headworks:

Types of diversion headworks-weirs and barrages, layout of diversion headwork-components. Causes and failures of weirs and barrages in permeable foundations-silt ejectors and silt excluders weirs on permeable foundations-creep theory-Bligh's ,lane and koala's theories, Determination of uplift pressure-various correction factors- design principles of weirs on permeable foundations using creep theory-exit gradient, upstream and downstream sheet piles-launching apron.

Module 5:

Unit 1: **Canal falls:**

Types of falls and their location, design principles of notch fall and sarada type fall. Canal regulation works, principles of design of distributor and head regulators, canal cross regulator-canal outlets, types of canal modules, proportionality sensitivity and flexibility.

Unit 2: **Cross drainage works:**

Selection of site, design principles of aqueduct, siphon aqueduct and super passage. Design of type II aqueduct (under tunnel).

Text Books:

1. "Irrigation and water power engineering" by Dr.B.CPunmia, Dr. Pande B Lal 16th edition, laxmi publications pvt ltd, 2009.
2. ''Irrigation and hydraulic structure'' by Santosh Kumar Garg, Khanna Publications 25th edition.

Reference Books:

1. "Irrigation water resources and water power engineering" by Dr.PN Modi Standard book house Publications 2019 11th edition.

E-Resources:

1. https://nptel.ac.in/courses/105/105/105105110/
2. https://nptel.ac.in/content/storage2/courses/105105110/pdf/m4l06.pdf

Course Outcomes:

On completion of the course, the students will be able to:

1. **Examine** irrigation requirements.
2. **Design** irrigation canals and canal networks.
3. **Analyze** the stability of Gravity and Earth dams.
4. **Design** spillways and energy dissipation works.
5. **Plan** and design diversion head works.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	-	-	1	-	3	-	-	-	1	1	-
CO2	2	-	-	-	-	-	-	-	-	-	-		-	-
CO3	1	2	-	3	-	-	-	-	-	-	-		3	-
CO4	3	-	-	-	-	-	-	-	-	-	-		-	-
CO5	-	-	-	-	-	-	-	-	-	-	-		3	-
Average	1.4	0.4	-	0.6	-	0.2	-	0.6	-	-	-	0.2	1.4	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE III Year – II Sem			
Course Code: J321H	**REMOTE SENSING AND GIS (Professional Elective Course - II)**	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Surveying

Course Objectives:

This course will enable students to:

1. Describe the different methods of photographs to analyze the ground condition.
2. Study the basic concepts of remote sensing and its interpretation.
3. Demonstrate the various aspects of GIS and its data interpretations
4. Compare different geo spatial analysis methods to get input and output data.
5. Apply the knowledge of Remote sensing and GIS to solve various water resource aspects.

Module 1:

Unit-1: Introduction to Photogrammetry

Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height and determinations.

Module 2:

Unit 1: Remote Sensing – I

Basic concepts and foundation of remote sensing. Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

Unit 2: Remote Sensing – II

Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

Module 3:

Unit 1: Geographic Information System

Geographic Information System and terminologies. GIS categories, components of GIS, fundamental operations of GIS and theoretical framework for GIS.

Unit 2: Types of data representation

Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

Module 4:

Unit 1: GIS Spatial Analysis

Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

Module 5:

Unit 1: **Water Resources Applications-I**

Land use/Land cover in water resources, Surface water mapping and inventory.

Rainfall – Runoff relations and runoff potential indices of watersheds. Flood and Drought impact assessment and monitoring. Watershed management for sustainable development and Watershed characteristics.

Unit 2: Water Resources Applications-II

Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting and Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management. Water depth estimation by bathymetry.

NOTE: The above topics have to be explained in the laboratory through demonstration and execution.

Text Books:

1. "Remote Sensing and its applications" by LRA Narayana University Press, 4th Edition Jan 2012.
2. "Principals of Geo physical Information Systems" – Peter.A.Burragh and Rachael A. Mc Donnell, Oxford Publishers, 2nd Edition Oct 2004.

Reference Books:

1. "Concepts & Techniques of GIS" by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications. 3rd Edition Jan 2010.
2. "Remote Sensing and Geographical Information systems" by M.Anji Reddy JNTU Hyderabad, B.S.Publications. 2nd Edition Apr 2008.

E-Resources

1. http://nptel.ac.in/courses/105107155/
2. http://www.nptelvideos.in/search?q=remote+sensing+%26+gis
3. ebooks.library.cornell.edu/k/kmoddl/pdf/016_002.pdf

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the different approaches of photogrammetric to analyze the ground condition.
2. **Apply** the concepts of remote sensing on earth surface features and atmosphere.
3. **Examine** the GIS data collection and input output overview.
4. **Analyze** the different geo spatial data.
5. **Describe** the different water resource application using RS and GIS.

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	-	-	2	1	-	-	-	-	2	2	2
CO2	-	-	3	3	-	-	-	1	-	-	-	2	2	2
CO3	-	2	3	1	2	-	-	-	-	-	-	2	2	2
CO4	-	2	3	3	1	-	-	2	-	-	-	2	2	2
CO5	2	2	3	-	-	-	-	1	-	-	-	2	2	2
Average	1	1.8	2.4	1.4	0.6	0.4	0.2	0.8	-	-	-	2	2	2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J321I</td><td rowspan="2">SUSTAINABLE MATERIALS AND GREEN BUILDINGS
(Professional Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems along with the established Indian codes and guidelines.
2. Explain various renewable and non-renewable sources of energy along with their carbon footprints and enumerates the process of performance testing including building modelling and energy analysis.
3. Discuss about the energy efficient green building materials and to have understanding on the cost-effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
4. Study the principles of sustainable development in green building design.
5. Formulate the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.

Module 1:

Unit 1: Sources of Energy: Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards, demand and supply in India, Global efforts to reduce carbon emissions. Building modelling- Energy analysis, Monitoring.

Unit 2: Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon footprint, Environmental issues, Minimizing carbon emission.

Module 2:

Unit 1: Sustainable Materials: Sustainable Materials, Depletion of natural resources for preparation of building materials, renewable and recyclable resources, energy efficient materials, Embodied Energy of Materials. Green cement, Biodegradable materials, Smart materials, Volatile Organic Compounds (VOC’s), Recycled materials.

Unit 2: Green Building Planning and Specifications: Environment friendly and cost-effective Building Technologies, Green Strategies for Building Systems, Alternative Construction Methods, Waste and Water management and Recycling by Sustainable Facilities, Heating, Ventilation and Air Conditioning.

Module 3:

Unit 1: Concept of Green Buildings: Green building - Definition, Features, Necessity, Initiatives, Green buildings in India, Green building Assessment – Green Building Rating Systems (BREEAM, USGBC, LEED, IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits, economic benefits, health and social benefits, Major energy efficiency areas for building, Contribution of buildings towards Global Warming. Life cycle cost of buildings. Certification Programs (including GEM and ECBC Certification) Energy audit procedures -energy simulation tools.

Module 4:

Unit 1: Design of Green Buildings: Sustainable sites, Impact of construction on environment, Life cycle assessment, Principles of sustainable development in Building Design, Design on Bioclimatic and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design.

Module 5:

Unit 1: **Construction of Green Buildings:** Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco-friendly water proofing; Energy conservation building codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods, Cost/benefit analysis of green buildings, Life-cycle analysis of green buildings.

Text Books:

1. ‘’Alternative Building Materials and Technologies’’ By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao, New Age International Publishers.
2. ‘’Integrated Life Cycle Design of Structures’ ‘By AskoSarja , SPONPress.
3. ‘’Non-conventional Energy Resources’’ By D S Chauhan and S K Sreevasthava, New Age International Publishers.
4. ‘’Green Buildings (McGraw hill publication)’’ by Gevorkian.

Reference Books:

1. ‘’Emerald Architecture: case studies in green buildings’’, The Magazine of Sustainable Design.
2. ‘’Understanding Green Building Guidelines’’,For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
3. ‘’Understanding Green Building Materials’’by Traci Rose Rider, W. W. Norton & Company Publisher.

E-Resources

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce08
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

Course Outcomes:

On completion of the course, the students will be able to:

1. Explain the underlying principles, history, environmental and economic impacts of green building technology and to identify the criteria for rating systems along with the established Indian codes and guidelines.
2. Identify various Renewable and Non-renewable sources of energy along with their carbon footprints and comprehend the techniques and benefits of building performance testing such as building modelling and energy analysis, monitoring and metering.
3. Identify the energy efficient green building materials and explain the cost-effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.

4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. Discuss the building codes, relevant legislation governing the consumption of resources and emission of environmental pollutants by buildings and be familiar with IGBC green building certification procedure.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	1	2	1	-	1	2	-	-	-	-	-	1	1
CO2	1	2	1	1	-	1	2	-	-	-	-	-	1	1
CO3	1	1	1	1	-	1	2	-	-	-	-	-	1	1
CO4	1	1	1	1	-	2	2	-	-	-	-	-	-	-
CO5	1	1	1	1	-	1	2	-	-	-	-	-	1	-
Average	1	1.2	1.2	1	-	1.2	2	-	-	-	-	-	0.8	0.6

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech CE III Year -II Sem**			
Course Code: J3211	**TRANSPORTATION ENGINEERING LAB**	**L**	**T**	**P**	**D**
Credits:1		**0**	**0**	**2**	**0**

Pre-requisite: Concrete Technology

Course Objectives:

This course will enable students to:

1. Study the practical knowledge of properties of Highway materials and surveys.
2. Perform the tests on Road Aggregates and bituminous material.
3. Discuss the material characteristic to various application of construction.
4. Study about Bitumen and & its engineering behaviour.
5. Perform Traffic Volume Studies.

LIST OF EXPERIMENTS:

I ROAD AGGREGATES:

EXPERIMENT 1: Aggregate Crushing Value Test.

EXPERIMENT 2: Aggregate Impact Test.

EXPERIMENT 3: Specific Gravity and water absorption Test.

EXPERIMENT 4: Los Angeles Abrasion Value Test.

EXPERIMENT 5: Flakiness and Elongation Indices of Coarse Aggregates.

II BITUMINOUS MATERIALS:

EXPERIMENT 6: Penetration Test.

EXPERIMENT 7: Ductility Test.

EXPERIMENT 8: Softening Point Test.

EXPERIMENT 9: Marshal stability Test.

III TRAFFIC STUDIES:

EXPERIMENT 10: Traffic volume study at Mid blocks.

EXPERIMENT 11: Traffic volume study at Junctions.

EXPERIMENT 12: Spot Speed Studies.

Note: At least any Ten (10) experiments have to be conducted out of available twelve (12) experiments.

Course Outcomes:

On completion of the course, students will be able to:

1. **List** Properties of Highway Materials.
2. **Perform** the Tests on Road Aggregates and Bituminous Material.
3. **Explain** Engineering Properties of Aggregate and Bitumen.
4. **Analyze** Traffic Volume for a Given Location on the Road.
5. **Analyze** Design Speed, Maximum Speed & Minimum Speed.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	2	-	-	-	2	2	-	-	2	2
CO3		2	-	-	-	-	-	-	-	-	-	-	1	2
CO4	1	2	-	-	-	-	-	-	2	2	-	-	1	1
CO5	2	2	-	-	-	-	-	-	2	2	-	-	1	1
Average	1.4	1.2	-	-	0.4	-	-	-	1.2	1.2	-	-	1	1.2

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
III Year – II Sem</td></tr>
<tr><td>Course Code: J3201</td><td colspan="4" rowspan="2">LIFE SKILLS & PROFESSIONAL SKILLS LAB
(COMMON TO ALL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 2</td><td>0</td><td>0</td><td>4</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Understand the importance of Communication and effective communication skills.
2. Obtain ample knowledge in understanding self-awareness and self-assessment.
3. Learn about empathy and emotional intelligence.
4. Understand the need of Leadership skills.
5. Be familiar with Interview skills and Corporate etiquettes.

Experiments:

1. Understand the importance of Self introduction and practice session on " Tell me about yourself".
2. Importance of Communication skills.
3. Advance communication skills needed for effective communication.
4. Understand the concepts of Self-assessment and self-awareness with required tools.
5. Understanding Empathy, Assertive behavior.
6. Importance of Social skills and how to handle criticism
7. Understanding Emotional Intelligence, Conflict resolution and anger management.
8. Understand the concepts of Innovation and creativity.
9. Understand importance of Leadership skills.
10. Case studies of famous leaders who inspired many.
11. A hands-on how to write proper curriculum vitae.
12. Role plays.
13. Group discussion and JAM session.
14. Mock interview sessions.
15. Corporate etiquettes.

Course Outcomes:

On completion of the course, the students will be able to:

1. Know the importance of proper and effective communication
2. Understand more about how to handle one’s own self.
3. Handle pressure in today’s world
4. Know how industry operates in real time
5. Equip with interview skills.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	3	-	-	-	-	3	3	-	3	3	-	-
CO2	-	-	2	-	-	-	-	3	3	-	3	3	-	-
CO3	-	-	2	-	-	-	-	3	2	-	3	2	-	-
CO4	-	-	2	-	-	-	-	2	2	-	3	2	-	-
CO5	-	-	2	-	-	-	-	2	2	-	2	1	-	-
Average			2.2					2.6	2.4		2.8	2.2		

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32M1</td><td rowspan="2">ARTIFICIAL INTELLIGENCE
(Common to ECE, CIVIL, ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Mathematics, Probability and statistics Knowledge in programming Language

Course Objectives:

This course will enable students to:

1. Know the AI based problems.
2. Illustrate AI techniques for representing the basic problem.
3. Illustrate Advanced AI techniques to solve the problem.
4. Define Learning and explain various learning techniques.
5. Understand the usage expert system

Module 1:

Unit-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:

Unit-1: 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:

Unit-1: Advanced Knowledge Representation and Reasoning:

Knowledge Representation Issues, Non- monotonic 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:

Unit-1: Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

Module 5:

Unit-1: **Expert Systems:** Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

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, Shivasankar 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/vi
4. https://nptel.ac.in/courses/106/105/106105077/

Course Outcomes:

On completion of the course, the students will be able to:

1. Identify the AI based problems.
2. Apply AI techniques for representing the basic problem.
3. Apply Advanced AI techniques to solve the problem.
4. Analyze Learning and explain various learning techniques.
5. Illustrate the use of expert system.

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

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

<table>
<tr><td>AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE III Year – II Sem</td></tr>
<tr><td>Course Code: J32A1</td><td rowspan="2">BUILDING BYELAWS AND QUALITY STANDARDS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable Students to:

1. **Describe** about the various Building byelaws and regulations.
2. **Explain** about the standard requirements for the planning of residential and public buildings.
3. **Explain** about the sign conventions for the various materials.
4. **Explain** about the different building elements and planning of a residential building.
5. **Describe** about the Quality of RCC structures

Module 1:

Unit-1: Building Byelaws and Regulations:

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

Module 2:

Unit-1: Residential Buildings:

Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types' residential buildings.

Unit-2: Public Buildings:

Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

Module 3:

Unit 1: Sign Conventions and Bonds:

Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

Unit 2: Doors, Windows, Ventilators and Roofs: Panelled door, panelled and glassed door, glassed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

Module 4:

Unit 1: Planning and Designing of Buildings: Draw the Plan, Elevation, and sections of a Residential & Public buildings from the given line diagram. Good for construction drawings, documents, and drawings to be submitted for building permission and approval process.

Module 5:

Unit 1: Quality standard's:

Environmental exposure conditions of concrete (Table-3 of IS-456:2000) Minimum cover Acceptance criteria for concrete(Table-11 of IS-456:2000) Grade of concrete W/c ratio minimum cement content Grade of concrete and standard deviation values (table-8 of IS-456:2000), Frequency of sampling of concrete Gradation specifications of coarse and fine aggregate(Table-2,Table-4 of IS-383-1970) coarse aggregate to fine aggregate ratio(Table-3 of IS 10262:2009) testing of concrete- NDT Expansion Joints (section-2 (27) IS456:2000).

TEXT BOOKS:

1. "Building planning and drawing" by Dr.N Kumaraswamy, A Kameswara Rao Charator publications 8th edition 2015.
2. Indian standard plain and reinforced concrete - code of practice (fourth revision) 10th Reprint April 2007 IS 456:2000

REFERENCES:

1. "Building planning and drawing" by S. S. Bhavikatti, M. V. Chitawadagi I.K. International Publishing House Pvt. Limited 2014.

E-Resources:

1. https://law.resource.org/pub/in/bis/S03/is.sp.7.1.2005.pdf

Course outcomes:

At the end of the course student will be able to:

1. **Describe** about the various Building byelaws and regulations.
2. **Explore** building drawing as a way of discovering and developing ideas for designing residential, commercial, and public buildings.
3. **Explain** about the sign conventions for the various material.
4. **Explain** about the different building elements and Develop basic drawing skills and working drawing.
5. **Explain** about the quality of RCC structures.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	-	-	1	-	-	-	-	1	-	-	1	-
CO2	-	-	-	-	2	-	-	-	-	2	-	-	-	-
CO3	-	-	-	-	-	-		-	-	3	-	-	3	-
CO4	-	-	-	-	-	-	3	-	-	-	-	-	3	-
CO5	-	-	-	-	-	-		-	-	-	-	-	3	-
Average	0.2	0.4	-	-	0.6	-	0.6	-	-	1.2		0.2	2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411A</td><td rowspan="2">ESTIMATION, COSTING AND VALUATION</td><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>Credits:2</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Building Materials, Construction and Services

Course Objectives:

This course will enable students to:

1. Study the different methods involved in the Estimation and prepare Abstract of quantities.
2. Perform the rate analysis for standard items.
3. Evaluate the quantities of earth works for road and canals.
4. List out the types and features of the contracts.
5. Formulate procedure for Valuation of buildings.

Module 1:

Unit-1: Estimation:

Types of estimates-Methods of estimates, approximate methods of Estimating, Principles of working out quantities for detailed and abstract estimates, centre line method, long wall short wall method- General items of work.

Module 2:

Unit-1: Detailed Estimates of Buildings:

Detailed Estimates of Buildings – Abstract of Quantities –Reinforcement- bar bending schedules. Specifications-Rate Analysis-SSR – Working out data for various items of work- over- head and contingent charges.

Module 3:

Unit-1: Earthwork for roads and canals:

Estimating the quantities of earthwork for roads and canals.

Module 4:

Unit-1: Contracts:

Types of contracts -including BOT, BOOT EPC, PPC– contract Documents – Conditions of contract, contract procedures, Tendering process, Rights, and responsibilities of parties to contracts. Contract act- selection of contractor.

Module 5:

Unit-1: **Valuation of buildings &Industrial establishments:**

Purpose and principles of valuation, Depreciation, methods of calculating depreciation, methods of valuation, Rental method, development method, profit based method.

Text Books:

1. "Estimating and Costing in Civil Engineering: Theory and Practice Including Specifications and Valuations" by B. N. Dutta, UBS Publishers & Distributors Ltd (28th February 2017).
2. "Estimating and Costing" by S. C. Rangwala, Charotar Publishing House Pvt. Ltd,17th Edition 2017.
3. "Text Book of Estimating and Costing for Civil Engineering" by G.S. Birdie,

Dhanpat Rai Publishing Company Private Limited-New Delhi (1st January 2014).

Reference Books:

1. "Estimating, Costing, Specification & Valuation In Civil Engineering" by M Chakraborti, Chakraborti (1st January 2006).
2. "Standard Schedule of rates and standard data book" by public works department.
3. "Method of Measurement of Building Works & Civil Engineering Works" (IS-1200) (Parts 1 to 28) by Bureau of Indian Standards (BIS) 1998.

E-Resources

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://www.coursera.org/lecture/construction-cost-estimating/introduction-to-cost-estimating-and-cost-control-xXOyj

Course Outcomes:

On completion of the course, the students will be able to:

1. **Apply** the diverse knowledge of estimating, costing, and professional practice in tackling the different construction projects.
2. **Evaluate** the quantities of all the items of the work.
3. **Estimate** the quantities of earth works and evaluate the abstract cost for road works.
4. **Create** the Tender and Contract document.
5. **Formulate** Valuation of buildings methods.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	1	-	2	1	-	-	-	-	3	1	3	-
CO2	3	1	1	-	-	-	-	-	1	-	3	-	2	-
CO3	3	1	-	-	1	1	1	-	-	-	3	-	2	-
CO4	2	2	-	-	1	-	-	-	-	-	3	1	2	-
CO5	3	2	2	-	-	-	-	-	-	-	3	2	3	2
Average	2.8	1.4	0.8	-	0.8	1	1	-	-	-	3	0.8	2.4	0.4

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411B</td><td rowspan="2">PAVEMENT DESIGN
(Professional Elective Course - III)</td><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Transportation Engineering

Course Objectives:

This course will enable students to:

1. Study the factors affecting pavement design.
2. Explain stresses induced in flexible and rigid pavements.
3. Identify the properties of aggregate, bitumen, and bituminous mixes.
4. Study design methods of flexible and rigid pavements.
5. Discuss construction of pavements and their maintenance.

Module 1:

Unit -1 Introduction to Pavement Design:

Variables considered in Pavement Design-Types of Pavements-Functions of individual Layers-Factors affecting Pavement Design-wheel Loads-Tire Pressure-Contact Pressure-Equivalent standard axle load (EAL) and Equivalent single wheel load (ESWL) Concepts-Traffic Analysis-Collection and Presentation Traffic Volume.

Module 2:

Unit - 1 Stresses in Flexible Pavement:

Stresses in Flexible Pavements-Layered Systems Concept-One-layer system-Boussinesq’s two-layer system-Burmister’s theory of Pavement design.

Unit - 2 Stresses in Rigid Pavement:

Stresses in Rigid Pavements-Relative stiffness of slab-modulus of Sub Grade Reaction-stresses due to warping-stresses due to loads-stresses due to friction.

Module 3:

Unit - 1 Material Characteristics:

Aggregate properties and their Importance-Tests on Aggregates- Bitumen Properties-Tests on Bitumen-requirements of bituminous mix - Design-Marshall method of mix design.

Module 4:

Unit - 1 Flexible Pavement Design:

Flexible Pavement Design concepts, Flexible Pavement design methods- CBR method, IRC method and American association of state highway and transportation officials (AASHTO) method.

Unit - 2 Rigid Pavement Design:

Rigid Pavement design concepts-IRC method of Rigid Pavement Design-Importance of Joints in rigid Pavements-Types of joints - Design of tie bars and dowel bars.

Module 5:

Unit - 1 Highway Construction:

Construction: Construction of Bituminous Pavements construction of Cement Concrete

Roads-Soil Stabilization-use of Geosynthetics.

Unit - 2 Highway Maintenance:

Highway maintenance –Pavement failures-failures in flexible Pavements-Rigid Pavement Failures-Pavement Evaluation-Benkelman Beam method. Latest Technologies in Pavement Design.

Text Books:

1. “Highway Engineering” by S.K.Khanna, C.E.G.Justo& A Veeraragavan , Nem Chand & Bros., 10^{th} edition (June 2017).
2. “Principles & Practices of Highway Engineering” by Dr L.R.Kadiyali&Dr.N.B Lal, Khanna Publishers. 7^{th} Edition (January 2019).
3. “Pavement Design” by R Srinivasa Kumar, Orient Blackswan Private Limited, (January 2013).

Reference Books:

1. “Principles of Pavement design” by E J Yoder. & Witzorac Mathew, John Wiley & Sons Inc. 2^{nd} edition (January 1991).
2. Pavement Analysis and Design by Yang H. Huang, Prentice Hall Inc, 2^{nd} edition (2008).
3. IRC: 37 “Guidelines for the Design of Flexible Pavements” (Fourth Revision-2018).
4. IRC: 58 “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways” (Fourth Revision- 2015).

E-Resources

1. https://nptel.ac.in/courses/105/101/105101087/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** the factors considered in pavement design.
2. **Analyze** stresses induced in flexible and rigid pavements.\
3. **Describe** the properties of aggregate, bitumen, and bituminous mixes.\
4. **Design** flexible and rigid pavement by various methods.
5. **Explain** the construction of pavements and their maintenance.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	2	-	-	-	-	-	-	-	-	1	1	1
CO2	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	2	1	-	-	-	-	-	3	2
CO5	1	1	2	2	-	2	1	-	-	-	-	-	2	2
Average	2	1.6	1.4	0.8	-	0.8	0.4	-	-	-	-	-	1.2	1

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411C</td><td rowspan="2">ELEMENTS OF EARTHQUAKE ENGINEERING
(Professional Elective Course - III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Geology, Geotechnical Engineering and Structural Engineering –I **(RCC)**

Course Objectives:

The objective of the course is to:

1. Learn the principles of engineering seismology.
2. Understand the design considerations for regular and irregular shapes of building.
3. Design of earthquake resistant RC building as per IS 1893:2002
4. Study the behaviour of masonry building under seismic loading.
5. Understand the concepts of Structural and Non-structural Elements and the ductile

Detailing of RC member as per IS 13920.

Module 1:

Unit-1: Engineering Seismology

Earthquake phenomenon- cause of earthquakes-Faults- Plate tectonics- Seismic Waves-Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy Released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-strong ground motions- Seismic zones of India.

Unit-2: Theory of Vibrations

Elements of a vibratory system- Degrees of Freedom-Continuous System-Lumped mass idealization-Oscillatory Motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) for undamped, damped and critical damping system

Module 2:

Unit 1: Conceptual design

Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of buildings- flexible building systems-choice of construction materials-unconfined concrete-confined concrete.

Module 3:

Unit-1: Introduction to earthquake resistant design

Seismic design requirements-regular and irregular configurations of plan-basic assumptions-basic load combinations-permissible stresses-seismic methods of analysis

Unit-2: Reinforced Concrete Buildings

Principles of earthquake resistant deign of RC members- Structural models for frame buildings as per IS 1893:2002, - Vertical irregularities- Plan configuration problems-Determination of design lateral forces- Equivalent lateral force procedure- Lateral distribution of base shear.

Module 4:

UNIT - I: Masonry Buildings

Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behavior of unreinforced and reinforced masonry walls- Behavior of Box action and bands, Behavior of infill walls- Improving seismic behavior of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

Module 5:

Unit-1: Structural and Non-Structural Elements

Sectional shape, variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of nonstructural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage.

Unit-2: Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Ductility-definition-ductility relationships-Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations of RC member as per IS 13920. Behavior of beams and columns during Earthquakes.

Text Books:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press.
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Masonry and Timber structures including earthquake Resistant Design –Anand S.Arya, Nem chand & Bros.
3. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial college Press.

E-Resources

1. https://nptel.ac.in/courses/105/101/105101004/
2. https://nptel.ac.in/courses/105/107/105107204/

Course Outcomes:

At the end of the course student will able to:

1. **Know** the principles of engineering seismology
2. **Understand** the behaviour of regular and irregular shaped buildings for lateral loads.
3. **Design** earthquake resistant buildings as per IS 1893:2002
4. **Understand** the behaviour of masonry building under seismic loading.
5. **Gain** the knowledge of ductile detailing consideration of RC member as per IS 13920

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	1	-	-	-	-	-	-	-	2	3	-
CO2	3	1	3	2	-	-	-	-	-	-	-	2	3	-
CO3	3	1	3	1	-	-	-	-	-	-	-	2	2	-
CO4	2	1	3	1	-	-	-	-	-	-	-	2	3	-
CO5	2	1	3	2	-	-	-	-	-	-	-	2	3	-
Average	2.4	1.2	2.6	1.4	-	-	-	-	-	-	-	2	2.8	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code:
J411D</td><td rowspan="2">GROUND IMPROVEMENT TECHNIQUES
(Professional Elective Course - III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Geotechnical Engineering

Course Objectives:

This course will enable students to:

1. Study the fundamental concepts of Ground improvement methods.
2. Discuss various grouting techniques to increase strength property of soil.
3. Study the various compaction methods used for granular soils and cohesive soils.
4. Explain the importance of soil stabilization in improving engineering properties of soil.
5. Choose suitable geosynthetic materials in various civil engineering projects to strength the soil properties.

Module 1:

Unit-1: Introduction to Ground Improvement Techniques

Soil profile Need and Objectives, factors affecting ground improvement.

Unit-2: Dewatering

Methods of dewatering sumps- single and multi-stage well point system-vacuum well points-horizontal wells- foundation drains-blanket drains- pit area for selection of fill materials around drains-electro osmosis method.

Module 2:

Unit-1: Grouting:

Objectives of grouting, grouts and their properties, grouting methods, ascending, descending and stage grouting, hydraulic fracturing in soils.

Module 3:

Unit-1: Compaction

In-Situ densification methods in granular soils, vibration at the ground surface, impact at the ground surface, vibration at depth, impact at the depth. In-Situ densification methods in cohesive soils, preloading or dewatering, vertical drains, sand drains, sand wick geo drains, store and lime columns, thermal methods.

Module 4:

Unit-1: Stabilization

Methods of stabilization-mechanical-cement-lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum.

Unit-2: Reinforced Earth Principles, components of reinforced earth, factors governing design of reinforced earth walls, design principles of reinforced earth walls.

Module 5:

Unit-1: **Geo synthetics Geo** textiles, types, functions and applications, geo grids and geo membranes, functions, and applications compression test and field Vane shear test, Test under different drainage conditions.

Unit-2: Expansive soils Problems of expansive soils, tests for identification, and methods of determination of swell pressure. Improvement of expansive soils, foundation techniques in expansive soils, under reamed piles.

Text Books:

1. "Engineering Principles of Ground Modification" by Manfred R. Hausmann, McGraw-Hill 3rd edition, (March 2008).
2. "Ground Improvement Techniques" by Dr. P. Puroshothama Raj, Laxmi Publication (P) LTD, 2nd edition (Feb 2016).

Reference Books:

1. "Ground Improvement" by M.P. Moseley & K. Kirsch, Spon Press, 2nd edition (Jun 2004).
2. "Designing with Geosynthetics" by Robert M.Koerner, Prentice Hall New Jersey 6th edition (Sep 2012).

E Resources

1. https://nptel.ac.in/courses/105/108/105108075/
2. https://nptel.ac.in/courses/105/106/105106144/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Apply** different approaches for ground improvement.
2. **Compare** the different grouting method to improve the characteristics of the ground.
3. **Apply** different methods of in situ compaction methods to increase the strength characteristics of the soil.\
4. **List** the various stabilization techniques by using locally available material.
5. **Identify** the different soil stabilization techniques with the aid of Geosynthetics.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	2	-	1	-	-	-	-	-	2	1	-
CO2	2	1	2	-	3	1	-	-	-	-	-	2	2	1
CO3	2	2	-	-	2	2	-	-	-	-	-	1	1	-
CO4	2	1	2	-	-	1	-	-	-	-	-	2	2	-
CO5	2	1	-	-	2	1	-	-	-	-	-	2	1	-
Average	2	1.2	0.8	0.4	1.4	1.2	-	-	-	-	-	1.8	1.4	0.2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411E</td><td rowspan="2">PRE - STRESSED CONCRETE STRUCTURES
(Professional Elective Course - IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Structural Engineering –I(RCC)

Course Objectives:

This course will enable students to:

1. Explain the basic concept and necessity of prestressed concrete and materials used.
2. Learn the analysis of prestress and load balancing concept and various techniques of prestressing.
3. Discuss the various losses of prestress.
4. Study the flexural and shear design of prestressed concrete beam sections.
5. Know the concepts of deflections and end blocks of prestressed concrete sections.

Module 1:

Unit 1: Introduction:

Historic development – General principles of prestressing Pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

Module 2:

Unit 1: Losses of prestress:

Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

Module 3:

Unit 1: Design of sections for flexure and shear:

Allowable stress, Design criteria as per I.S. Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile-PT slabs.

Unit 2: Analysis of end blocks:

Types of end blocks and Importance of end block, Analysis and design of end block by Guyon method and IS method -Approximate design of End block-for not more than two cables- Anchorage zone stresses- Anchorage zone reinforcement – Transfer of prestress in pretensioned members

Module 4:

Unit 1: Deflections:

Necessity of deflection estimation, limitations of deflections. Deflections of pre-stressed concrete beams with uniformly distributed and point loads.

Module 5:

Unit 1: **Composite section**:

Introduction – Analysis of stress – Differential shrinkage – General designs considerations – Shear connectors.

Text Books:

1. “Prestressed Concrete” by Krishna Raju,6th Edition Tata McGraw Hill Education (28 April 2018).
2. “Prestressed Conc
3. rete” by N. Rajagopalan, 2nd Edition, Narosa publications.

Reference Books:

1. “Prestressed Concrete” by Ramamrutham, 5th Edition, Dhanpatrai Publications (2013).
2. “Design of Prestressed concrete structures (Third Edition)” by T.Y. Lin & Ned H.Burns. (7 September 2010).
3. Codes: BIS code on prestressed concrete, IS 1343-2012 by John Wiley & Sons.

E-Resources

1. https://nptel.ac.in/courses/105/106/105106118/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Apply** the concept of prestressing and determine the losses of prestress.
2. **Analyze** the prestressed concrete beam and suggest the cable profile for beam.
3. **Evaluate** the prestressed concrete beam for flexure and shear.
4. **Apply** skills to satisfy the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).
5. **Examine** the principles of design of composite sections and their advantages.

CO-PO/PSO Mapping Chart (Draft) **(3/2/1 indicates strength of correlation)** **3 – Strong; 2 – Medium; 1 – Weak**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	2	-	-	-	-	-	1	1	-
CO2	2	2	3	-	-	1	-	-	-	-	-	1	1	-
CO3	2	2	3	-	-	1	-	-	-	-	-	1	1	-
CO4	2	3	2	-	-	1	-	-	-	-	-	1	1	-
CO5	2	3	2	-	-	1	-	-	-	-	-	1	1	-
Average	2.2	2.4	2.4	-	-	1.2	-	-	-	-	-	1	1	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411F</td><td rowspan="2">FEM FOR CIVIL ENGINEERING
(Professional Elective Course - IV)</td><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Structural Analysis

Course Objectives:

This course will enable students to:

1. To Describe about the various approximation methods.
2. To Explain about the stress and strain concept.
3. Study about the Finite element formulation of the truss element.
4. Explain about the Finite element formulation of the beam elements.
5. Describe about the Finite element formulation for plane stress and plane strain problems.

Module 1:

Unit 1: Introduction:

Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation. Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with Axi-symmetric loading.

Module 2:

Unit 1: One Dimensional Bar Element:

Displacement function &Shape functions for one dimensional element – Stiffness matrix for linear and quadratic bar element - one dimensional bar problem – temperature loading -solution of bars with varying C/s using FE formulation.

Unit 2: One Dimensional Beam element:

FE formulation of beam element- shape functions -Stiffness matrix for beam element- load vector – analysis of continuous beam using FE formulation.

Module 3:

Unit 1: Plane truss:

Bar element in 2-D assembly -solution of a Plane truss problem- Transformation matrix

Unit 2: Two-Dimensional FEM:

Different types of elements for plane stress and plane strain analysis – Displacement models – CST element, LST element- generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates.

Module 4:

Unit 1:

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements. Isoparametric formulation: Concepts of isoparametric elements for 2D analysis- 4 –noded and 8-noded iso-parametric quadrilateral elements – Simple problems with CST and LST elements.

Module 5:

Unit-1: **Axi-symmetric analysis:**

Basic Principles -Formulation of 3-node Iso-parametric plane strain element, Axisymmetric ring element.

Unit-2: Solution techniques:

Numerical Integration, Lagrangian and Serendipity elements. Static condensation, assembly of elements and solution techniques for static loads.

Text Books:

1. "Finite Elements Methods in Engineering" by Tirupati.R. Chandrupatla and Ashok D. Belegundu ,4th Edition, Pearson Education Publications.
2. "Finite element analysis" by S.S. Bhavikatti, 3rd Edition New age international publishers (1 January 2015).

Reference Books:

1. "Concepts and Applications of Finite Element Analysis" by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons 4th Edition (1 January 2007).
2. "Finite Element analysis – Theory & Programming" by C.S.Krishna Moorthy,2nd Edition Tata Mc.Graw Hill Publishers,2007.
3. "Finite element analysis" by P.Seshu, Prentice Hall of India. (1 January 2003)

E-Resources

1. https://nptel.ac.in/courses/105/106/105106051/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Develop** constitutive relations in mechanics and formulate equilibrium equations in elasticity
2. **Formulate** structural mechanics problems by using energy principles and applying Rayleigh -Ritz method.
3. **Solve** simple structural mechanics problems of one dimension using Numerical technique of Finite element method.
4. **Develop** finite element formulation of two-dimensional problems and solve them for displacements at nodes.
5. **Assemble** Stiffness matrices, apply boundary conditions and solve for the displacements in Axi symmetric problem.

CO-PO/PSO Mapping Chart (Draft) **(3/2/1 indicates strength of correlation)** **3 – Strong; 2 – Medium; 1 - Weak**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	1	-	-	-	-	-	-	1	-	1
CO2	2	3	-	-	2	-	-	-	-	-	-	1	-	1
CO3	2	3	-	-	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	-	2	-	-	-	-	-	-	-	-	1
CO5	2	3	2	-	2	-	-	-	-	-	-	-	-	1
Average	2	2.8	0.6	-	1.8	-	-	-	-	-	-	0.4	-	1

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year-I Sem			
Course Code: J411G	INDUSTRIAL WASTE WATER TREATMENT (Professional Elective Course - IV)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Environmental Engineering.

Course Objectives:

This course will enable students to:

1. Study the difference between the quality of domestic and industrial water requirements.
2. Study the concept and application of Industrial pollution prevention and cleaner technologies.
3. Describe the principles of various processes applicable to industrial wastewater treatment.
4. Identify the best applicable technologies for wastewater treatment from the perspective of yield production.
5. Study the various disposal methods of industrial wastewater.

Module 1:

Unit-1: Introduction to Industrial Waste:

Sources of Industrial Waste, Characteristics of the Industrial Wastes, Inorganic salts, Acids and Alkalis, Organic matter, Suspended solids, Floating Solids and liquids, Heated Water, Colour, Toxic chemicals, Microorganisms, Inplant survey– composite sampling – Tolerance limits for effluents discharges into inland surface water's public sewers, and on land for irrigation – standards.

Module 2:

Unit 1: Waste Reduction:

Waste Reduction Alternatives, Volume Reduction, Classification of Wastes, Conservation Of wastewater, Changing Production to Decrease Wastes, Re-Using Both Industrial and Municipal Effluents for Raw Water supplies, Elimination of Batch or Slug Discharge of Process Wastes, In general.

Module 3:

Unit 1: Wastewater Treatment:

Waste minimization - Equalization - Neutralization – Oil separation – Flotation – Precipitation, Heavy metal Removal – adsorption – Aerobic and anaerobic biological Treatment – Sequencing batch reactors – High Rate reactors. Advanced Treatment Methods: Nitrification and De-nitrification, Phosphorous removal – Heavy metal removal, Membrane Separation Process, Air Stripping and Absorption Processes.

Module 4:

Unit 1: **Special Treatment Methods:**

Special Treatment Methods Chemical oxidation, Ozonation, Photocatalysis, Wet Air Oxidation, Evaporation, Ion Exchange, Membrane Technologies, Nutrient removal Disposal of Treated Waste.

Module 5:

Unit 1: **Disposal Process:**

Comparison of Disposal Methods, Tanning Process, Sources of wastewater and their characteristics, Effects of waste on receiving water and sewers, Treatment of Cotton and Woolen Textile Mill Waste.

Unit 2: **Common Effluent Treatment Plants (CETPs):**

Location, Need, General Design considerations and principles, Operation & Maintenance Problems, Zero effluent discharge systems, Wastewater reuse, Waste Audit.

Text Books:

1. "Wastewater Treatment" by M. N. Rao and A. K. Datta, Oxford I. B. H publishers.
2. "Handbook of Industrial Waste Disposal" by Richard A. Conway Richard Ross, Van Nostrand publisher (1980).
3. "Industrial Waste Treatment" Contemporary Practice and Vision for the Future by Nelson Leonard Nemerow, Nemerow , Butterworth Weinemann publisher (2006).

Reference Books:

1. "Zero Pollution for Industry: Waste Minimization through Industrial Complexes" by N. L. Nemerow, John Wiley & Sons, 1995.
2. "Wastewater Treatment for Pollution Control" by S. J. Arceivala, Tata Mc. Graw Hill, 1999.
3. "Industrial Water Pollution Control" by W. W. Eckenfelder, Mc. Graw Hill.
4. Indian standards: IS: 2490 (1963), IS: 3306 (1065).

E-Resources

1. https://nptel.ac.in/courses/105/106/105106119/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Assess** the quality of domestic and industrial water requirements.
2. **Apply** the different procedure involved in efficient industrial effluent management with reference to specific industries.
3. **Describe** the Principles of pollution prevention and mechanism of oxidation processes.
4. **Apply** the suitable technologies for the treatment of wastewater.
5. **Prioritize** the various disposal methods for efficient operation and maintenance of treatment plants.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	3	-	-	-	2	1	-	-	-	-	-	2	1
CO2	-	-	3	2	-	-	-	-	-	-	-	-	1	2
CO3	3	2	-	-	-	-	2	-	-	-	-	-	2	2
CO4	-	-	3	2	3	-	-	-	-	-	-	-	2	2
CO5	-	-	3	2	-	1	2	-	-	-	-	-	2	2
Average	0.6	1	1.8	1.2	0.6	0.6	1	-	-	-	-	-	1.8	1.8

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411H</td><td rowspan="2">CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT
(Professional Elective Course - V)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Concrete technology, Estimation and costing.

Course Objectives:

This course will enable students to:

1. Study on Fundamentals of construction technology.
2. Study the different equipment's for construction.
3. Explain the Quality control, Contract Management and Construction Planning.
4. Study the different types of estimations and contracts.
5. Differentiate the PERT and CPM.

Module 1:

UNIT-1: Fundamentals of Construction Technology

Construction Activities – Process – Construction Schedule –Construction Records – Documents - Codes and Regulations., and scheduling of Material and Equipment.

Module 2:

Unit-1: Construction Method

Earthwork, excavators, rollers, dozers, Scrapers – Handling Equipment – Draglines and Clamshells -Concrete Equipment – Hauling Equipment – Cranes – Piling – Concrete and Concreting – Form work – Fabrication and Erection.

Module 3:

Unit-1: Quality Control

Quality Control, Assurance and Safety – ISO – 9000 Quality Systems.

Unit-2: Safety

Principles on Safety – Personnel, Fire and-Electrical Safety – Environment Protection– Concept of Green Building. Air condition and HVAC systems.

Module 4:

Unit-1: Contract Management

Project Estimation – Types of Estimation – Contract Document – Classification – Bidding –Procurement Process. Construction Claims, Dispute and Project Closure – Source of Claim – Claim Management – Dispute Resolution –Arbitration – Construction Closure – Contract Closure – Documentation.

Module 5:

Unit-1: Construction Planning: Project Planning Techniques – Planning of manpower, Equipment Economics and Finance. Project – PERT – CPM, Resources.

Text Books:

1. "Construction Technology" by Subira K. Sarkar, Subhajit Saraswathi / Oxford University Press, 3rd edition, Apr 2009.
2. "Construction Equipment and Management" by S C Sharma, New age International publisher,2^{nd} edition, Jan 2018.

Reference Books:

1. “Construction Planning, Equipment and Methods” by Peurifacy, Schexnayder, Shapira TMH, 3rd edition, oct 2010.
2. “Project Planning and Control with PERT and CPM” by B.C. Punmia, K.K. Khandelwala – Laxmi Publication, 4th edition Nov 2015.

E-Resources

1. https://www.researchgate.net/publication/227991740
2. https://nptel.ac.in/courses/105/103/105103093/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** different activities involves in construction.
2. **Describe** the quality and quantity control different machinery used for the construction.
3. **Examine** risks and uncertainty related issues in constructions.
4. **Differentiate** the type of estimation and contracts.
5. **Construct** the various types CPM and PERT networks.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	-	-	-	-	-	-	3	2	1	-
CO2	2	-	2	-	3	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	3	2	2	-	-	-	2	1	-
CO4	2	2	-	-	-	-	-	-	-	2	2	2	1	-
CO5	2	2	-	-	-	1	-	1	-	-	3	2	1	-
Average	2	1.4	0.8	-	0.6	0.8	0.4	0.6		0.4	1.6	2	1.2	

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411I</td><td rowspan="2">ADVANCED STRUCTURAL ENGINEERING
(Professional Elective –V)</td><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Structural Engineering –I **(RCC),** Structural Analysis-I

Course Objectives:

This course will enable students to:

1. Explain the design steps and technical aspects in the design of cantilever and counterfort retaining wall with horizontal backfill, shear wall.
2. Elucidate design of flat slabs (Interior panel only).
3. Explain design of RCC circular water tanks resting on the ground.
4. Explain the design of concrete bunkers of circular shape (excluding staging) and brief the difference between bunkers and silos.
5. Explain the design of steel gantry girders.

Module 1:

Unit 1: Design of retaining wall: Design of cantilever and counterfort retaining wall -stability check -with & without surcharge.

Unit 2: Shear wall Design: Shear wall design -ductile detailing.

Module 2:

Unit-1: Flat slabs: Introduction, Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat Slabs-Check for one way and two-way shears – IS Codal provisions.
Design of flat slabs (Interior panel only) & shear walls-ductile detailing.

Module 3:

Unit-1: Water tank: Design principles and IS codal provisions for water tanks, Design principles of underground water tank & overhead circular water tank.

Module 4:

Unit-1: Bunkers & Silos: Design of concrete bunkers of circular shape – Introduction to silos.

Module 5:

Unit-1: Girders: Design specification of steel gantry girders and plate girders as per IS-800.

Text Books:

1. "Advanced R.C.C" by KrishnamRaju, CBS Publishers & distributors, New Delhi 3rd edition 2016.
2. "Structural Design and drawing (RCC and steel) " by KrishnamRaju, Univ.Press , New Delhi 3rd edition 2016.

Reference Books:

1. "R.C.C Structures" by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi. 1st edition 2015.

E-Resources

1. https://nptel.ac.in/courses/105/105/105105104/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** the loading and design principles involved in retarning walls, shear walls, water tanks, bunkers and silos, gantry girder.
2. **Remember** the codal provision available in the design of flat slabs, water tanks, plate girder.
3. **Analyse** the retaining walls and water tanks, gantry girder for the possible forces and perform stability checks.
4. **Evaluate** the available equations the design of bunkers and silos, gantry girder.
5. **Design** the retaining wall, plate girder and flat slabs.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year – I Sem</td></tr>
<tr><td>Course Code: J411J</td><td rowspan="2">EARTH, ROCK FILL DAMS AND SLOPE STABILITY
(Professional Elective-V)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Geotechnical Engineering, Irrigation and Hydraulic Structure

Course Objectives:

This course will enable students to:

1. Study the different features of the Earth and Rock fill dams.
2. Study the different approaches to control the failure of earth dams.
3. Discuss the different slope failure mechanisms and its stability analysis.
4. Discuss the different stability methods to control the slope failures.
5. Study the different features of Rock fill dams.

Module 1:

Unit-1: Earth and rock fill dams

General features, selection of site; merits and demerits of the earth and rock fill dams, classification of earth dams, causes of failure, safe design criteria, instrumentation in earth dams: pore pressure measurements, settlement gauges, inclinometers, stress measurements, seismic measurements, Composite earth dam with casing and hearting.

Module 2:

Unit-1: Failures, damages, and protection of earth dams

Nature and importance of failure, piping through embankment and foundations, methods of seepage control through embankments and foundations, design criteria for filters, treatments of upstream and downstream of slopes, drainage control fitter design.

Module 3:

Unit-1: Slope stability analysis

Types of failure, Failure surface, planar surfaces, Circular surfaces, non-circular surfaces, limit equilibrium methods, total stress analysis versus effective stress analysis, use of hop's pore pressure parameters, short term and long-term stability in slopes, Taylor charts

Module 4:

Unit-1: Slope Stability Methods

Methods of slices, effect of cracks, vertical cuts, Bishops analysis, Bishops and Morgenstern analysis, non-circular failure surfaces, Janb analysis, slider analysis, seismic stability, stabilization of slopes: slopes reinforcement and photosynthetic/soil nailing/micro piles ectasia treatment (cement time/lime treatment), surface protection (Vegetation/shotcrete).

Module 5:

Unit-1: **Rock fill dams**

Requirements of compacted rockfill, shear strength of rockfill mixtures, rockfill embankments, earth core rock fill dams, stability upstream and downstream slopes.

Text Books:

1. “Earth and Rock fill Dams” by Christian Kutzner, A A Balkema (1997).
2. “Earth and rock fill Dams” by Bharat Singh and Sharma, (1999).

Reference Books:

1. “Slope Stability and Stabilisation Methods” by Abramson, L H Lee, S.N Sharma, S. - john Wiley and sons. (2002).\
2. “Earth and rock fill Dams” by Sowers, Gf and Sashay, H.D. Williams, R.C and Venice, TS (1995).

E-Resources

1. https://link.springer.com/chapter/10.1007/978-3-662-47331-3_10
2. https://civilpddc2013.weebly.com/uploads/2/2/5/5/22556782/20_-_earthen_dams_and_rockfill_dams.pdf

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the behaviour of natural and engineered soil / rock slopes under various weather and engineering conditions.
2. **Explain** the different causes of the failure of the earth dams and possible damages.
3. **Analyse** the different slope stability methods.
4. **Assess** the different approaches for the protection of slope failures using different slope stability methods.
5. **Describe** the different features of the Rock fill dams.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	-	-	1	-	-	-	-	-	3	1	-
CO2	2	2	2	-	-	1	-	-	-	-	-	-	1	-
CO3	2	1	2	-	-	1	3	-	-	-	-	-	1	1
CO4	2	1	3	-	-	1	-	-	-	-	-	-	1	-
CO5	2	1	2	-	-	1	-	-	-	-	-	-	2	-
Average	2.2	1.2	2.2	-	-	1	0.6	-	-	-	-	0.6	1.2	0.2

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE IV Year -I Sem</td></tr>
<tr><td>Course Code: J4101</td><td rowspan="2">COMPUTATIONAL MATHEMATICS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:2</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Course Objectives:

This course will enable students to:

1. Develop the logic for solution of the numerical methods using computer program.
2. Implement the logic of solving linear simultaneous equation with a computer program.
3. Obtain finite differences of an array of two variables and obtain value of a function using finite difference tables.
4. Evaluate an integral using numerical methods
5. Generate the logic sequence in solving differential equation in the form of computer program.
6. Implement statistical methods based on computer logic.

Module 1:

Unit-1: Error theory and propagation:

Generate an algorithm for the error analysis-Algorithm for obtaining the roots of a given linear and non-linear equation using Bisection, Newton raphson and Iteration methods-implementing the same as computer program.

Module 2:

Unit-1: Solution of linear simultaneous equations:

Algorithm for LU decomposition method, Gauss Jordan method, Gauss Seidal iteration method. -implementing the same as computer program.

Module 3:

Unit-1: Array and functions:

Finite differences tables for arrays-writing a program to evaluate a function in terms of other variable numerical differentiation solution.

Unit-2: Interpolation:

Lagrangian and Newton’s divided difference interpolation methods-implementing the same using a computer program.

Module-4:

Unit-1: Numerical Integration:

Trapezoidal rule, Simpson’s $1/3^{rd}$ and $3/8^{th}$ rule-implementing the same as computer program.

Unit 2: Solution of differential equation Euler’s & Range Kutta method.

Module-5:

Unit-1: Distribution methods:

Statistical distribution, mean, variance and fitting to nominal, binominal and Poisson distribution-implementing the same as computer program.

Unit-2: Introduction to FEM Solution of a bar problem.

Course outcomes:

On completion of course the student will be able to:

1. **Understand** the concept of statistical and numerical methods and to obtain algorithm for solution of linear and nonlinear equations.
2. **Analyze** different methods used for the solution of linear simultaneous equations.
3. **Design** a program to evaluate functions of a variable using finite differences, interpolation and numerical differentiation.
4. **Determine** an integral using numerical methods obtain solution and the differential equations.
5. **Demonstrate** statistical distribution methods in terms of computer program

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year -I Sem</td></tr>
<tr><td>Course Code: J4112</td><td rowspan="2">COMPUTATIONAL MATHEMATICS LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Course Objectives:

This course will enable students to:

1. To practice the concepts learnt in the subject of Statistical and Numerical Methods.
2. To practice these concepts using Octave software.

LIST OF EXPERIMENTS:

1. **EXPERIMENT-1**: Write a program for Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors and corresponding errors
2. **EXPERIMENT-2**: Program to find the roots of the given linear equations using i. Bisection and ii. Newton Raphson's method and iii. Iteration method
3. **EXPERIMENT-3**: 3. Program to find the solution of given system of linear equations using LU decomposition method
4. **EXPERIMENT-4**: Program to find the solution of given system of linear equations using Gauss Seidal method
5. **EXPERIMENT-5**: Program to determine y for a given x, if two array of x and y of same size using
   i. Newton's forward ii. Newton's backward and iii. Central difference methods
6. **EXPERIMENT-6**: Program to determine y for a given x, if two array of x and y of same size using
   i. Lagrange's interpolation ii. Newton's divided interpolation method
7. **EXPERIMENT-7**: Program to determine integral using
   i. Trapezoidal rule, ii. Simpson's $1/3^{rd}$ rule and iii. Simpson's $3/8^{th}$ rule
8. **EXPERIMENT-8**: Program to solve given differential equations using
   i. Modified Euler's method ii. Runge- Kutta method
9. **EXPERIMENT-9**: Write a program to demonstrate statistical distributions i. Mean and i. Variance ii. to fit Binomial and Poisson distributions
10. **EXPERIMENT-10**: Write a programme to fit F- distribution and t - distribution

Note: At least any Eight (8) experiments must be conducted out of available Eleven (10) experiments.

Course outcomes:

On completion of the course, students will be able to:

1. **Analyse** the different statistical and numerical methods
2. **Explain** the linear equations using software
3. **Acquire** the skills to solve the numerical examples

<table>
<tr><th colspan="15">CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak</th></tr>
<tr><th rowspan="2">Course Outcomes (COs)</th><th colspan="12">Program Outcomes (POs)</th><th colspan="2">Program Specific Outcomes*</th></tr>
<tr><th>PO 1</th><th>PO 2</th><th>PO 3</th><th>PO 4</th><th>PO 5</th><th>PO 6</th><th>PO 7</th><th>PO 8</th><th>PO 9</th><th>PO 10</th><th>PO 11</th><th>PO 12</th><th>PSO 1</th><th>PSO 2</th></tr>
<tr><td>CO1</td><td>3</td><td>1</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td>CO2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td>CO3</td><td>3</td><td>1</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td>CO4</td><td>3</td><td>1</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td>CO5</td><td>3</td><td>1</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td>Average</td><td>3</td><td>1</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
</table>

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE
IV Year -I Sem</td></tr>
<tr><td>Course Code: J4111</td><td rowspan="2">COMPUTER AIDED DESIGN AND DRAFTING LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:2</td><td>0</td><td>0</td><td>4</td><td>0</td></tr>
</table>

Pre-requisite: Structural analysis

Course Objectives:

This course will enable students to:

1. **Recall** the principles used in structural analysis.
2. **Impart** knowledge on analysis and design of concrete and steel structures and develop software skills.
3. **Apply** the software tools available for design and detailing of structural members.
4. **Study** the detailing of structural members to meet the drawing standard requirements.
5. **Create** the structural drawings with detailing by applying engineering drawing principles using CAD software.

LIST OF EXPERIMENTS:

EXPERIMENT-1: Analysis of Beams (Simply Supported, cantilever).

EXPERIMENT-2: Analysis of Beams (continuous, fixed).

EXPERIMENT-3: Analysis of plane moment resisting frames subjected to dead and live loads.

EXPERIMENT-4: Analysis and design of multi-story frames (2D&3D) subjected to dead and live loads.

EXPERIMENT-5: Analysis of steel portal frames (industrial bent) subjected to dead, live and wind loads.

EXPERIMENT-6: Analysis and Design of Roof Truss subjected to dead, live and wind loads.

EXPERIMENT-7: Detailing of reinforcement in Beams using CAD software.

EXPERIMENT-8: Detailing of reinforcement in columns using CAD software.

EXPERIMENT-9: Detailing of reinforcement in footings (isolated, combined) using CAD software.

EXPERIMENT-10: Detailing of reinforcement in RC one-way, two-way slabs using CAD.

EXPERIMENT-11: Detailing of reinforcement in staircases in CAD.

EXPERIMENT-12: Drawing of Steel members and connections in CAD.

Note: At least any Eight (10) experiments must be conducted out of available Eleven (11) experiments.

Course outcomes:

On completion of the course, students will be able to:

1. **Analyze** the basic structural elements and interpret the results.
2. **Analyze** structural frames by using STADD Pro software.

3. **Describe** the different drawing annotations used in the structural drawing.
4. **Develop** drawings of reinforcement details of structural elements using CAD.
5. **Evaluate** results of different structural models under different loads and load combinations.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	1	3	-	-	-	-	-	-	-	2	3
CO3	-	-	-	-	3	-	-	-	-	-	-	-	2	3
CO4	-	3	1	1	2	-	-	-	-	-	-	-	1	2
CO5	-	2	3	2	3	-	-	-	-	-	-	-	1	2
Average	1.2	1.8	1.6	0.8	2.2	-	-	-	-	-	-	-	1.8	2.6

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE IV Year-II Sem			
Course Code: J421A	URBAN WASTE MANAGEMENT (Professional Elective Course - VI)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Environmental Engineering.

Course Objectives:

This course will enable students to:

1. Explain the handling of urban waste from source to grave.
2. Study about waste collection and transportation.
3. Explain the Waste processing and Reuse Processing Technologies.
4. Discuss about the waste minimization and landfill operations.
5. Explain the liquid waste management.

Module 1:

Unit-1: Fundamental of Urban Waste Management:

Introduction to Urban Waste – Sources and impact of urban waste on environment, categories of urban waste –composition and its determinants of urban waste –factors influencing generation quality assessment of urban waste –methods of sampling and characterization.

Module 2:

Unit-1: Waste collection and Transportation:

Collection: Collection of Solid waste –collection services –collection system, equipment's– time and frequency of collection –labour requirement –factors affecting collection – analysis of collection system –collection routes –preparation of master schedules. Transfer station and Transport: Need for transfer operation- transfer stations-types-transport means and methods, location of transport stations, Design requirements, operation, and maintenance.

Module 3:

Unit-1: Waste processing techniques:

Waste processing and reuse Processing technologies: Biological, chemical conversation technologies and thermal conversion technologies. Reuse of solid waste energy recovery – incineration- solidification and stabilization of hazardous waste-treatment of biomedical wastes.

Module 4:

Unit-1: Landfill Design and Operation:

Waste disposal techniques Introduction, composting, principles of composting, factors affecting composting, vermi composting, waste to energy technique- Landfill technique and design and operating procedure of landfill. Solid waste management Hierarchy, waste reduction at source using 5r's Technique.

Module 5:

Unit-1: **Liquid waste management:** Introduction, source, basic principles, characteristics, unit operation and unit process, maintenance, analysis of BOD and COD, flowchart of waste water treatment, sludge processing and disposal, Liquid waste reuse.

Text Books:

1. "Integrated Solid Waste Management" by Tchobanoglous, Theissen & Vigil, McGraw Hill Publication, 3rd Edition, 2014.
2. "Management of municipal Solid waste" by T V Ramachandra -TERI Press 2009.
3. "Wastewater engineering" by B.C Punmia, Laxmi Publications. Pvt Ltd. (2016).
4. "Water and Waste water Technology" – by Mark J. Hammer Prentice Hall- publications-2017.

Reference Books:

1. "Solid Waste Management" By K.Sasi Kumar & S.Gopi Krishna. Prentice hall india learning pvt. 2009.
2. "Integrated Solid Waste Management: Engineering Principles and Management Issues" by George Tchobanoglous, Hilary Theisen, Samuel A. Vigil.

E-Resources

1. https://nptel.ac.in/courses/105/103/105103205/
2. https://nptel.ac.in/courses/105/106/105106119/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Discuss** the Reuse of waste material.
2. **Explain** the collection system and transport of urban waste.
3. **Discuss** about Recycle of waste that cannot be used and recovery of resources.
4. **Explain** the design, operation and maintenance of landfills, incinerators and composting units.
5. **Describe** the liquid waste management.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	3	1	2	-	-	-	-	2	1
CO2	-	3	-	-	-	1	-	-	-	-	-	-	2	1
CO3	-	-	-	-	-	1	3	2	-	-	-	-	1	1
CO4	-	-	3	-	2	-	2	1	-	-	-	-	2	2
CO5	-	-	1	-	-	-	3	1	-	-	-	-	2	2
Average	-	0.6	0.8	-	0.4	0.8	1.8	1.2	-	-	-	-	1.8	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech CE IV Year – II Sem</td></tr>
<tr><td>Course Code: J421B</td><td rowspan="2">REHABILITATION AND RETROFITTING OF STRUCTURES (Professional Elective Course - VI)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Concrete Technology, Building Materials, Construction and Services.

Course Objectives:

This course will enable students to:

1. Study the Deterioration and distress in structures.
2. Study the Mechanisms of degradation in Reinforced concrete structures.
3. Explain the field monitoring and non-destructive evaluation of concrete structures.
4. Discuss the alternative repair strategies for deteriorated concrete structures.
5. Study the Strengthening and Health monitoring of Structures.

Module 1:

Unit1: Introduction:

Deterioration of Structures, Distress in Structures, Causes and Prevention. Mechanism of Damage, Types of Damage-Types of Cracks-Analysis of Failures.

Unit-2: Terminology:

Rehabilitation, Retrofitting, Repair, Strengthening, Maintenance of structures.

Module 2:

Unit 1: Corrosion of Steel Reinforcement: Causes – Mechanism and Prevention.

Unit 2: Damage of Structures due to Fire – Fire Rating of Structures – Phenomenon of Desiccation.

Module 3:

Unit 1: Inspection and Testing:

Symptoms and Diagnosis of Distress - Damage assessment –Investigation techniques-Non-Destructive Testing (NDT)- Ultrasonic pulse velocity test, Rebound hammer test, Penetration resistance test, Windsor probe, Pull out test, Flexure test.

Module 4:

Unit 1: Repair of Structures:

Common Types of Repairs, Repair in Concrete Structures - Repairs in Underwater Structures-Repair Techniques – Epoxy injection – Guniting – Shotcreting– Underpinning.

Module 5:

Unit 1: **Strengthening of Structures**:

Strengthening Methods – Retrofitting – Jacketing.

Unit 2: Health Monitoring of Structures:

Methodology- advantages -Use of Sensors-Instrumentation.

Case studies on building and bridges subjected deterioration and distress of concrete.

Text Books:

1. “Concrete Repair and Maintenance Illustrated” by RS Means Company Inc W. H. Ranso, (2002).
2. “Building Failures: Diagnosis and Avoidance” by E F&N Spon by

W.H.RANSON, Taylor & Francis Group (19 November 1987).
3. “Concrete Technology” by A.R. ShanthaKumar,Oxford University Press (1 April 2018).
4. “Maintenance and Repair of Civil Structures” by B.L. Gupta and Amit Gupta, Standard Publications. (2009).
5. “Repair and Rehabilitation of Structures” by Dr.K.Sumitra, SreeKamalmani, (2019).
6. “Repair and Rehabilitation of Concrete structure”s by Dr.R P Rethaliya , Atul Prakashan (1 January 2019).

Reference Books:

1. “Defects and Deterioration in Buildings” by Barry Richardson, Consulting Scientist, Winchester, UK.Routledge (30 November 2000).
2. “Acoustic Emission and Related Non-destructive Evaluation Techniques in the Fracture Mechanics of Concrete: Fundamentals and Applications ”by MasayasuOhtsu(1 October 2020) Woodhead Publishing.
3. “Non-Destructive Evaluation of Concrete Structures” by Bungey, Woodhead Publishing (4June 2010).
4. “Maintenance, Repair & Rehabilitation and Minor Works of Buildings” by P.C.Varghese,Publisher : Prentice Hall India Learning Private Limited (1 January 2014).
5. “CPWD Handbook on Repair and Rehabilitation of RCC buildings”, Govt of India Press, New Delhi, 2014.
6. ACI Handbook on Repair and Rehabilitation of RCC buildingsbyDirector General Works {DG(W)}, Central Public Works Department (CPWD), Government of India, New Delhi 2002.

E-Resources

1. https://nptel.ac.in/courses/105/102/105102176/
2. https://nptel.ac.in/courses/105/106/105106202/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the defects and deterioration of structures.
2. **Apply** the Mechanisms of degradation in Reinforced concrete structures.
3. **Discuss** about repair of structures and evaluate applications.
4. **Describe** the specific repairs in under water structures and the constraints.
5. **Explain** the building health monitoring structures.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	2	1	-	-	-	-	2	2	2
CO2	-	-	3	3	-	-	-	1	-	-	-	2	2	2
CO3	-	2	3	1	2	-	-	-	-	-	-	2	2	2
CO4	-	2	3	3	1	-	-	2	-	-	-	2	2	2
CO5	2	2	3	-	-	-	-	1	-	-	-	2	2	2
Average	1	1.8	2.4	1.4	0.6	0.4	0.2	0.8	-	-	-	2	2	2

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CE IV Year – II Sem			
Course Code: J421C	BRIDGE ENGINEERING (Professional Elective-VI)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Structural Engineering –I **(RCC),** Structural Engineering – II **(Steel)**

Course Objectives:

This course will enable students to:

1. Describe about the different components of bridges.
2. Explain about the various standard specifications for roads and railway bridges.
3. Explain about the design considerations for RCC bridges.
4. Explain about the design of Steel bridges.
5. Describe the sub structure design of bridges.

Module 1:

Unit-1: Introduction:

Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations, and essential design data.

Unit-2: Standard Specifications for Roads and Railways Bridges:

General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads- Railway loading standards

Module 2:

Unit-1: Design Consideration for R. C. C. Bridges: Various types of R.C.C. bridges (brief description of each type), design of R.C.C. slab and T-beam road bridges for IRC loading.

Module 3:

Unit-1: Design Consideration for Steel Bridges:

Types of steel bridges (brief description of each), description of truss girder bridges & main elements, their design considerations- IRC &Railway loading.

Module 4:

Unit-1: Sub- Structure Design: Load & stability analysis for Piers, abutments, wing-wall and approaches- design specifications.

Module 5:

Unit-1: Introduction to Long span bridges and new technologies- relevant design concepts.

Text Books:

1. "Essentials of Bridge Engineering" by D.J.Victor, 6th Edition, Oxford & IBH Pub, N. Delhi,1 January 2019.
2. "Design of Bridges" by N. Krishna Raju, 5th Edition,Oxford & IBH, N. Delhi, 1 January 2019

Reference Books:

1. **“**Bridge Engineering”by S. Ponnuswamy,3rd Edition, McGraw Hill Education(20 May 2017)
2. ‘’Design of Bridge Structures” by T. R. Jagadish & M.A.Jairam,2nd Edition, Prentice Hall of India, N. Delhi**.** 1 January 2009

E-Resources

1. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce23/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** the types of bridges and their components.
2. **Describe** the IS and other codal provisions for loading on bridges.
3. **Formulate** design considerations for RCC and Steel bridges.
4. **Design** the slab, girder and truss bridges.
5. **Analyse** sub structure for a bridge.

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

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	3	2	-	-	2	-	-	-	-	-	1	1	-
CO2	-	3	2	-	-	2	-	-	-	-	-	1	1	-
CO3	-	2	3	-	-	2	-	-	-	-	-	1	1	-
CO4	-	2	3	-	-	2	-	-	-	-	-	-	1	-
CO5	-	2	3	-	-	2	-	-	-	-	-	-	1	-
Average	-	2.4	2.6	-	-	2	-	-	-	-	-	0.6	1	-

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31OA</td><td rowspan="2" colspan="4">ELEMENTS OF CIVIL ENGINEERING
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study the basic requirements of civil engineering components.
2. Study the basic concepts of surveying.
3. Study the different types of building materials and components.
4. Study to deal with fire risk prevention and control.
5. Study about Highway development in India, Necessity for Highway planning, different road development plans

Module-1:
Unit-1: Introduction:
History of the civil engineering, sub – disciplines of civil engineering.

Module-2:
Unit-1: Surveying
Introduction, divisions of surveying, classification of surveying, principles of surveying. Linear measurements and errors–introduction, methods of linear measurements, chaining instruments, types of error and correction. Compass surveying – introduction, angular measurement using compass, whole circle bearing and reduced bearing, fore bearing, and back bearing. Traverse surveying –introduction, chain, and compass traversing, closing error and adjustments. Levelling– introduction, types of levelling instruments, dumpy level, adjustment of level, levelling staff

Module-3:
Unit-1: Building Materials and Construction
Materials**:** Introduction to construction materials like ferrous and nonferrous metals, alloys, Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete, and bitumen. Construction: Types of building, different loads considered in building design, types of foundation in building, other developments, and constructions of buildings
Module-4:
Unit-1: Fire and Earthquake Protection in Building:
Introduction, fire protection in building, structural and architectural safety requirements of resistive structures, fire resistive properties of building materials, fire exit requirements, force and acceleration on building due to earthquake, building response characteristics, building drift.

Module-5:

Unit-1: Water Supply, Sanitary and Electrical Works in Building:

Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

Unit-2: Highway Engineering:

Introduction, historical background of road or highway, classification of roads, pavements and roads, traffic control mechanism.

TEXTBOOKS:

1. "Elements of Civil Engineering'' by Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, PHI Learning Private Limited New Delhi.
2. "Elements of Civil Engineering'' by Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education, India Pvt. Ltd.
3. "Surveying Vol. I'' by Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain16th Edition Publisher: Laxmi Publication Delhi.
4. "Building drawing"byM.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.

REFERENCES:

1. "Surveying Theory and Practice" by James M Anderson and Edward M Mikhail McGraw Hill Education, India Pvt. Ltd. (7th Edition).
2. "Surveying and Leveling" by R. Subramanian, Oxford University.
3. "Building drawing" by M.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.
4. "Civil Engg. Drawing" by S. C. Rangwala, Charotar Pub. House Anand.

E-Resources:

1. https://nptel.ac.in/courses/105/106/105106201/

Course outcomes:

On completion of the course, students will be able to:

1. **Explain** the basic requirements of civil engineering components.
2. **Evaluate** area for irregular shaped bodies.
3. **Explain** the various building materials.
4. **Plan** the building against the fire.
5. **Discuss** the highway development in India.

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

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I
Sem</td></tr>
<tr><td>Course Code:
J31OB</td><td rowspan="2">ENVIRONMENTAL IMPACT
ASSESSMENT
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Environmental Science.

Course Objectives:

This course will enable students to:

1. Study the need of environmental impact assessment.
2. Study the role of EIA and different methodologies of EIA.
3. Discuss the guidelines of EIA for the project.
4. Study the different approaches to mitigate the adverse impact on environment.
5. Identify the EIA for specific case studies.

Module 1:

Unit-1: Impact of developmental projects – sustainable development – Need for Environmental Impact Assessment (EIA), Rapid and Comprehensive EIA, Environmental Impact statement (EIS) – EIA capability and limitations – Legal provisions on EIA – stages of EIA.

Module 2:

Unit-1: Role of NEPA in EIA, CEQ, Environmental documents. EIA/ EIS& FONSI relationship, processing of EIA/EIS, Environmental attributes.

Methodologies: Criteria to be considered for the selection of EIA methodologies, Adhoc, overlays, Check lists – Matrices – Networks – Cost-benefit analysis with their advantages and limitations.

Module 3:

Unit-1: EIA guidelines for Development Projects, Rapid and Comprehensive EIA. Prediction and Assessment: Assessment of Impact on land, water, air, and noise. Social and cultural activities and on flora and fauna – mathematical models – public participation. Forest act 1980.

Module 4:

Unit-1: Environment management plan:

Plan for mitigation of adverse impact on Environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to project affected people. Post project monitoring. ISO 9000, 14000 & 18000.

Module 5:

Unit-1:

EIA for Water resource developmental projects, Highway projects: Nuclear Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

Text Books

1. "Environmental Impact Assessment" by S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye, I k international house publishing, pvt ltd. 1st addition Sep 2019.

2. “Environmental Impact Assessment” by Barthwell, R. R. New Age International Publications. 3rd addition Oct 2017.

Reference Books

1. “Environmental Impact Analysis” by Jain R.K.-Van Nostrand Reinhold Co, H K E S international publication, 3rd addition oct 2014.
2. “Environment Impact Assessment” by Anjaneyulu, B S Publication, 2nd addition Jan 2010

Web Resources

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

Course Outcomes

On completion of the course, the students will be able to:

1. **Explain** the stages and need for environmental impact assessment.
2. **Discuss** different methodologies for environmental impact prediction and assessment.
3. **Evaluate** the environmental management plans.
4. **Solve** the problems associated with adverse impact on environment.
5. **Apply** the knowledge of EIA on different construction projects.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	2	-	-	-	1	2	3	-	-	-	-	2	1
CO2	-	-	-	-	-	2	3	1	-	-	-	-	1	1
CO3	-	-	-	-	-	2	2	3	-	-	-	-	2	1
CO4	-	2	-	-	-	1	2	3	-	-	-	-	1	3
CO5	-	-	-	-	-	1	3	2	-	-	-	-	2	2
Average	-	0.8	-	-	-	1.4	2.4	2.4	-	-	-	-	1.6	1.6

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech III Year – I Sem</td></tr>
<tr><td>Course Code: J31OC</td><td rowspan="2">Energy Engineering
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisites: Nil

Course Objectives:
This course will enable students to:
1. To provide basic knowledge about various types of energy resources.
2. To familiarize the students about conventional energy systems.
3. To understand the practical significance of hydro-electric technology, wind, solar and biomass energy technologies.
4. Illustrate how biomass is currently used as a source of energy, its Future potential both in providing energy and in producing alternative fuels.
5. To familiarize energy conservation and management.

MODULE-I: INTRODUCTION TO ENERGY RESOURCES
World Energy status – Indian scenario, Energy resources – conventional and renewable, fuel cells, hydrogen energy, small hydro resources; Need for energy storage, energy storage methods; Environmental aspects of energy – Economics.

MODULE-II: CONVENTIONAL ENERGY SYSTEMS
Unit-I: Coal fired steam thermal power plant – layout, working, T-S diagram of water and steam, rankine cycle for steam turbine, efficiency.
Unit-II: Gas turbine power plant – various options, layout, working and T-S diagram for simple and combined cycle power plant, comparison, efficiency.
Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, nuclear waste management.

MODULE-III: HYDRO ELECTRIC TECHNOLOGY
Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects – Hydro-Thermal coordination. Ocean Energy Technology, Wave and tidal energy - fundamentals - energy converters - power plant - limitations.

MODULE-IV: WIND, SOLAR AND BIOMASS ENERGY TECHNOLOGIES
Unit-I: Wind turbine types and construction – power equation – wind energy conversion systems grid connection - environmental aspects.
Unit-II: Solar energy basics – energy from the sun, solar constant, solar spectrum, clarity index, V-I characteristics of a solar cell – solar module –Solar PV plant – hybrid systems.
Biomass energy resources – conversion technologies – urban waste to energy conversion –Biogas plant.

MODULE-V: ENERGY CONSERVATION AND MANAGEMENT

Unit-I: Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities.

Unit-I: Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager.

Energy Audit: Type and Methodology, Energy audit reporting format, Understanding Energy

Costs, Fuel and Energy Substitution, Energy Audit Instruments.

TEXT BOOKS

1. S.Rao and Dr.B.B.parulekar, "Energy Technology", Khanna pub., Third edition, 1999.
2. Non-conventional energy resources by B.H.Khan, TMH, 2006.
3. Desai,AV, "Energy Demand: Analysis, Management and Conservation", WileyEastern Limited, 1990.

REFERENCE BOOKS

1. G.D.Rai, "Non-conventional energy sources", Khanna pub. Fourth Edition, 2002.
2. Pulfrey, D.L., Photovoltaic Power Generation, Van Nostrand Co., 1983.
3. Abbasik "Renewable Energy Sources and their Environment", PHI, 2008.
4. B.Mohanty, R.S.Liu, U.V Krishna Mohan Rao, "Energy Audit Management for theIndian Industry", Directorate the Institute of Charted Accountants of India, New Delhi,2001.
5. Encyclopedia of Energy – McGraw Hill Publication.
6. Energy Management Handbook, John Wiley & Sons, Wayne C.Turner.
7. Kothari et al. "Renewable Energy Sources and Emerging Technologies", PHI, 2008.

E-Resources:

1. http://nptel.ac.in/courses/112105051/
2. https://www.youtube.com/watch?v=Ota2_LUuar0
3. https://www.youtube.com/watch?v=Ota2_LUuar0
4. https://www.youtube.com/watch?v=3dJAtHaSQ98
5. https://www.youtube.com/watch?v=xokHLFE96h8
6. http://www.tatapower.com/businesses/renewable-energy.aspx
7. http://www.cleanlineenergy.com/technology/wind-and-solar

Course Outcomes:

On completion of the course, the students will be able to:

1. **Provide** basic knowledge about various types of energy resources.
2. **Familiarize** the students about conventional energy systems.
3. **Understand** the practical significance of hydro-electric technology, wind, solar and biomass energy technologies.

4. **Know** how biomass is currently used as a source of energy, its Future potential both in providing energy and in producing alternative fuels.
5. **Familiarize** energy conservation and management.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	2	-	-	3	2	3	-	-	-	-	-	2
CO2	-	-	3	-	-	2	3	2	-	-	-	-	-	3
CO3	-	-	3	-	-	3	3	3	-	-	-	-	-	2
CO4	-	-	3	-	-	3	3	2	-	-	-	-	-	3
CO5	-	-	3	-	-	2	3	3	-	-	-	-	-	2
Average	-	-	2.8	-	-	2.6	2.8	2.6	-	-	-	-	-	2.4

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OD</td><td rowspan="2">SENSORS AND TRANSDUCERS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisites: Nil

Course Objectives:

1. To make students familiar with the constructions and working principle of different types of sensors and transducers
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.
3. To make students familiar with the Potentiometer, Loading effect, Strain gauge
4. To make students aware about Linear Variable Differential Transformer, LVDT Accelerometer
5. To make students aware piezoelectric and pyro-electric transducers

MODULE – I

Measurements and Instrumentation of Transducers: Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors

– Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

MODULE – II

Characteristics of Transducers: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

MODULE– III

Resistive Transducers: Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell

– Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

MODULE – IV

Inductive and Capacitive Transducer: Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

MODULE – V

Miscellaneous Transducers: Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, Dhanpat Rai & Company Private Limited, 2007.
2. Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.
2. Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGrawHill, New York, 2000.
3. John. P, Bentley, "Principles of Measurement Systems", IIIEdition, PearsonEducation, 2000.
4. Murthy. D. V. S, "Transducers and Instrumentation", Prentice Hall of India, 2001.
5. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
6. Instrument Transducers – An Introduction to their Performance and design – byHerman K. P. Neubrat, Oxford University Press.

E-Resources:

1. http://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf

Course Outcomes:

On completion of the course, the students will be able to:

1. **Concept** behind working of measurement systems and different types of sensors and transducers.
2. **Sensor** to measure various physical parameters used in Industry and normal measurement applications
3. **Working** principle of resistive, inductive and capacitive transducers and their applications.
4. **Understanding** of digital and proximity sensors and their applications.
5. **Understanding** of thermocouples, piezoelectric and pyro-electric transducers and their applications.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	1	-	-	-	-		-	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	1	1	-	-	-	1	-	-	-	2	1
CO4	2	-	-	-	1	-	2	-	-	-	-	-	2	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-
Average	1.6	1.5	1	1	1	1	2		1	-	-	-	1.6	1

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code: J31OE	**AUTOMOTIVE TECHNOLOGY** (Open Elective-I)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Engineering Chemistry, Engineering Physics.

Course Objectives:

This course will enable students to:

6. Provide an overview on automobile engineering
7. Learn different fuels and advanced control systems
8. Study the concepts and drive train configurations of electric and hybrid electric vehicles
9. Understand use of intelligent vehicle technologies like navigation in automobiles
10. Provide awareness of safety security and regulations

Module 1

Unit-1: Structural systems of automobile– chassis and body, power unit, transmission system, Steering System, Suspension System, Braking System.

Unit-2: Other systems of automobile- Ignition systems, Fuel System, Cooling System, Electrical System.

Module 2

Unit-1: Fuels: Types of Fuels-Gasoline fuels, CNG, Biofuels, advantages and limitations.

Unit-2: Advanced Engine Controls: Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi-point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control.

Module 3

Unit-1: Fuel Cell and Solar Vehicles: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

Unit-2: Electric and Hybrid Vehicles: Electric vehicles - Layout of an electric vehicle, performance, energy consumption, advantage and limitations. Hybrid electric vehicles - Concepts, types of hybrid drive train architecture, merits and demerits.

Module 4

Unit-1: Telematics Systems: Global positioning system, geographical information systems, navigation system.

Unit-2: Comfort Systems: Automotive vision system, adaptive cruise control system, active suspension system, power steering and power windows.

Module 5

Unit-1: Safety and Security Systems: Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti-lock braking systems, traction control system, electronic immobilizers, remote keyless entry, smart card system, number plate coding.

Unit-2: Emission and noise control regulations- Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

Text Books:

1. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn, 1998.
2. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2005.
3. Kripal Singh, "Automobile Engineering", Standard Publishers, Vol. 1 & 2, 2007

Reference Books:

1. Automotive Hand Book" Robert Bosch, SAE, 5th edition, 2000.
2. LjuboVlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
3. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
4. "Navigation and Intelligent Transportation Systems – Progress in Technology", Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998.

E - Resources:

1. https://rb.gy/zm8le8
2. https://rb.gy/ceck4k
3. https://nptel.ac.in/courses/107/106/107106088/
4. https://nptel.ac.in/courses/108/102/108102121/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Outline** the overview of automobile engineering
2. **Identify** the different fuels and advanced control systems
3. **Develop** the concepts and drive train configurations of electric and hybrid electric vehicles
4. **Apply** the use of intelligent vehicle technologies like navigation in automobiles
5. **Aware** of safety security and regulations

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

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech III Year – I Sem**				
Course Code: J31OG	**PRINCIPLES OF SENSORS AND THEIR APPLICATIONS** (Open Elective-I)	**L**	**T**	**P**	**D**	
Credits: 3		3	0	0	0	

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. To understand the concepts of measurement technology.
2. To learn the different sensors used to measure various physical parameters.
3. To Acquire knowledge on Optical sensors.
4. To understand the concepts Acoustic sensors.
5. To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

Module 1:
Unit 1: INTRODUCTION
Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers.

Unit 2: Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

Module 2:
Unit 1: MOTION, PROXIMITY ANDRANGINGSENSORS
Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive.

Unit 2: LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

Module 3:
Unit 1: FORCE, MAGNETIC AND HEADINGSENSORS
Strain Gage, Load Cell, Magnetic Sensors–types, principle, requirement and advantages:
Unit 2: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

Module 4:
Unit 1: OPTICAL, PRESSURE ANDTEMPERATURE SENSORS9
Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD.

Unit 2: Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors Film sensor, MEMS & Nano Sensors, LASER sensors.

Module 5 :

Unit 1: SIGNAL CONDITIONING andDAQSYSTEMS9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition.

Unit 2: Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi,2013.

REFERENCES

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi,2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications,1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

E-RESOURCES:

1. https://www.sciencelearn.org.nz/resources/1602-electricity-and-sensors
2. https://predictabledesigns.com/introduction-to-electronic-sensors/

OUTCOMES:

The students will be able to

1. **Expertise** in various calibration techniques and signal types for sensors.
2. **Apply** the various sensors in the Automotive and Mechatronics applications
3. **Study** the basic principles of various smart sensors.
4. **Apply** Optical and Acoustic sensors in Home Appliances.
5. **Implement** the DAQ systems with different sensors for real time applications

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**2.5**	**2.67**										

<table>
<tr><td>2020-21</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31OH</td><td colspan="4" rowspan="2">PRINCIPLES OF COMMUNICATIONS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Communication systems

Course Objectives:

The Student will

1. provide the basic concepts of communication systems.
2. gain knowledge about Amplitude modulation and Angle Modulation.
3. study sampling and pulse modulation methods.
4. study and compare different binary digital modulation techniques.
5. understand the basic concepts of information theory.

Module 1: Introduction

Unit 1: Block diagram of Electrical communication system, Radio communication: Types of communications, Analog, pulse and digital types of signals,

Unit 2: Noise – Types of noise, sources of noise, calculation of noise in Linear systems and noise figure.

Module 2: Amplitude Modulation

Unit 1: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM: Diode detector, Product demodulation for DSB SC & SSB SC.

Unit 2: Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

Module 3: Pulse Modulations

Unit 1: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM.

Unit 2: Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

Module 4: Digital Communication

Unit 1: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

Unit 2: Digital Modulation: ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

Module 5: Information Theory

Unit 1: Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding

Unit 2: Error control coding: Introduction, Error detection and correction codes, block codes, convolution codes

TEXT BOOKS :

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCES:

1. Electronic Communication Systems – Kennedy and Davis, TMH , 4th edition, 2004.
2. Communication Systems Engineering -John. G. Proakis and Masoud Salehi, PHS, 2nd ed.2004.

E - Resources:

1. https://nptel.ac.in/courses/Nanoelectronics/IITMadras/ab1011/102/111102111/

Course Outcomes:

The student will be able to:

1. **illustrate** the main concepts of analoge and digital communication systems.
2. **analyze** and design an AM and FM modulator/demodulator.
3. **explain**, discuss, and compare different binary digital modulation techniques.
4. **distinguish** different types of noise and explain the effects of noise on communication system.
5. **use** the basic concepts of information theory.

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OI</td><td rowspan="2">FUNDAMENTALS OF DATA BASE MANAGEMENT SYSTEM
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: A course on “Data Structures”

Course objectives:

The Student will

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

Module 1:

Introduction to Data Base Systems

Data base System Applications, data base System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML.

Database Access for applications Programs

data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor.

Module 2:

Introduction to the Relational Model

Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra

Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus.

Module 3:

Form of Basic SQL Query

Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity’s – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values.

Schema refinement

Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

Module 4:

Transaction Concept

Transaction State- Implementation of Atomicity and Durability – Concurrent Executions – Serializability- Recoverability– Implementation of Isolation – Lock – Based Protocols – Timestamp Based Protocols- Validation- Based Protocols.

Recovery and Atomicity

Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

Module 5:

Data on External Storage

-File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM).

Advanced Database Management System

Introduction to Distributed Database-Reference Architecture, fragmentation, Allocation, Joins.

Text Books:

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

Reference Books:

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

E - Resources:

1. http://www.iran-lms.com/images/images/Books/PDF/Fundamentals-of-Database-Systems-Pearson-2015-Ramez-Elmasri-Shamkant-B.-Navathe.pdf
2. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcs.gmu.edu%2F~aobaidi%2Ffall_05%2Findex_files%2FLectures%2FENCh10.ppt
3. https://www.youtube.com/watch?v=T7AxM7Vqvaw
4. https://cs.ulb.ac.be/public/_media/teaching/infoh303/dbmsnotes.pdf
5. https://www.w3schools.in/dbms/intro/

Course outcomes:

The Student will be able to

1. **Identify** the underlying concepts of database technologies.
2. **Design** a database schema for a given problem domain.
3. **Formulate** SQL queries and integrity constraints over relations.
4. **Apply** normalization on database for eliminating redundancy.
5. **Summarize** transaction properties, concurrency control and recovery techniques and learn various data storage and security mechanisms.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	-	1	-	-	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	2
CO4	3	2	3	3	2	-	-	-	-	-	-	-	-	3
CO5	2	2	3	1	3	-	-	-	-	-	-	-	-	1
Average	**2.8**	**2.6**	**2.6**	**2.0**	**2.0**	-	-	-	-	-	-	-	-	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OJ</td><td rowspan="2">PRINCIPLES OF OPERATING SYSTEMS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

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

Course objectives:

The Student will

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

Module 1:

Background

Overview: Basic Elements, Evolution of the Microprocessor, Instruction Execution, Interrupts, Cache Memory, Direct Access Memory.

System Structures: Computer Systems Organization, Computer System Architecture, Operating System Architecture, Systems Calls, Operating System structure, Building and Booting an Operating System.

Module 2:

Process Management

Process Concepts: Introduction, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization.

Deadlock: Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Module 3:

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

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

Module 4:

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

File system Management: File Concepts, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management.

Module 5:

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

File system Management: File Concepts, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management.

Text Books:

1. Operating System Concepts-A. Silberschatz, Peter B. Galvin, Greg Gagne, 10th Edition, John Wiley& Sons inc.
2. Operating Systems Internals and Design Principles – William Stallings, 7th Edition, Prentice Hall.

Reference Books:

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

E - Resources:

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

Course outcomes:

The Student will be able to

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech
III Year – I Sem.</td></tr>
<tr><td>Course Code: J31OK</td><td rowspan="2">INTRODUCTION TO DATA STRUCTURES through PYTHON
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Programming in C

Course Objectives:

This course will enable students to:

1. Understand fundamentals of programming.
2. Adapt Basic taxonomy of python.
3. Familiarize with OOP.
4. Understand Data Structure in Python.
5. Design Solutions with OOP Paradigm.

Module I: Introduction

Unit 1:

Relationship between computers and programs, Basic principles of computers, Fundamentals of Programming and File systems,

Unit 2:

Using the Python interpreter, Introduction to binary computation, Input / Output.

Module II: Data types and control structures

Unit 1:

Keywords, Operators (unary, arithmetic, etc.), Data types, variables, expressions, and statements, Assignment statements, Strings and string operations.

Unit 2:

Control Structures: loops and decision

Module III: Modularization and Classes

Unit 1:

Standard modules, Packages and using of Packages.

Unit 2:

Defining Classes, Defining functions, Functions and arguments.

Module IV: Data Structures and Exceptions

Unit 1:

Data Structures (array, List, Tuples and Dictionary).

Unit 2:

Error processing, Exception Raising and Handling.

Module V: Object oriented design

Unit 1:

Programming types, Object Oriented Programming, Object Oriented Design.

Unit 2:

Inheritance and Polymorphism.

Text Books:

1. Data Structures and Algorithms in Python. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, Wiley, 2013.Reference Books:

Reference Books:

1. Data Structures and Algorithms Using Python Rance D. Necaise, JOHN WILEY & SONs.

E - Resources:

1. https://www.my-mooc.com/en/mooc/introduction-to-python-programming/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Recall** fundamentals of programming.
2. **summarize** Basic taxonomy of python.
3. **Get** Familiarity with OOP.
4. **Apply** Data Structure in Python.
5. **Solve** Problems with OOP Paradigm.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	1	-	-	-	-	-	-	-	-	2	1
CO2	1	2	2	1	-	-	-	-	-	-	-	-	1	2
CO3	2	2	2	2	-	-	-	-	-	-	-	-	1	1
CO4	2	2	2	2	-	-	-	-	-	-	-	-	2	2
CO5	1	2	2	2	-	-	-	-	-	-	-	-	2	1
Average	1.6	2	1.8	1.6	-	-	-	-	-	-	-	-	1.6	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
III Year – I Sem.</td></tr>
<tr><td>Course Code:
J31OL</td><td rowspan="2">INTRODUCTION TO WEB DESIGN
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Know regarding internet related technologies.
2. Understanding of the current industry support for web technologies.
3. Explain the basic concepts of CSS.
4. Visualize the basic concepts of PHP.
5. Understanding PHP functions and Methods

Module I:

UNIT-I: Basics in Web Design: Brief History of Internet, what is World Wide Web, why create a web site, Web Standards, Audience requirement.

UNIT -II: Web Design Principles: Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing, Designing navigation bar page design, Home Page Layout, Design Concept.

Module II:

UNIT-I: What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags, HTML Tables, HTML Forms.

UNIT II: Introduction to elements of HTML, working with Text Working with Lists, Tables and Frames, working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

Module III:

UNIT-I: Concept of CSS, Creating Style Sheet and types of CSS, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties).

UNIT-II: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Colors, Creating page Layout and Site Designs.

Module IV:

UNIT-I: Downloading, installing, configuring PHP, The anatomy of a PHP Page. Basic Security Guidelines, Variables, Data Types, Operators and Expressions, Constants, Flow Control Functions; Switching Flow, Loops.

UNIT II: Code Blocks and Browser Output, Objects, Strings Processing, Form processing, connecting to database, using cookies, dynamic contents.

Module V:

UNIT I: Creating the Web Site, Saving the site, working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Text Books:

1. Dietel and Dietel : ―Internet and World Wide Web - How to Program‖, 5th Edition, PHI/Pearson Education,2011
2. Web Technologies: HTML,CSS, XML,Php BlackBook.

Reference Books:

1. Chris Bates, ―Web Programming, building internet applications‖, 2ndEdition, WILEY, Dreamtech,2008.
2. HTML 5 in simple steps Kogent Learning Solutions Inc, DreamtechPress.
3. Beginning CSS: Cascading Style Sheets for Web Design Ian Pouncey, ichard York Wiley India

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105084/
2. http://www.nptelvideos.in/2012/11/internet-technologies.html
3. http://www.nptelvideos.com/php/php_video_tutorials.php

Course Outcomes:

At the end of the course , students will be able to

1. **Develop** the application of the HTML for document structure.
2. **Develop** the skills in analyzing the usable of a website.
3. **Create** dynamic webpage, using PHP.
4. **Using** PHP to manipulate Files.
5. **Develop** the concept of web publishing.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3
Average	3	2.4	3	-	-	-	-	-	-	-	-	-	3	3

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OM</td><td rowspan="2">BASICS OF OBJECT-ORIENTED PROGRAMMING
(Open Elective-I)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Knowledge of C and C++

Course Objectives:
The Students will
1. Familiar with concepts of OOP
2. Explain inheritance and polymorphism
3. Familiar with packages and interfaces
4. Familiar with exception handling and multithreading
5. Familiar with applet programming and event handling.

Module I:
Unit 1: Introduction: Concepts of Object-Oriented Programming, Encapsulation and Polymorphism, history of Java.
Unit 2 : Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program.
Module II:
Unit 1: Classes and Objects: Concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion. String handling.
Unit 2 : Inheritance 1: Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Module III:
Unit 1: Interfaces 2: Defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.
Unit 2 : Packages: Defining, creating and accessing a package, importing packages, access control, exploring package - java.io.

Module IV:
Unit 1 : Exception handling: Concepts of exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.
Unit 2 : Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Module V:

Unit 1: Applets: Concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.

Unit 2: Event Handling: Events, event sources, event classes, event listeners, delegation event model, handling mouse and key board events, adapter classes. The AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists

Text Books:

1. Java The complete reference, 8th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, up dated edition, T.Budd, Pears on education.

Reference Books:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, Pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.

E-Resources:

1. www.javasoft.com
2. www.w3schools.com
3. www.tutorialpoint.com
4. www.oracle.com
5. https://www.youtube.com/watch?v=-HafzawNlUo&ab_channel=SundeepSaradhiKanthety.
6. https://www.youtube.com/watch?v=7WhnYwoBY24&list=PLlhM4lkb2sEhf5NlWeYh_gdcN49pHjVP0&ab_channel=SmartProgramming.
7. https://www.youtube.com/watch?v=G_t6BbZeyUU&ab_channel=VoidRealms

Course Outcomes:

Students will be able to

1. **Familiar** with constructors and string handling
2. **Understand** inheritance and polymorphism
3. **Understand** packages and interfaces
4. **Understand** exception handling and multithreading
5. **Understand** applet programming

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	3	-	3	3	-	3	-	-	2	-	-	3	-
CO2	-	-	2	-	-	3	-	3	-	-	3	-	-	3
CO3	3	-	-	3	-	2	-	-	3	-	-	3	-	-
CO4	3	-	-	-	3	-	-	3	3	3	-	-	3	-
CO5	-	3	-	-	-	-	2	-	-	-	3	-	-	3
Average	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**2.5**	**2.5**	**3.0**	**3.0**	**2.5**	**3.0**	**3.0**	**3.0**	**3.0**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31ON</td><td rowspan="2">FUNDAMENTALS OF DIGITAL LOGIC DESIGN
(Open Elective-I)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basics of Boolean algebra

Course Objectives:
Students will learn to

1. Understand basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. Understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. Implement simple logical operations using combinational logic circuits.
4. Design combinational logic circuits, sequential logic circuits.
5. Impart the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Module I:
Unit 1: Binary systems: digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, binary storage and registers, binary logic.

Module II:
Unit 1: Boolean algebra and logic gates: basic definitions, axiomatic definition of boolean algebra, basic theorems and properties of boolean algebra, boolean functions canonical and standard forms, other logic operations, digital logic gages, integrated circuits.

Module III:
Unit 1: Gate – level minimization: the map method, four-variable map, five-variable map, product of sums simplification don't-care conditions, nand and nor implementation other two-level implementnations, exclusive – or function, hardward description language (hdl).

Module IV:
Unit 1 : Combinational logic : combinational circuits, analysis procedure design procedure, binary adder-subtractor decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers, hdl for combinational circuits.
Module V:
Unit 1: Registers, shift registers, ripple counters synchronous counters, other counters, hdl for registers and counters.

Text Books:

1. Digital design – third edition, m.morris mano, pearson education/phi.
2. Fundamentals of logic design, roth, 5th edition,thomson.

Reference Books:

1. Switching and finite automata theory by zvi. Kohavi, tata mcgraw hill.
2. Switching and logic design, c.v.s. rao, pearson education
3. Digital principles and design – donald d.givone, tata mcgraw hill, edition.
4. Fundamentals of digital logic & micro computer design, 5th edition, m. Rafiquzzaman john wiley

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105185/
2. https://www.coursera.org/learn/digital-systems

Course Outcomes:

Students will be able to

1. **Manipulate** numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
2. **Build** Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. **Design** and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. **Analyze** small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.
5. **Construct** digital systems by Algorithmic State Machine Charts

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1									2	2	
CO2	3	2			1							2	1	2
CO3	3		2	2	1								2	2
CO4	3	2	2	2	1								2	
CO5	2	2	2	1	1									2
Average	2.4	2	1.75	1.67	1								1.75	2

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OP</td><td rowspan="2">INTRODUCTION TO MINING TECHNOLOGY
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course objectives:

1. To introduce the distribution of mineral deposits in India
2. To acquaint with different stages of mining process
3. To get idea about Drilling and its machinery
4. To get idea about Explosives and blasting in mines
5. To know about shaft sinking methods, precaution & lining during shaft sinking

Module 1

Unit - I: Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology

Module 2

Unit - I: Stages in the life of the mine - prospecting, exploration, development, exploitation, and reclamation.

Unit - II: Access to mineral deposit- selection, location, size, and shape (incline, shaft and Adit), brief overview of underground and surface mining methods.

Module 3

Unit - I: Drilling: Types of drills, drilling methods, electric, pneumatic, and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

Module 4

Unit - I: Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.

Unit - II: Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

Module 5

Unit - I: Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

Textbooks:

1. R. P. Pal, Rock blasting effect and operation, A. A. Balkema, 1st Ed, 2005.
2. D. J. Deshmukh, Elements of mining technology, Vol. 1, Central techno, 7th Ed, 2001.

Reference books:

1. C. P. Chugh, Drilling technology handbook, Oxford and IBH, 1st Ed, 1977.
2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

E-resources:

1. https://www.cienciaviva.pt/img/upload/Introduction%20to%20mining.pdf
2. https://www.researchgate.net/publication/282572490_Basic_concept_of_mining_technology

Course outcomes:

The student will be able to:

1. **Learn** about distribution of mineral deposits in India
2. **Learn** about stages on mining process
3. **Learn** about drilling and its machinery
4. **Understand** about explosives, blasting and blasting mechanism
5. **Understand** about shaft sinking methods, precautions, and lining of shafts

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Numerical Solution of Ordinary Differential Equations
(Common to EEE, ECE, CSE, IT&ECM)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To solve algebraic, transcendental equations and system of linear equation by various methods and find Eigen value by iteration method.
2. To Interpolate and approximate equal and unequal intervals by various formulae.
3. To discuss approximation of numerical differentiation and integration (single &double).
4. To solve Ordinary Differential Equations (ODEs) in Initial value Problems (IVPs) by various methods.
5. To solving ODEs & Partial Differential Equations (PDEs) in boundary value Problems (IVPs) by various methods

Module 1: Solution of Equations and Eigen value Problems

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

Module 2: Interpolation and Approximation

Interpolation with unequal intervals - Lagrange's interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

Module 3: Numerical Differentiation and Integration

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Romberg’s method - Two point and three point Gaussian quadrature formulae Evaluation of double integrals by Trapezoidal and Simpson’s 1/3rules.

Module 4: Initial Value Problems for Ordinary Differential Equations

Single Step methods - Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne’s and AdamsBash forth predictor corrector methods for solving first order equations**.**

Module 5 : Boundary Value Problems in Ordinary Differential Equations

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two-dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method**.**

Text Books:

1. “Higher Engineering Mathematics”, B.S. Grewal ,Khanna Publications, 2017
2. "Numerical Methods for Engineers”, Chapra. S.C., and Canale.R.P., Tata McGraw Hill, 5 th Edition, New Delhi,2007.

Reference Books:

1. “Advanced Engineering Mathematics”, R.K.Jain& S.R.K. Iyengar, Narosa Publications, 5th Edition, 2015.
2. “Higher Engineering Mathematics”, Ramana B.V., Tata McGraw Hill New Delhi,11thReprint, 2010

E - Resources:

1. http://www.brainkart.com/article/Solution-of-Equations-and-Eigenvalue-Problems_6462/
2. http://www.cs.nthu.edu.tw/~cchen/CS3331/ch6.pdf
3. http://www.vbspu.ac.in/wp-content/uploads/2016/02/Differentiation-and-Integration.pdf
4. https://link.springer.com/chapter/10.1007/978-1-4612-6390-6_4
5. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_FREE_DIFFEQ_II.PDF

Course Outcomes:

On completion of the course, the students will be able to:

1. **understand** the basic knowledge on solution of Eigenvalues
2. **use** interpolation and approximation to solve engineering problems.
3. **discuss** the numerical differentiation and integration.
4. **apply** initial value problems for solving first order differential equation.
5. **apply** the boundary value problems in ordinary and partial differential equations.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Number Theory & Cryptography
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. The basic definitions and theorems in number theory
2. The concept of a congruence and use various results related to congruence's including the Chinese Remainder Theorem
3. Number theory algorithms and procedures to basic problems.
4. The fundamentals of Cryptography how number theory is related to and used in cryptograph

Module 1 : Divisibility Theory And Canonical Decompositions
Division algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

Module 2 : Diophantine Equations And Congruence's
Linear Diophantine equations – Congruence‘s – Linear Congruence‘s – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.

Module 3: Classical Theorems And Multiplicative Functions :
Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phifunctions**.**

Module 4: Classical Encryption Techniques
Classical encryption techniques: Symmetric chipper model – Substitution techniques – Transposition techniques – Steganography.

Module 5: Block Chippers and Public Key Encryption
Block chipper principles – block chipper modes and operations – advanced encryption standards (AES) – Public key cryptography – Principles of public key cryptosystem – The RSA algorithm – Elliptic curve arithmetic – Elliptic curve cryptosystem.

Text Books:

1. "Course on Number Theory and Cryptography", Koblitz, N. Springer Verlag, 1986
2. "Handbook of Applied Cryptography", Menezes, A, et.al. CRC Press,1996

Reference Books:

1. "An Introduction to the Theoryof Numbers", Ivan Niven, Herbert S. Zukerman, Hugh L. Montgomery.

E - Resources:

1. https://people.maths.bris.ac.uk/~mazag/nt/lecture1.pdf
2. https://www.diva-portal.org/smash/get/diva2:530204/FULLTEXT01.pdf
3. https://en.wikipedia.org/wiki/Multiplicative_function
4. https://www.slideshare.net/PrachiGulihar/elementary-cryptography
5. https://en.wikipedia.org/wiki/Public-key_cryptography

Course Outcomes:

On completion of the course, the students will be able to:

1. **Ability** to think and reason about abstract mathematics
2. **Analyze** the vulnerabilities in any computing system and hence be able to design a security solution
3. **Evaluate** security mechanisms using rigorous approaches, including theoretical
4. **Solve** problems in elementary number theory
5. **Apply** elementary number theory to cryptograpy

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">NANOMATERIALS
(Common to CE, EEE, ME, ECE, CSE, IT& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. To familiarize about the various properties of nanostructures.
2. Utilizing the different physical and chemical methods in preparing nanomaterials.
3. Provide different methods of synthesis of Nano materials.
4. Bring out the distinct Quantum Structure properties of nanostructures.
5. Find out the particle size of a crystal by XRD technique.

Module 1: Introduction to Nanomaterials
Introduction to nanotechnology and materials, Nano materials, Introduction to nano sizes and properties comparison with the bulk materials, Different Shapes and Sizes and Morphology. Classification of nanomaterials. Fullerene, carbon, Nanotubes (CNT's), Nanoparticles. Physical, Chemical, Electrical, Optical, Magnetic and mechanical properties of nanomaterials.

Module 2:
Unit-1: Physical Methods: Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, and electro deposition.
Unit - 2: Chemical Methods: Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

Module 3: Synthesis of Nanomaterials
Thermolysis route – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method, PVD method.

Module 4: Properties of Nanomaterials
Quantum Structure: 3D-Pontential Wells (Spherical & Rectangular Parallelepiped), 2D (Circular & Square, Quantum Corrals), 1D (Quantum Wires), 0D (Quantum Dots).

Module-5: X-RAY Characterization techniques
X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA), SEM and TEM method.

Text Books:

1. "The chemistry of Nano materials: Synthesis, Properties and Applications", C N R Rao, A Muller and A K Cheetham , John Wiley, First Edition, 2004
2. "Nano structured Materials and Nanotechnology", Hari Singh Nalwa, Academic Press, First Edition, 2002.

Reference Books:

1. "Introduction to Nanotechnology", Charles P Poole Jr, John Willey & Sons, 1st Edition, 2003
2. Nanoscience: "Nanotechnologies and Nano physics", C Dupas, P Houdy, M Lahmani, Springer-Verlag Berlin Heidelberg, 1st Edition, 2007.

E - Resources:

1. http://nptel.ac.in/courses/103103033/module9/lecture1.pdf
2. http://courses.washington.edu/overney/NME498_Material/NME498_Periods/Lect ure4-Overney- NP-Synthesis.pdf.
3. http://www.materialstoday.com/nanomaterials/journals/
4. https://www.journals.elsevier.com/nanoimpact
5. http://www.springer.com/materials/nanotechnology/journal/12274
6. http://nptel.ac.in/courses/118104008/
7. http://nptel.ac.in/courses/118102003/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** the properties of Nano-structured materials.
2. **Get** the knowledge of different physical and chemical methods of synthesis of Nano materials.
3. **Develop** basic knowledge on the properties and applications of few nanomaterials.
4. **Understand** different thermal methods of synthesis of nano materials and to learn different surface characterization techniques.
5. **Acquire** the different compositional and structural characterization techniques.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	2	-	2	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-	1	-
Average	2.6	1.4	2	-	2	-	-	-	-	-	-	--	1	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Chemistry of Engineering Materials
(Common to CE, EEE, ME, ECE, CSE, IT& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to
1. Learn the concept of phase rule and alloys, phase diagrams of different systems.
2. Gain the knowledge on abrasives, glass, ceramics, and adhesives.
3. Understand the basic concepts of chemistry to develop futuristic materials for high-tech. applications in the area of engineering.
4. Know the concepts of glass, ceramics and Refractories.
5. Analyze the different types of solutions.

Module 1: Phase Rule and alloys:
Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

Module 2: Composites, Abrasives and Adhesives:
Composites: Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications. Abrasives- natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives- classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

Module 3: Cement and Concrete:
Introduction-Classification of cement-natural-chemical composition of cement-Portland cement-chemical reactions involved in setting and hardening of cement-additives for cement-mortars and concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete, constructions-testing and decaying of cement-prevention of cement decay.

Module 4: Glass, Ceramics and Refractories:
Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

Module-5: Colloids and surfactants:

Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids (Dialysis, Electro dialysis and Ultrafiltration).Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

Text Books:

1. "A text Book of Engineering Chemistry", P.C.Jain and Monica Jain, Dhanpat Rai Publications, New Delhi, 12th Edition 2006.
2. "Text Book of Engineering chemistry", B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, Cengage Learning India Pvt. Ltd, 2016.
3. "Colloids and Interfaces with Surfactants and Polymers", J. Goodwin, 2nd Edition 2009.

Reference Books:

1. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharmaand M.S.Pathania, S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.
2. "Engineering Chemistry",M.ThirumalaChary and E.Laxminarayana, SciTech publications(INDIA) PVT Ltd, Third Edition,2016

E - Resources:

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials-science.html
2. https://www.sciencedirect.com/science/article/pii/S1369702110701875
3. https://engineering.purdue.edu/MSE/aboutus/whatsmaterials
4. https://www.engineergirl.org/32721/Difference-between-chemical-and-materials-engineering
5. https://www.webpages.uidaho.edu/catalog/2013/chemical-and-materials-engineering.htm

Course Outcomes:

On completion of the course, the students will be able to:

1. **Interpret** the vitality of phase rule in metallurgy and application of phase rule to one and two component systems.
2. **Understand** the concepts of abrasives, adhesives and liquid.
3. **Know** the importance of basic constructional material, Portland cement in Civil Engineering works.
4. **Acquire** the knowledge about properties and applications of glass, ceramics and refractories.
5. **Understand** the relationships between macroscopic material properties and microscopic structures.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	-	2	1	-	-	-	-	-	-	-	2	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	2	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	1	-	-
CO5	2	2	-	-	1	-	-	-	-	-	-	2	-	-
Average	2.4	1.4	1	1	-	-	-	-	-	-	-	1.8	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">TECHNICAL COMMUNICATION SKILLS
(COMMON TO ALL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives:
The students will

1. Understand the role of language as a communication
2. Employ the role of presentation skills in public speaking
3. Know the importance of body language
4. Examine the role of group discussion for getting jobs
5. Understand the importance of interview skills for getting jobs

Module -I Language as a Communication
Introduction-definition-the process of communication-types of communication-barriers of communication; language and communication-properties of language.

Module -II Presentation Skills
Nature and importance of oral presentation-planning the presentation-preparing the presentation-organizing the presentation-rehearsing the presentation and checklist for making oral presentation

Module -III Body Language
Introduction-definition-eye contact- facial expressions-gesture and posture.

Module -IV Group Discussion
Nature of GD- Characteristics and Strategies of GD-Techniques for Individual Contribution-Group Interaction Strategies.

Module -V Interview Skills
The Interview Process-Characteristics of Interview-Pre-interview preparation Techniques-interview questions-FAQ- Projecting a Positive Image and Alternative Interview Format.

References:

1) Raman, Meenakshi and Sangeeta Sharma. Technical Communication- Principles and Practice. Third Edition, New Delhi: UP., 2015.
2) Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.

E-Resources:

1. https://www.ilstranslations.com/blog/language-vs-communication-theyre-not-the-same-thing/#:~:text=Language%20is%20a%20system%20of,is%20a%20tool%20of%20communication.

Course outcomes:

The students will be able to

2. Use the language skills in order to better communication
3. Learn the presentation skills and use them in conferences and seminars
4. Identify the role of presentation skills in expressing our feelings and emotions
5. Understand the role of group discussion for getting jobs
6. Know the importance of interview skills for getting jobs

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

<table>
<tr><td>AY 2020-21 Onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td colspan="4" rowspan="2">ENTREPRENEURSHIP
(Open Elective - I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objective:
The students will

1. To implore an understanding of the dimensions and traits required to become an entrepreneur.
2. To understand the Entrepreneurial process and also inspire them to be Entrepreneurs
3. To understand the Entrepreneurship and its role in the society
4. To understand the process of Entrepreneurship & preparing business plans
5. To gain knowledge about the Entrepreneurship Development Institutions of Government

Module 1:
UNIT - I:
Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs.
UNIT - II:
Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.

Module 2:
UNIT - I:
The individual entrepreneurial mind-set and Personality- The entrepreneurial journey-Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations- Motivational cycle – Entrepreneurial motivational behavior – Entrepreneurial competencies.
UNIT - II:
Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur-conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

Module 3:
UNIT - I:
Launching Entrepreneurial Ventures - opportunities identification- Finding gaps in the market place – techniques for generating ideas- entrepreneurial Imagination and Creativity- the nature of the creativity process - Innovation and entrepreneurship.

UNIT - II:

Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising- advantage and disadvantages of Franchising.

Module 4:

UNIT - I:

Legal challenges of Entrepreneurship - Intellectual property protection - Patents, Copyrights - Trademarks and Trade secrets - Avoiding trademark pitfalls
Feasibility Analysis - Industry and competitor analysis –

UNIT - II:

Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process.

Module 5:

UNIT - I:

Strategic perspectives in entrepreneurship - Strategic planning - Strategic actions- strategic positioning- Business stabilization - Building the adaptive firms - Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growing ventures.

UNIT - II:

Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship -T-hub, J-hub

Text Books:

1. D F Kuratko and T V Rao, Entrepreneurship- A South-Asian Perspective, Cengage Learning, 2012.
2. Bruce R. Barringer/ R. Duane Ireland, Entrepreneurship Successfully launching new ventures, 4e, Pearson, 2015
3. S. S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

Reference Books:

1. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012
2. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013
3. Madhurima Lal Shikha Sahai – Entrepreneurship, Excel Books.
4. S.K Mohanthy, Fundamentals of Entrepreneurship, Prentice Hall of India, New Delhi.

E-Resources:

1. Entrepreneur.com
2. BusinessOwnersToolKit.com
3. YourStory.com
4. ASmartBear.com

Course outcomes:

Upon successful completion of the course, the students should be able to

1. Understand the need and significance of Entrepreneurship in the Economy
2. Develop Entrepreneurial Competencies
3. Develop Business Plan with the required contents.
4. Understand contribution of family business and Social Entrepreneurship in the Economy.
5. Plan Strategic perspectives in entrepreneurship

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

<table>
<tr><td>AY
2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32OA</td><td rowspan="2">CONSTRUCTION MANAGEMENT, CONTRACTS AND VALUATION
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Construction Technology and Project Management, Estimation and Costing.

Course Objectives:

This course will enable students to:

1. Study the different tools and techniques for project management.
2. Explain the various types of organization and their impact on and suitability to construction projects.
3. Study the various safety concepts and requirements applied to construction industry.
4. Differentiate the different types of contracts.
5. Study purpose of valuation and types of valuation.

Module 1:

Unit 1: Concept of a Project

Characteristic features – Project Life cycle – Phases – Project Management – tools and techniques for project management – role of project managers.

Module 2:

Unit 1: Project Management Plan and Objectives

Programming – scheduling – project organization – organization and project team – role of communication in project management – controlling systems.

Module 3:

Unit 1: Safety Management Function

Importance of safety in construction industry, Line versus staff authority, Safety responsibility and accountability in construction industry, Safety organizations, Role of various parties, duties, responsibilities of top management, site managers, supervisors etc., Role of safety officers, Responsibilities of general employees, Safety administration.

Module 4:

Unit 1: Types of contract documents

Essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents, and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

Module 5:

Unit 1: Valuation

Types of value, purposes of valuation factors affecting value. Different methods of valuation for different types of assets such as land and building, horticulture, historical places. Valuation Report, contents, standard formats, Case study of any one Report.

Text Books:

1. “Construction Technology” by Subira K. Sarkar, Subhajit Saraswathi / Oxford University Press, 3rd edition, Apr 2009.
2. "Project management- strategic Financial Planning, Evaluation and Control" by B M Patel, Vikas Publishing House Pvt. Ltd. New Delhi, 2nd edition oct 2000.

Reference Books:

1. "Total Construction Project Management" by George J.Ritz , McGraw-Hill Inc, 2nd edition Jan 2013.
2. "Construction Project Management Planning, Scheduling and Control" by K K Chitkara

E-Resources:

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/103/105103023/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the different approaches for successful handling of the project.
2. **Apply** different plans and schedules for the development of the project.
3. **Describe** the importance of safety management in construction industry.
4. **List** out the different tenders and contract document for a construction project.
5. **Evaluate** the different types of reports for different construction projects.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	-	-	2	1	-	-	2	-	3	1	1	-
CO2	2	1	2	-	-	-	-	-	-	-	2	2	2	-
CO3	2	1	-	-	-	3	-	-	-	-	-	1	1	-
CO4	2	1	-	-	-	2	-	-	-	-	3	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	2	-	1	-
Average	2	1.4	0.4	-	0.4	1.2	-	-	0.4	-	2	0.8	1.4	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OB</td><td rowspan="2">ENERGY AUDIT & GREEN BUILDINGS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the various energy scenarios and energy auditing methodology.
2. Explain various renewable and non-renewable sources of energy.
3. Describe the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.
4. Explain the efficient use of waste materials in construction industry
5. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems.

Module 1:

Unit 1: Energy Scenarios:

Energy Conservation-Energy Audit-Energy Consumption-Energy Security-Energy Strategy-Clean Development Mechanism.

Unit 2: Types of Energy Audits and Energy-Audit Methodology:

Definition of Energy Audit-Place of Audit-Energy- Audit Methodology-Financial Analysis-Sensitivity Analysis-Project Financing Options-Energy Monitoring and Training.

Module 2:

Unit 1: Environmental Audit:

Environmental Audit; Introduction-Necessity-Norms. Types: Objectives-Bases types; Liabilities Audit-Management Audit-Activities Audit-Client drive and types; regulatory external audits-independent external audit-internal environmental audit-third party audit.

Unit 2: Environmental Impact Assessment:

Introduction-EIA regulations-Steps in Environmental impact assessment process-benefits of EIA-limitations of EIA-Environmental Clearance for Civil Engineering Projects.

Module 3:

Unit 1: Energy Sources:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards.

Unit 2: Energy Conservation:
Introduction-Specific objectives-need of energy conservation-LEED India rating system and Energy Efficiency.

Module 4:
Unit 1: Green Building:
Introduction-Definition-Benefits-Principles; Planning concept of Green Building-Salient features of Green Building-Environmental Design-Strategies for Building Construction- Process; Improvement in Environmental Quality in Civil Structure. Materials; Bamboo, Rice Husk Ash, Concrete, Plastic Bricks-Reuse of waste materials-Plastic, Rubber, News Paper, Wood, Non-Toxic paint, Green roofing.

Module 5:
Unit 1: Rating system for Green Building:
Leadership in Energy and Environmental Design (LEED) Criteria-Indian Green Building Council (IGBC) Green Rating-Green Rating for Integrated Habitat Assessment (GRIHA) criteria-HVAC unit in Green Building-Certification Programs (including GEM and ECBC Certifications).

Text Books:

1. "Sustainable construction: Green Building design and delivery" by Kibert, C.J(John Wiley Hoboken, New Jersey).
2. "Non-Conventional Energy resources" by Chauhan, D S Sreevasthava, S K (New Age International Publishers, New Delhi).
3. "Alternative Building Materials and Technologies" by Jagadeesh, K S, Reddy Venkatta Rama, Nanjunda Rao K S (New Age International Publishers, New Delhi).
4. "Green Buildings" by Gevorkian (McGraw hill publication).

Reference Books:

1. "Handbook of Green Building Design and Construction" by Sam Kubba (Butterworth-Heinemann).
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design.
3. Energy Conservation Building Code 2017.

E-Resources:
1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce06
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

Course Outcomes:

On completion of the course, the students will be able to:

1. **Differentiate** and select best of various energy scenarios and energy auditing methodology.
2. **Identify** various Renewable and Non-renewable sources of energy.
3. **Justify** others to use the waste materials efficiently and effectively.
4. **Explain** the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. **Discuss** the building codes, relevant legislation governing the consumption of resources.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	2	1	1	-	1	2	-	-	-	-	-	1	1
CO2	1	2	1	1	-	2	2	-	-	-	-	-	1	-
CO3	2	1	2	1	-	1	2	-	-	-	-	-	-	1
CO4	1	1	1	1	-	2	2	-	-	-	-	-	1	1
CO5	-	1	1	1	-	1	2	-	-	-	-	-	1	-
Average	1	1.4	1.2	1	-	1.4	2	-	-	-	-	-	0.8	0.6

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OC</td><td rowspan="2">HYBRID ELECTRIC VEHICLES
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Understand working of different configurations of electric vehicles, and its components
2. Understand hybrid vehicle configuration and performance analysis.
3. Introduce the transmission configuration and its analyze the characteristics
4. Analyze the different speed control techniques
5. Design and evaluate the sizing of components in hybrid vehicles.

MODULE -I: History of hybrid and electric vehicles – social and environmental importance of hybrid and electric vehicles – impact of modern drive-trains on energy supplies – Basics of vehicle performance, vehicle power source characterization transmission characteristics – Mathematical models to describe vehicle performance.

MODULE -II: Basic concept of hybrid traction – Introduction to various hybrid drive train topologies – power flow control in hybrid drive – train topologies-Fuel efficiency analysis.

MODULE -III: Introduction to electric components used in hybrid and electric vehicles-Configuration and control of DC motor drives-Configuration and control of introduction motor drive configuration and control of permanent magnet motor drives configuration and control of switch reluctance- motor drives, drive system efficiency.

MODULE -IV: Matching the electric machine and the internal combustion engine (ICE) Sizing the propulsion-motor, sizing the power electronics selection the energy storage technology – Communications, supporting subsystems.

MODULE -V: Introduction to energy management and their strategies used in hybrid and electric vehicle-Classification of different energy management strategies comparison of different energy management strategies implementation issues of energy strategies.

TEXT BOOKS:

1. Iqbal Husain, "Electric and Hybrid Electric Vehicles", CRC Press, 2011.

2. Wei Liu, "Hybrid Electric Vehicle System Modeling and Control", Second Edition, WILEY, 2017.
3. Sira – Raminez ,R.SilvaOrtigoza, control Design techniques in power electronics Devices, Springer.
4. Siew – Chong tan, Yuk-Ming lai Chi Kong Tse, “Sliding mode control of switching power Converters”.

REFERENCE BOOKS:

1. James Larminie and John Lowry, "Electric Vehicle Technology Explained", Second Edition 2012.
2. Christopher D Rahn, Chao-Yang Wang, "Battery Systems Engineering", Wiley, 2013.

E - Resources:

1. https://nptel.ac.in/courses/108/103/108103009/

Course Outcomes:

The students will be able to

1. **Understand** the working of different configurations of electric vehicles, hybrid vehicles and its components.
2. **Apply** the basic concepts of batteries and Motors in the design of Electric and Hybrid Vehicles.
3. **Differentiate** the modes of operation of Hybrid Vehicles.
4. **Analyze** the performance of hybrid vehicles.
5. **Design** the basic parameters of Electric and Hybrid Electric Vehicles.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		2	-	-	-	2	-	-	-	-	-	3	2
CO2	3	2	3	2	-	-	2	-	-	-	-	-	2	2
CO3	3	2	3	-	-	-	-	-	-	-	-	2	2	2
CO4	2	3	2	-	-	-	-	-	-	-	-	2	3	3
CO5	2	3	3	-	-	-		2	-	-	-		2	2
Average	2.6	2.5	2.6	-	-	-	2	2	-	-	-	2	2.4	2..2

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – II Sem			
Course Code: J32OD	ENERGY AUDITING CONSERVATION AND MANAGEMENTS (Open Elective-II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Nil

Course Objectives:
The students will
1. To understand the need of Energy Audit and Energy Conservation Schemes.
2. To know the necessity of conservation of energy.
3. To generalize the methods of energy management.
4. To illustrate the factors to increase the efficiency of electrical equipment.
5. To detect the benefits of carrying out energy audits.

MODULE -I: Basic Principles of Energy Audit: Energy Audit-
Unit-I: Definitions, Concept, Types of audit, Energy index, Cost index, Pie charts, Sankey diagrams.
Unit-II: Load profiles, Energy conservation schemes- Energy audit of industries- Energy saving potential, Building energy audit.

MODULE -II: Energy Management
Principles of energy management, organizing energy management program, Initiating, Planning, Controlling, Promoting, Monitoring, Reporting, Energy manger, Qualities and functions, Language, Questionnaire – Check list for top management.

MODULE -III: Energy Efficient Motors
Energy efficient motors, Factors affecting efficiency, Loss distribution, Constructional details, Characteristics - Variable speed, Variable duty cycle systems, RMS HP- Voltage variation-Voltage unbalance- Over motoring- Motor energy audit.

MODULE -IV: Power Factor Improvement, Lighting and Energy Instruments
Unit-I: Power factor – Methods of improvement, Location of capacitors, Pf with non-linear loads, Effect of harmonics on power factor.
Unit-II: Power factor motor controllers - Good lighting system design and practice, Lighting control , Lighting energy audit - Energy instruments- Wattmeter, Data loggers, Thermocouples, Pyrometers, Lux meters, Tongue testers ,Application of PLC's.

MODULE -V: Economic Aspects and Analysis
Economics analysis-Depreciation methods, Time value of money, Rate of return, Present worth method, Replacement analysis, Life cycle costing analysis- Energy efficient motors- Calculation of simple payback method, Net present worth method-

Power factor correction, Lighting -Applications of life cycle costing analysis, Return on investment.

TEXT BOOKS

1. W.R. Murphy & G. Mckay, "Energy Management", Butter worth, Heinemann Publications, Second Edition, 2009.
2. Paul o' Callaghan, "Energy Management", Tata Mc-Graw Hill Book Company- First Edition, 1998.
3. W.C.Turner, "Energy Management Hand Book", CRC Press, First Edition, 2004.

REFERENCE BOOKS

1. John .C. Andreas, "Energy Efficient Electric Motors", CRC Press, Third Edition, 1992.
2. Great Britain, "Energy Management and Good Lighting Practice: Fuel Efficiency- Booklet Volume 12-EEO, 1989.

E-Resources:

1. www.beeindia.gov.in

Course Outcomes:

On completion of the course, the students will be able to:

1. **Tell** energy audit of industries.
2. **Predict** management of energy systems.
3. **Sequence** the methods of improving efficiency of electric motor.
4. **Analyze** the power factor and to design a good illumination system.
5. **Determine** pay back periods for energy saving equipment

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

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course
Code:
J32OE</td><td rowspan="2">FUNDAMENTALS OF OPERATIONS
RESEARCH
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mathematics

Course Objectives:
This course will enable students to

1. Get the basic knowledge of Linear Programming and its applications to engineering problems and able to formulate a problem in LP model, and solve it using graphical method and Simplex method.
2. Be taught about the variants of the LP problem such as Transportation, Assignment, and Sequencing problems
3. Learn to find the optimal replacement time of capital cost equipment, and application of Group Replacement strategy
4. Learn the importance of maintaining optimal inventory in any industry, and be familiarized with the intricacies of waiting line models faced in real world situations
5. Understand the basics of Network analysis (CPM and PERT) and Project Cost Analysis; Learn Simulation and its applications.

Module 1
Unit 1: Introduction: Development – Definition – Scope, Characteristics and Phases – Types of Operations Research models – applications.
Unit 2: Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

Module 2
Unit 1: Transportation Models: Formulation – Optimal solution, unbalanced transportation problem – Degeneracy
Unit 2: Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

Module 3
Unit 1: Sequencing: Introduction – Flow-Shop sequencing – ‘n’ jobs through two machines – ‘n’ jobs through three machines – Job-shop sequencing – two jobs through ‘m’ machines

Unit 2: Replacement: Introduction – Replacement of capital cost items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail suddenly and completely- Group Replacement.

Module 4

Unit 1: Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks – inventory models with and without shortage cost. Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.
Unit 2: Waiting lines: Introduction – Terminology - Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models.

Module 5

Unit 1: Network analysis (CPM and PERT): Basic Concepts of Network Analysis - Network diagram - Critical Path Method - Terminology in CPM 804 – Float – Limitations of CPM - PERT - Project Cost Analysis - Comparison between CPM and PERT.
Unit 2: Simulation: Definition – types of simulation models- applications, advantages and disadvantages - Brief introduction of simulation languages – simple problems on inventory and queuing using random numbers.

Text Books:

1. J. K. Sharma, “Operations Research”, MacMillan Publishers India Ltd, 4th Edition 2009.
2. A.C.S. Kumar, “Operations Research (Quantitative Analysis for Business Decisions)”, Yes Dee Publishers, 1st Edition, 2015.

Reference Books:

1. Maurice Saseini, ArhurYaspan, and Lawrence Friedman, “Operations Research: Methods and Problems”, Literary Licensing Publisher, 2013
2. A. M. Natarajan, P. BalaSubramani and A. Tamilarasi “Operations Research” Pearson Education, 4th Edition, 2009.
3. Wagner H. M, “Principles of Operations Research”, PHI Publications, 2nd Edition, 2006.
4. Hillier / Libermann “Introduction to Operations Research”, MacMillan Publishers, 10th Edition, 2017.

E - Resources:

1. https://rb.gy/1ckbxh
2. https://rb.gy/gev0g5
3. https://nptel.ac.in/courses/112/106/112106134/
4. https://nptel.ac.in/courses/111/107/111107128/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Allocate** optimally the resources in any industry to maximize the overall effectiveness parameter, determine the number of each item to be produced
2. **Find** the optimal number of units to be transported such that the total transportation cost will be minimum, and Assign the required men / machines to perform the given tasks in an optimal way
3. **Schedule** and sequence production runs by proper allocation of machines and men to get maximum gain and Compute the economic order quantity. Find the optimal replacement period for capital cost items
4. **Decide** the optimal inventory to be maintained under different situations involving different types of demand and inventory costs, find how to strike a balance between the waiting time cost and service facility cost for different waiting line models
5. **Apply** the techniques of Network Analysis like CPM and Pert for Project Cost Analysis. Apply Simulation methods to inventory and queuing problems

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

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

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32OG</td><td rowspan="2">SOFTWARE DEFINED RADIO
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Digital Signal Processing, TCP / IP

Course Objectives:

The objectives of this course is

1. To provide fundamentals and state of the art concepts in software defined radio.
2. To Analyze the analog RF components as front end block in implementation of SDR.
3. To Visualize digital hardware architectures and development methods.
4. To Understand the radio recourse management in heterogeneous networks.
5. To Remember the object-oriented representation of radio and network resources.

.

Module -I:

Unit-1

Introduction: The Need for Software Radios, what is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues the Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design

Unit-2

RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

Module -II:

Unit-1

Profile and Radio Resource Management: Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile, Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure

Unit-2

XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Class marks, Dynamic Class marks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data

Module -III:

Unit-1

Radio Resource Management in Heterogeneous Networks: Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks

Unit-2

Measuring Gain in the Upper Bound Due to JRRM, Circuit Switched System, Packet-Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems

Module -IV:

Unit-1

Reconfiguration of the Network Elements: Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks

Unit-2

Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer, Optimized Reconfiguration, Optimization Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals

Module -V:

Unit-1

Object – Oriented Representation of Radios and Network Resources: Networks-Object-oriented Programming- Object Brokers- Mobile Application Environments-Joint Tactical Radio System.

Unit-2

Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAKeasy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, Kambiz Madani, WILEY 2003
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger,Kambiz Madani, Nancy Alonistioti, 2003, Wiley.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Engineering– Joseph Mitola, III, 2000, John Wiley & Sons.

Course Outcomes:

On completion of this course, the students:

1. **Understand** the design principles of software defined radio.
2. **Analyze** the analog RF components as front end block in implementation of SDR.
3. **Visualize** digital hardware architectures and development methods.
4. **Understand** the radio recourse management in heterogeneous networks.
5. **Remember** the object-oriented representation of radio and network resources.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	1	-	-	-	-	-	-	-	-	-	2	-	1
CO2	3	2	1	1	-	-	-	-	-	2	2	2	-	2
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	1
CO4	2	2	2	-	-	2	-	-	-	-	2	3	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	1
Average	2	1.4	0.6	0.2	-	0.4	-	-	-	0.4	0.8	2.2	-	1.4

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: III Year – II Sem			
Course Code: J32OH	**BASICS OF IC TECHNOLOGY** (Open Elective-II)	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Pre-requisite: Electronic devices and circuits Switching Theory & Logic Design, Pulse & Digital Circuits

Course Objectives:

The students will

1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non – linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To introduce the concepts of waveform generation and introduce some special function ICs.
5. To understand and implement the working of basic digital circuits

MODULE 1:

Unit 1: Introduction to Linear Integrated Circuits

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting.

Unit 2: Non-Linear Applications of OP-AMP

Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator.

MODULE 2:

Unit 1: Introduction to Filters

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters

Unit 2: wave form generators

Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer - Functional Diagram, Monostable, and Astable Operations.

MODULE 3:

Unit 1: Converters of DAC

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC

Unit 2: Converters of ADC

Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

MODULE 4:

Unit 1: Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications.

Unit 2: Applications of Digital ICs

Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers.

MODULE 5:

Unit 1: Combinational Circuits Using TTL 74XX ICS

Familiarity with commonly available 74XX &CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters.

Unit 2: Memories

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILL EDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E - Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20 Notes.pdf.
3. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20L DIC(Linear%20 and%20Digital%20IC%20Applications).pdf
4. http://crectirupati.com/sites/default/files/lecture_notes/LDICA%20Lecture%2 0notes%20y% 20A.Mounika.pdf
5. http://www.springer.com/engineering/electronics/journal/10470.
6. https://www.journals.elsevier.com/microelectronics-journal
7. http://nptel.ac.in/courses/117107094/
8. https://www.youtube.com/watch?v=NVj_Eu3sJL4

9. http://freevideolectures.com/Course/2915/Linear-Integrated-Circuits
10. Analog Electronic Circuits: https://swayam.gov.in/nd1_noc19_ee38/preview
11. Op-amp practical Applications: Design, Simulation and Implementation: https://onlinecourses.nptel.ac.in/noc18_ee10/preview
12. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Course Outcomes:

On completion of the course, the students will be able to:

1. **understanding** of operational amplifiers with linear integrated circuits.
2. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
3. **Analyse** the functioning of various design circuits using operational amplifiers for various applications.
4. **Design** various techniques to develop A/D and D/A convertors.
5. **Acquire** hands-on laboratory experience on IC based project kits in above areas according to specifications.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OI</td><td rowspan="2">FUNDAMENTALS OF COMPUTER NETWORKS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Knowledge on "Digital Logic Design".
2. Knowledge on "Computer Organization".

Course objectives:

The Student will:

1. Recognize various layering approaches for networking and understand the functionalities of physical layer.
2. Identify the data link layer protocols, multi access protocols and various internetworking devices.
3. Examine design issues of network layer, services provided to above layer and routing, and congestion control protocols.
4. Examine IP protocol, addressing, various protocols like CIDR, ICMP, ARP and RARP of internet Layer and examination of transport layer services.
5. Examine Transport layer protocols like TCP, UDP and various congestion controlling mechanisms, including application layer services, protocols like HTTP, FTP, E-Mail etc.

Module 1:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Connecting Devices: Repeaters, Hubs, Switches, Gateways and Bridges.

Module 2:

Data Link Layer: Design issues, Framing, Error Detection and Error Correction, Hamming Distance, CRC, Flow control and error Control.

Protocols: Noiseless Channels, Noisy Channels,

Multi Access protocols- Random access - ALOHA, CSMA, CSMA/CD and CSMA/CA, Controlled access, Channelization.

Module 3:

Network Layer: Network layer design issues, Store and forward packet switching, connection less and connection-oriented network services.

Internetworking: Protocols-IPV4 and IPV6**,** Logical Addressing-IPV4, IPV6, Tunneling and Packet Fragmentation.

Address Mapping: ARP, RARP, DHCP, ICMP and IGMP.

Routing Algorithms: Shortest Path Finding and Distance Vector Routing Algorithms.

Module 4:
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), The TCP Connection Establishment, The TCP Connection Release, The TCP sliding window, The TCP congestion control

Module 5:
Application Layer: Introduction, services, Application layer paradigms.
Applications: DNS, WWW, HTTP, FTP, E-MAIL, TELNET, SNMP, SSH.

Text Books:

1. ComputerNetworks,5E,Peterson,Davie,Elsevier
2. Introduction to Computer Networks and CyberSecurity, Chawan -HwaWu, Irwin, CRC Publications.
3. Computer Networks and Internets with Internet Applications, Comer .

Reference Books:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education

E - Resources:

1. https://lecturenotes.in/subject/2234/Computer_Network
2. http://nptel.ac.in/courses/106102234/
3. https://www.iitg.ernet.in/dgoswami/CN-Notes.pdf
4. http://www.coursera.org/http://ocw.mit.edu/index.htm.

Course outcomes:
The Student will be able to

1. **Demonstrate** the networking concepts, various Layering approaches and their functionalities.
2. **Understand** the protocols of Data Link layer, how a medium can be shared among multiple devices and internetworking devices used.
3. **Work** on fragmentation, assigning of logical address and judge on routing, congestion.
4. **Demonstrate** the working of IP Protocol, other protocols of internet layer and services of transport layer.
5. **Explain** the transport layer and application layer protocols, their working

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	2	2
Average	**2.4**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OJ</td><td rowspan="2" colspan="4">INTRODUCTION TO JAVA PROGRAMMING
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Knowledge on Programming Language.

Course objectives:

The Student will:

1. Familiar with constructors and string handling functions
2. Explain inheritance and polymorphism
3. Familiar with packages and interfaces
4. Familiar with exception handling and multithreading
5. Familiar with applet programming and event handling.

Module 1:

Introduction: OOP concepts, history of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program.

Classes and Objects: concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion.

String handling: String, String Buffer, String Tokenize.

Module 2:

Inheritance: base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.

Packages: Defining, creating and accessing a package, importing packages, access control, exploring package - java.io

Module 3:

Exception handling: concepts of exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

Module 4:

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

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

Module 5:

Event Handling: events, event sources, event classes, event listeners, delegation event model, handling mouse and key board events, adapter classes. The AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists

Text Books:

1. Java The complete reference, 8th editon, Herbert Schildt, TMH.
2. Under tanding OOP with Java, up dated edition, T.Budd, Pears on education.

Reference Books:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.

E- Resources:

1. www.javasoft.com
2. www.w3schools.com
3. www.tutorialpoint.com
4. www.oracle.com

Course outcomes:

At the end of the course, students will be able to

1. **Familiar** with constructors and string handling
2. **Understand** inheritance and polymorphism
3. **Understand** packages and interfaces
4. **Understand** exception handling and multithreading
5. **Understand** applet programming

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	3	-	3	3	-	3	-	-	2	-	-	3	-
CO2	-	-	2	-	-	3	-	3	-	-	3	-	-	3
CO3	3	-	-	3	-	2	-	-	3	-	-	3	-	-
CO4	3	-	-	-	3	-	-	3	3	3	-	-	3	-
CO5	-	3	-	-	-	-	2	-	-	-	3	-	-	3
Average	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**2.5**	**2.5**	**3.0**	**3.0**	**2.5**	**3.0**	**3.0**	**3.0**	**3.0**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OK</td><td rowspan="2">COMPUTER ORGANIZATION
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: NIL

Course Objectives:

This course will enable students to:

1. To understand the basic operations of the computer system.
2. To know the functioning of CPU and the control unit.
3. To Analyse various algorithms for arithmetic operations in the computer.
4. To understand different hierarchical memory systems including cache memory and virtual memory.
5. Recognize different ways of communicating with input/output devices and standard I/O interfaces.

Module I

Unit 1 Basic structures of Computers

Computer Types, Functional unit, Basic operational concepts, Bus structures, software, Performance, multiprocessors and multi computers.

Unit 2 Data Representation

Fixed point representation, Floating point representation, Error detection codes.

Module II:

Unit 1 Register Transfer and Micro operations

Register transfer language, Register transfer, Bus and memory transfers, Arithmetic micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Unit 2 Basic computer organization and Design

Instruction codes, computer registers, computer instructions, Timing and control, instruction cycle

Module III:

Unit 1 Computer Arithmetic

Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point arithmetic operations, Decimal arithmetic unit, Decimal arithmetic operations.

Module IV:

Unit 1 The Memory System

Basic concepts, Semiconductor RAM memories, Read-Only memories, speed, Size and Cost, Cache memories, performance considerations, Virtual memories, Secondary storage.

Module V:

Unit 1 Input/output Organization

Accessing I/O Devices Interrupts, Interrupt hardware, Enabling and disabling interrupts, Direct memory access, Buses, interface circuits, Standard I/O interfaces.

Text Books:

1. Computer Organization-Carl Hamacher, ZvonkoVranesic, SafwatZaky, Vth Edition, McGraw Hill.
2. Computer System Architecture-M.MorisMano,IIIrdEdition,Pearson/PHI

Reference Books:

1. Computer Organization and Architecture-William Stallings, SixthEdition, Pearson/PHI
2. Structures Computer Organization-Andrew S.Tanebaum,4th Edition PHI/Pearson.

E - Resources:

1. https://nptel.ac.in/courses/106/103/106103180/
2. https://nptel.ac.in/courses/117/105/117105078/
3. https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Illustrate** basic operations of the computer system.
2. **Apply** knowledge of CPU and the control unit.
3. **Apply** various algorithms for arithmetic operations in the computer.
4. **classify** different memory systems.
5. **Produce** knowledge on input/output organization.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-	-	-
Average	3.0	2.0	2.5	2.0	-	-	-	-	-	-	-	-	2.5	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech
III Year–II Sem.</td></tr>
<tr><td>Course Code: J32OL</td><td rowspan="2">FUNDAMENTALS OF HUMAN COMPUTER INTERACTION
(Open Elective-II))</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: GUI(Windows) Working Knowledge

Course Objectives:

This course will enable students to:

1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Design, implement and evaluate effective and usable graphical computer interfaces.
3. Describe and apply core theories, models and methodologies from the field of HCI.
4. Able to apply HCI principles, guidelines, methods, and techniques for human-centred information systems development.
5. Use the information sources available and be aware of the methodologies and technologies supporting advances in HCI.

Module I:

Unit 1:

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

Unit 2:

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Module II:

Unit 1:

Design process – Human interaction with computers, importance of human characteristics human consideration.

Unit 2:

Human interaction speeds, understanding business junctions

Module III:

Unit 1:

Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition.

Unit 2:

amount of information – focus and emphasis, presentation of information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Module IV:

Unit 1:

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls Components – text and messages, Icons and increases.

Unit 2:

Multimedia, colors, uses problems, choosing colors.

Module V:

Unit 1:

Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices.

Unit 2:

speech recognition digitization and generation – image and video displays – drivers.

Text Books:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.

Reference Books:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.

E - Resources:

1. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/human-computer-interaction-brief-intro
2. https://www.interaction-design.org/literature/topics/human-computer-interaction
3. https://www.udacity.com/course/human-computer-interaction--ud400

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** the human computer components functions regarding interaction with computer.
2. **Describe** the key design principles for user interfaces.
3. **Apply** an interactive design process and universal design principles to designing HCI systems.
4. **Use** Paradigms, HCI in the software process.
5. **Implement** Interaction design basics.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1	2	2	-	1	-	-	-	-	-	1	-
CO2	1	1	2	2	2	-	1	-	-	-	-	-	2	-
CO3	1	3	3	3	3	-	2	-	-	-	-	-	2	-
CO4	-	2	2	2	1	-	1	-	-	-	-	-	-	-
CO5	1	2	1	1	1	-	1	-	-	-	-	-	2	-
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

<table>
<tr><td rowspan="2">AY 2020-21 onwards</td><td rowspan="2">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="3">B.Tech III Year – II Sem</td></tr>
<tr></tr>
<tr><td>Course Code: J32OM</td><td rowspan="2">INTRODUCTION TO MICROPROCESSORS AND MICRO CONTROLLERS
(Open Elective-II)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Knowledge in IC **'s**

Course Objectives:
Students will learn to:
1. Study the Architecture of 8085&8086 microprocessor
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study the Architecture of 8051 microcontroller

Module 1:
Unit 1: 8086 Introduction: 8086 Architecture Functional diagrams, Register organization, memory segmentation, programming model, memory addresses, physical memory organization
Unit 2: 8086 Architecture: Architecture of 8086,signal descriptions of 8086-common function signals, Timing diagrams, interrupts of 8086.

Module 2:
Unit 1: Instruction set of 8086: Instruction formats, addressing modes, instruction set, assembler directives, macros.
Unit 2: Assembly language programming of 8086: Simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Module 3:
Unit 1: I/O Interface: 8255 PPI, Various modes of operation and interfacing to 8086, interfacing keyboard, Display, D/A and A/D converter.
Unit 2: Interfacing with advanced devices: Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

Module 4:
Unit 1: Introduction to Microcontrollers: Overview of 8051 microcontrollers, architecture, I/O ports, memory organization.
Unit 2: Addressing Modes: Addressing modes and instruction set of 8051, simple programs.

Module 5:
Unit 1: 8051 Real Time control 1: Programming Time Interrupts, Programming External Hardware Interrupts.
Unit 2: 8051 Real Time control 2: Programming the serial communication interrupts, programming 8051 Timers and counters

Text Books:

1. D.V.Hall, Microprocessors and interfacing,TMGH,2 Edition 2006.
2. Kenneth.J.Ayala, The8051Microcontroler,3rdEd., C engage Learning.

Reference Books:

1. Advanced Microprocessors and Peripherals-A. K. Rayand K.M Bhurchandi, TMH, 2nd Edition 2006.
2. The 8051Microcontrollers.Architecture and programming and applications-K.Uma Rao, Andhe Pallavi,Pearson, 2009.
3. Microcomputer system 8086/8088 family architecture. Programming and design- Du and GA Gibson, PHI 2nd Edition.

E-Resources:

1. https://nptel.ac.in/courses/106/108/106108100/
2. https://www.youtube.com/watch?v=o6W0opScrKY&list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3
3. https://www.youtube.com/watch?v=liRPtvj7bFU&list=PL0E131A78ABFBFDD0

Course Outcomes:

Students will be able to:

1. **Design** programs on 8085 microprocessors.
2. **Implement** programs on 8086 microprocessors.
3. **Design** interfacing circuits with 8086.
4. **Design** and implement 8051 microcontroller based systems
5. **Understand** the concepts related to I/O and memory interfacing

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

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

<table>
<tr><td rowspan="1">AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B. Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32ON</td><td rowspan="2">INTERNET OF THINGS
(Open Elective – II)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nill

Course Objectives:
Students will learn to

1. Understand the basic building blocks of IoT.
2. Analyze the difference between M2M and IoT along with IoT system Management
3. Extend the knowledge in Logical Design of IoT System using Python.
4. Acquire knowledge about IoT Physical Devices and End points.
5. Identify the IoT Physical Servers and cloud offerings.

Module 1:
Unit 1 Introduction to Internet of Things:
Definition and Characteristics of IoT, Physical Design of IoT –IoT Protocols, IoT communication models, IoT Communication APIs
Unit 2 IoT enabled Technologies:
Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Module 2:
Unit 1 IoT and M2M:
Software defined networks, network function virtualization, difference between SDN and NFV for IoT
Unit 2 Basics of IoT System:
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Module 3:
Unit 1 Introduction to Python:
Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling.
Unit 2 Python packages:
JSON, XML, HTTPLib, URLLib, SMTPLib.
Module 4:
Unit 1 IoT Physical Devices and Endpoints:
Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming.

Unit 2 Python program with Raspberry PI-1:
Python program with Raspberry PI with focus of interfacing external gadgets, controlling
output, reading input from pins.

Module 5:
Unit 1 Python program with Raspberry PI-2:
Python program with Raspberry PI with focus of interfacing external gadgets.
Unit 2: Controllingoutput, reading input from pins.

Text Books:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

References:

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

Course Outcomes:
Students will be able to

1. **Understand** the basic building blocks of IoT.
2. **Analyze** the difference between M2M and IoT along with IoT system Management
3. **Extend** the knowledge in Logical Design of IoT System using Python.
4. **Acquire** knowledge about IoT Physical Devices and End points.
5. **Identify** the IoT Physical Servers and cloud offerings

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	2
Average	**3.0**	**3.0**	**2.8**	-	-	-	-	-	-	-	-	-	**1.6**	**2.0**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech.
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OP</td><td rowspan="2">INTRODUCTION TO SURFACE MINING
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

The students will

1. To introduce surface mining terms and applicable conditions
2. To acquaint with different machinery used in surface mining
3. To get idea about Drilling and blasting of surface ore bodies.
4. To get idea about lighting, dust, and slopes in surface mines.
5. To know about ore and waste transportation.

Module 1

Unit - 1: Definition, Terminology, Applicability and limitations of surface mining, Classification, Advantages, and dis-advantages of surface mining.

Module 2

Unit - 1: Introduction to surface mining machinery: Equipment selection; Working with rippers, shovels, draglines, shovel-dragline combination; bucket wheel excavator. Disposal of OB/waste material

Module 3

Unit - 1: Drilling & blasting**:** Drilling mechanism, drilling patters, Drill bits Explosives, Blasting accessories, Bulk explosives, problems in blasting.

Module 4

Unit -1: Basics of Mine lighting, Sources of dust in surface mining, dust control, and slope stabilization

Module 5

Unit - 1: Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator. Impacts on environment due to surface mining

Textbooks:

1. D.J. Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001.
2. Principles & Practices of Coal Mining, R.D. Singh

Reference Books:

Surface Mining Technology, by Prof S.K. Das, Lovely Prakashan, Dhanbad

E-Resources:

1. https://www.researchgate.net/publication/282572490_Basic_concept_of_mining_technology
2. http://www.eolss.net/sample-chapters/c05/e6-37-06-01.pdf

Course Outcomes:

The student will be able to:

1. **Understand** about surface mining terms and conditions of applicability
2. **Learn** about different machinery used in surface mining
3. **Learn** drilling and blasting in surface mining
4. **Understand** mine lighting, dust, and slopes in surface mining
5. **Understand** the transportation of ore and waste in surface mining.

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Numerical Solution of Partial Differential Equations
(Common to CE, EEE,ME,ECE,CSE,IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. solve large number of algebraic linear equation by various methods
2. solve one Dimensional Parabolic Equations by numerical methods.
3. solve two Dimensional Parabolic Equations by numerical methods.
4. solve hyperbolic equations by numerical methods by using various methods.
5. solve elliptic equations by numerical methods by various methods

Module 1 : Linear Systems of Equations
Iterative methods for solving large linear systems of algebraic equations: Jacobi, Gauss-seidel and S.O.R methods - Conditions for convergence of them - Methods for accelerating convergence: Lyusternite's& Aitken's methods - Optimum acceleration parameter for S.O.R method.
.
Module 2 : One Dimensional Parabolic Equations
Explicit and Crank-Nicolson Schemes for - Weighted average approximation - Derivative boundary conditions - Truncation errors - Consistency, Stability and convergence - Lax Equivalence theorem

Module 3: Matrix Norms & Two Dimensional Parabolic Equation
Vector and matrix norms - Eigenvalues of a common tridiagonal matrix - Gerischgorin's theorems- Stability by matrix and Fourier-series methods - A.D.I. methods.

Module 4: Hyperbolic Equations
First order quasi-linear equations and characteristics - Numerical integration along a characteristic - Lax- Wendroff explicit method - Second order quasi-linear hyperbolic equation - Characteristics - Solution by the method of characteristics.

Module 5: Elliptic Equations
Solution of Laplace and Poisson equations in a rectangular region - Finite difference in Polar coordinate Formulas for derivatives near a curved boundary when using a square mesh - Discretisation error - Mixed Boundary value problems.

Text Books:

1. "Numerical Methods for Engineers", Chapra. S.C., and Canale.R.P., Tata McGraw Hill, 5 th Edition, New Delhi,2007.
2. "The Finite Difference Methods in Partial Differential Equations", Mitchel A.R. and Griffiths S.D.F., John Wiley and sons, New York,1980.

Reference Books:

1. "Numerical Solutions of Partial Differential Equations", Morton K.W., Mayers, D.F., Cambridge University Press, Cambridge,2002.
2. "Numerical Solution of P.D.E.",SmithG.D., Oxford University Press, New 2. York,1995.
3. "A first course in the Numerical Analysis of Differential Equations", Iserles A., Cambridge University press, New Delhi, 2010. xx t u u

E - Resources:

1. https://www.purplemath.com/modules/systlin1.htm
2. https://nptel.ac.in/courses/111/107/111107063/
3. https://www.researchgate.net/publication/227760098_Numerical_solution_of_two-dimensional_parabolic_equation_subject_to_nonstandard_boundary_specifications_using_the_pseudospectral_Legendre_method
4. https://link.springer.com/chapter/10.1007/978-3-662-09207-1_2
5. https://www.researchgate.net/publication/310744390_Numerical_Solutions_of_Elliptic_Partial_Differential_Equations_by_Using_Finite_Volume_Method

Course Outcomes:

On completion of the course, the students will be able to:

1. Know the knowledge of solving large number of algebraic linear equation.
2. Understand the knowledge of solving one dimensional parabolic equations by numerical methods
3. Recognize the knowledge of solving two dimensional parabolic equations by numerical methods.
4. Apply and understand the knowledge of solving hyperbolic equation by numerical methods.
5. Know the knowledge of solving elliptic equations by numerical methods.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">ADVANCED PHYSICS FOR ENGINEERS
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering.
2. To understand the importance of hologram.
3. To introduce the fundamental concepts of film deposition.
4. To make the students acquainted with the concepts of photonic crystals.
5. To understand the fundamental concepts of Solar cell Physics.

Module 1: Special Theory of Relativity

Introduction, Concept of theory of relativity, Frames of reference-Inertial, noinertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module 2: Holography

Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

Module 3: Thin films Synthesis

Introduction, Deposition techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

Module 4: Photonic Crystals

Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module-5: Solar cell Physics

Single, poly and amorphous silicon, GaAs, CdS, Cu_2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

Text Books:

1. “Engineering Physics” ,R K Gaur and SL Gupta, Dhanpat Rai Publications, 8th revised Edition, 2006.

2. “Engineering Physics”,B K Pandey and S Chaturvedi, Cengage Learning India, Revised Edition, 2014.

Reference Books:

1. “Hand Book of Technologies for Films and coating”,R F Bun shah, Noyes publishers,1st Edition, 1996.
2. “Fundamentals of Photonics”,B E A Saleh and A C Tech, John Wiley and Sons, New York, 1st Edition, 1993.

E - Resources:

1. http://physics.mq.edu.au/~jcresser/Phys378/LectureNotes/SpecialRelativityNotes. pdf
2. http://www.kfupm.edu.sa/centers/CENT/AnalyticsReports/KFUPM-TFSCDec20.pdf
3. https://www.journals.elsevier.com/solar-energy-materials-and-solar-cells
4. https://www.journals.elsevier.com/journal-of-alloys-and-compounds/
5. http://aip.scitation.org/journal/apl
6. http://nptel.ac.in/courses/115101011/
7. http://nptel.ac.in/courses/117103066/11.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Explain** special theory of relativity and apply its concepts in various fields of physics and engineering.
2. **Analyze** the basic concepts of Holography and applications.
3. **Identify** different concepts of film deposition.
4. **Develop** basic knowledge on the photonic crystals.
5. **Apply** the basic concepts of solar cell physics.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	3	1	1	-	1	1	-	-	-	-	-	-	1	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	1	-	3	2	2	-	-	-	-	-	2	-
Average	2.6	1.6	1	-	2	1.5	2	-	-	-	-	--	1.25	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Green Chemistry
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Acquire knowledge of issues in sustainability as they relate to business and industry internationally and nationally.
2. Examine and evaluate case studies of sustainable practices in business and industry.
3. Knowledge on Non-conventional energy sources.
4. Study the Green synthetic method.
5. Understand and analyse the interconnectivity of global concerns.

Module 1: Green Chemistry - An Overview:

Introduction: Definition, the twelve basic principles of green chemistry. Green synthetic methods.

Module 2: Materials for green chemistry and technology:

Catalysis, environmental friendly catalysts, Biocatalysis, biodegradable polymers, alternative solvents, ionic liquids.

Module 3: Nonconventional energy sources:

Thermo-chemical conversion; direct combustion, gasification, pyrolysis and liquefaction, Bioenergy, Bio photolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications.

.

Module 4: Green Synthetic Methods & Catalysis:

The design and development of environmentally friendly chemical pathways, Microwave synthesis, electro-organic synthesis, Supercritical fluids (SCFs): examples and properties, Extraction with SCFS.

Module-5: Green Chemistry & Sustainable development:

Green chemistry in batteries, production and recycling, Fuel cell and electric vehicles, Solar energy and hydrogen production, biodiesel, bio-hydrogen, Anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Best practices in Green Chemistry for sustainable development with suitable examples.

Text Books:

1. "Green Chemistry an Introductory Text", Lancaster, M., Royal Society of Chemistry, Cambridge, UK 2002.
2. "Real World Cases in Green Chemistry", Cann M.C.; Connelly, M.E. American Chemical Society: Washington DC. 2000.

Reference Books:

1. "Green Chemistry: Theory and Practice", Anastas, P.; Warner, J. Oxford University Press: London, 1998.
2. "The 12 Principles of Green Engineering as a Foundation for Sustainability" in Sustainability Science and Engineering: Principles. Zimmerman, J.B.; Anastas, P.T. Ed. Martin Abraham, Elsevier Science. available 2005.
3. "Design through the Twelve Principles of Green Engineering," Anastas, P.; Zimmerman, J. Environmental Science and Technology, 37, 94A - 101A, 2003.
4. "Green Chemistry Challenging Perspectives" ,Tundro, P.; Anastas, P., Oxford Press, Oxford, 2000.
5. "Introduction to Green Chemistry", Matlack, A.S., Marcel Dekker, Inc., New York, 2001.

E - Resources:

1. https://pubs.rsc.org/en/journals/journalissues/gc#!recentarticles&adv
2. https://www.sciencedirect.com/topics/chemistry/green-chemistry
3. https://www.intechopen.com/books/green-chemistry/introductory-chapter-principles-of-green-chemistry
4. https://www.sigmaaldrich.com/chemistry/greener-alternatives/green-chemistry.html
5. https://science.sciencemag.org/content/367/6476/397

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** of Green Chemistry & Green Eng. Principles.
2. **Know** the applications of green routes for synthesis of chemicals.
3. **Use** better awareness about global environmental concerns and green remedies to address these concerns.
4. **Appraise** about tenets of sustainable development and its integration with Green practices.
5. **Realise** about reflections of Green Chemistry on sustainable development initiatives.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	-	1	-	-	-	-	-	-	-	2	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	1	1	-	-	-	-	-	-	-	-	-	2	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	2	-	1	-	-	-	-	-	-	-	-	2	2	-
Average	1.6	1.2	1	1	-	-	-	-	-	-	-	1.2	1.25	-

AY 2020-21 onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B.Tech III Year – II Sem			
Course Code:		**L**	**T**	**P**	**D**
Credits: 3	**TECHNICAL WRITING SKILLS (COMMON TO ALL)**	**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:
The students will

1. Know the elements of effective writing
2. Understand the letter writing and resume writing
3. Classify the types and styles of report writing
4. Understand the proposal writings
5. Examine the research papers and research articles

Module-I Elements of Effective Writing
Introduction-Characteristics of Good Writing-words, phrases, sentences and developing effective paragraphs.

Module -II Academic Writing
Letter writing and Job Application: Introduction-types of letter writing-the seven C's of letter writing- significance- purpose-structure-layout-principles-planning a letter and cover letter.
Resume writing: Introduction-Resume design- parts of a Resume-Resume Styles and final tips.

Module -III Technical Report Writing
Introduction-importance of Reports-Objectives of Reports-Categories of Reports-Formats-prewriting-structures of reports-types of reports- short reports- long reports-research and writing the report-first draft-revising, editing, and proofreading.

Module -IV Technical Proposals
Introduction-definition and purpose-types-characteristics-structure of proposals-style and appearance-evaluation of proposals.

Module -V Writing Research Papers and Articles
Introduction-writing strategies-nature and significance-types of research papers and articles-journal articles-conference papers-review and research articles and elements of articles.

References:

1. Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.

2. Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.
3. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.
4. Cooper, Donald R. Pamela S Schindler. Business Research Methods. New Delhi: Tata McGraw-Hill, 2006.

E-Resources:

1. https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/

Course outcomes:

At the end of this course students will be able to

1. Use the characteristics of good writing like words, phrases, sentences and paragraphs.
2. Understand the role of letters and resumes getting jobs.
3. Utilize the report writing skills in business environment
4. Define the style, appearance, and evaluation of proposals.
5. Write the academic and research papers and articles

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	**2**	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Average	-	-	-	-	-	-	-	-	**2**	**3**	-	3	-	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">RESEARCH METHODOLOGY
(Open Elective - II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives: To Understand the
1. Concept / fundamentals of research and their types
2. Practical application of various research techniques
3. Importance of measurement techniques and sampling techniques
4. Importance of coding, editing, tabulation and analysis in doing research
5. Applying the concept of statistical analysis which includes various parametric test and non-parametric test and ANOVA technique and understand technique of report writing

Module 1:
Research— concepts – research methodology – approaches to business research – scientific methods – types of research – research design.

Module 2:
Formulation and planning of research - selection of research problem – literature review - setting of objectives - formulation of hypotheses – measurement of variables – research plan — conducting the research

Module 3:
Data collection– methods and techniques of primary data & secondary data – interviews – surveys – census and sample surveys – Editing, classification and codification of data – using computer packages.

Module 4:
Data Analysis – qualitative data analysis – descriptive quantitative data analysis – tests of measurement and quality – using computer packages

Module 5:
Writing and presenting the report—planning report writing —report format – footnotes and bibliography - references and citations presentation

Text Books:

1. Mathew David & Carole D. Sutton, Social Research: The Basics, Sage Publications, New Delhi
2. O.R. Krishnaswami, Methodology of Research in Social Sciences,

3. Mathew David & Carole D. Sutton, Social Research: The Basics, Sage Publications, New Delhi
4. O.R. Krishnaswami, Methodology of Research in Social Sciences, Himalaya Publishing House, Mumbai.
5. Ajai S. Gaur and Sanjaya S. Gaur: Statistical methods for practice and Research, Sage Publishers.
6. Deepak Chawla & Neena Sondhi, Research Methodology, Vikas Publishers, 2011

Reference Books:

1. Naval Bajpai, Business Research Methods, Pearson, 2013
2. CR Kothari, Research Methods and Techniques, New Age International, New Delhi.

E-Resources:

1. https://nptel.ac.in/courses/121/106/121106007/

Course outcomes:

Students should be able to

1. **Gain** Knowledge of concept / fundamentals for different types of research
2. **Apply** relevant research techniques
3. **Basics** of Research Methodology and Research Design
4. **Apply** Data Collection methods and the tools for analysis and interpretation
5. **Know** the importance of presentation of data analysis and report writing including referencing style.

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

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

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:
J41OA</td><td rowspan="2">WASTE MANAGEMENT
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. Study about handling of solid waste from cradle to grave.
2. Explain the design and construction of the solid waste treatment system.
3. Study the residue disposed of in an environmentally sound way.
4. Study the design and maintenance of different techniques
5. Discuss about waste minimization.

Module 1:
Unit-1 Introduction
Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes Municipal waste, industrial waste, plastic waste, electronic waste, bio-medical waste and hazardous waste - Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Module 2:
Unit 1: Functional Elements of Solid Waste Management
Waste generation and handling at source-onsite storage-Collection of solid wastes Collection methods and services-storage of solid waste- guidelines for collection route layout.

Module 3:
Unit 1: Transfer and Transport of Wastes
Transfer station-types of vehicles used for transportation of solid waste-Processing and segregation of the solid waste- various methods of material segregation. Processing and Transformation of Solid Wastes. Recycling and recovery principles of waste
Unit 2: Management- Composting: definition methods of composting-advantages of composting- Incineration: Definition, methods of Incineration, advantages and disadvantages of incineration.

Module 4:
Unit 1: Treatment and Disposal of Solid Waste
Volume reduction, Open dumping, land filling techniques, Landfills: Classification, Design and Operation of landfills, Land Farming, Deep well injection.

Module 5:

Unit 1: **Waste Minimization**

Introduction to waste minimization, waste minimization techniques-5R (refuse, reduce, reuse, recover, recycle), municipal waste minimization.

Text Books

1. “Integrated Solid Waste Management” by Tchobanognous, Theissen& Vigil
2. McGraw Hill Publication, 3rd Edition, 2014.
3. “Solid and hazardous waste management” by M.N.Rao and Razia sultana, BS publications.
4. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

Reference Books

1. Environmental engineering by Y.Anjaneyulu, B.Spublication.
2. Environmental Pollution Control Engineering by C.S. Rao; Wiley Eastern Ltd.,New Delhi.
3. Environmental engineering by Gerad Kiley, Tata Mc GrawHill

E-Resources

1. https://nptel.ac.in/courses/105/105/105105160/
2. https://nptel.ac.in/courses/105/106/105106056/
3. https://nptel.ac.in/courses/105/103/105103205/

Course Outcomes

On completion of the course, the students will be able to:

1. **Recall** the components of solid waste management and the laws governing it
2. **Discuss** design, operation and maintenance of landfills, incinerators and composting units.
3. **Explain** the waste minimization.
4. **Discuss** the Reuse of materials as practicable.
5. **Discuss** about Recycle of waste that cannot be used and recovery of resourc

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	2	2	3	-	-	-	-	2	1
CO2	-	3	3	-	-	-	2	1	-	-	-	-	2	1
CO3	-	-	-	-	-	2	3	2	-	-	-	-	1	1
CO4	-	-	-	-	-	2	3	2	-	-	-	-	2	2
CO5	-	1	-	-	-	3	2	1	-	-	-	-	2	2
Average	-	0.6	0.6	-	-	1.8	1.2	1.8	-	-	-	-	1.8	1.4

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OB</td><td rowspan="2">ROAD SAFETY ENGINEERING
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the Fundamentals of Traffic Engineering
2. Explain the Accident Situations
3. Discuss Statistical measures of accident data
4. Explain different parameters responsible for providing road safety
5. Study about Accident prevention.

Module 1:

Unit-1: Fundamentals of Traffic Engineering

Road User Characteristics, Vehicular Characteristics, Applications of Traffic Control Devices, Traffic signs, Road Marking,

Module 2:

Unit-1: Introduction to Road Safety:

Accident Situation in India, International Comparison of Accident Data, Standard Definitions by IRC, Collection of Accident Data, Collision and Condition Diagrams,

Module 3:

Unit-1: Statistical Methods and Analysis of Accident Data:

Methods in Analysis of accident Data, Regression Method, Poisson Distribution, Chi-Squared Distribution, Statistical Comparisons, Black Spot Identification & Investigations,

Module 4:

Unit-1: Road & its Effect on Accidents:

Factors Causing Accidents, Skidding, Factors Determining Skid Resistance, Pedestrian Safety, Measures to Increase Pedestrian Safety, Safety Improvement Strategies, Case Studies

Module 5:

Unit-1: Mitigation Measures:

Accident prevention by better planning, Accident prevention by Better design of roads, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety.

Text Books:

1. "Transport planning and Traffic Engineering" by Dr. L. R. Kadiyali, Khanna Publications 9th Edition (2017
2. 'Principles of Transportation Engineering'' by Partha Chakroborty &Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).

Reference Books:

1. Fundamentals of Traffic Engineering, Richardo G Sigua
2. Road Safety by NCHRP.

E-Resources:

1. https://nptel.ac.in/courses/105/101/105101087/

Course Outcomes:

On completion of the course, students will be able to:

1. **Explain** the Traffic characteristics
2. **Analyze** Collision and Condition Diagrams.
3. **Analyze** Statistical Methods for accident data
4. **Describe** Road & its Effect on Accidents
5. **Explain** Accident preventions.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO2	1	1	1	-	-	3	2	-	-	-	-	-	2	2
CO3	1	1	1	-	-	3	1	-	-	2	-	2	1	1
CO4	1	1	1	-	-	2	-	-	-	-	-	2	1	2
CO5	1	1	1	-	-	2	-	-	-	-	-	2	1	1
Average	1	1	1	-	-	2	0.6	-	-	0.4	-	1.2	1.2	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OC</td><td rowspan="2">ELECTRICAL ENGINEERING MATERIALS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical and Electronics Engineering

Course Objectives:

The students will

1. To understand the importance of various materials used in electrical engineering.
2. To obtain a qualitative analysis of their behaviour and applications.
3. To understand Conducting and resistor materials, and their engineering application.
4. To understand Semiconducting materials, their properties and applications.
5. To understand Magnetic materials, Soft and hard magnetic materials and applications; Superconductors

MODULE - I

Unit-I: Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics.

Unit-II: Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyro electric materials.

MODULE – II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

MODULE – III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

MODULE – IV

Unit-I:Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials.

Unit-I: Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

MODULE – V

Unit-I: Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials.

Unit-II: Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

TEXT BOOKS:

1. "R K Rajput", "A course in Electrical Engineering Materials", Laxmi Publications, 2009.
2. "T K Basak", "A course in Electrical Engineering Materials", New Age Science Publications 2009.

REFERENCE BOOKS:

1. TTTI Madras, "Electrical Engineering Materials", McGraw Hill Education, 2004.
2. "AdrianusJ.Dekker", Electrical Engineering Materials, PHI Publication, 2006.
3. S. P. Seth, P. V. Gupta "A course in Electrical Engineering Materials", Dhanpat Rai & Sons, 2011.

E - Resources:

1. https://nptel.ac.in/courses/112/108/112108150/

Course Outcomes:

After completion of this course, the student will be able to

1. **Understand** various types of dielectric materials, their properties in various conditions.
2. **Evaluate** magnetic materials and their behaviour.
3. **Evaluate** semiconductor materials and technologies.
4. **Acquire** Knowledge on Materials used in electrical engineering and applications
5. **Acquire** Knowledge on Smart materials: Sensors and actuators, piezoelectric, magnetostrictive and electrostrictive materials.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	2	3	-	-	-	-	3	-	3
CO2	2	3	3	-	-	-	2	-	-	-	-	2	-	3
CO3	2	3	3	-	-	-	2	-	-	-	-	2	-	2
CO4	2	2	2	-	-	-	2	-	-	-	-	3	-	3
CO5	3	2	2	-	-	-	2	-	-	-	-	2	-	3
Average	2.4	2.5	2.5	-	-	2	2.2	-	-	-	-	2.4	-	2.8

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OD</td><td rowspan="2">NON-CONVENTIONAL ENERGY SOURCES
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

The students will

1. elucidate the fundamentals of various sources of Non-Conventional Energy such as Wind, Solar, Biomass, Geo thermal and other renewable energy sources.
2. impart a thorough knowledge about the application of different types of Non-Conventional Energy systems.
3. inculcate the students on feasibility and limitations of various Non-Conventional Energy Systems.
4. Analyze the principle and operation of direct energy conversion.
5. Apply the renewable energy sources to real world electrical and electronics problems.

MODULE –I: WIND ENERGY

Unit-I: Introduction to energy sources-Renewable and non-renewable energy sources –energy consumption as a measure of Nation's development – Strategy for meeting the future energy requirement – Global and national level energy scenarios –Prospects of renewable energy sources.

Unit-II: Basic principles of wind energy conversion –site selection consideration – types of wind mills – basic components of wind energy conversion systems (WECS) – types of WECS – applications of wind energy – safety system – environmental aspects.

MODULE –II: SOLAR ENERGY

Solar radiation - Physical principles of conversion of solar radiation into heat –Solar constant – Solar energy collectors - flat plate collector – collector efficiency – concentrating collector: focusing type – advantages of focusing collectors – cylindrical parabolic concentrating collector – selective absorber coatings – central receiver tower solar power plant – solar energy storage systems –types – solar driers – solar water heaters - principle of solar photo voltaic cell – solar photo voltaic power generation – MPPT (Maximum Power Point Tracking) – solar pump – solar hydrogen energy.

MODULE –III: ENERGY FROM BIO-MASS

Bio mass conversion technologies - Bio gas generation principle – types of bio- gas plants – applications of bio-gas plants – bio-mass as a source of energy – energy plantation – thermal gasification of bio mass – energy from agricultural waste – agro thermal power plant – Bio gas-based cogeneration programme – integrated waste management – advantages and disadvantages.

MODULE –IV: GEO-THERMAL AND OCEAN ENERGY

Unit-I: Nature of geo-thermal energy – geo-thermal sources – prime movers for geo- thermal energy conversion – advantages and disadvantages of geo-thermal energy –application of geo-thermal energy.

Unit-II: Principle of ocean thermal energy conversion (OTEC) – open cycle OTEC system – closed cycle – hybrid cycle – prospects of OTEC in India -applications – basic principle and components of tidal power plant – single basin and double basin tidal power plants -site requirements – storage –advantages and limitations of tidal power generation – ocean wave energy conversion devices.

MODULE –V: OTHER ENERGY SOURCES

Unit-I: Basic principle and components of a fuel cell – types of fuel cell –conversion efficiency of fuel cell - advantages and disadvantages of fuel cell – conversion energy and application of fuel cell – basic battery theory – batteries applied for bulk energy storage. **Unit-II:** Hydrogen fuel – hydrogen production – methods - storage – transportation and utilization – hydrogen as alternative fuel for motor vehicle – safety management.

TEXT BOOKS:

1. Rai, G.D., 'Non-Conventional Energy Sources', Khanna Publishers, New Delhi, 4th Edition, 2004.
2. Gupta, B.R., 'Generation of Electrical Energy', S.Chand & Co. Ltd, New Delhi, 5th Edition, 2014.

REFERENCE BOOKS:

1. Agarwal, M.P., 'Future Sources of Electrical Power', S.Chand & Co. Ltd, New Delhi, 1999.
2. Hassan and D.K. Sharma 'Non-Conventional Energy Resources, S.K. Kataria and Sons Ltd, 2009
3. S.P. Sukhatme, 'Solar Energy: Principles of Thermal Collection and Storage,' Tata McGraw Hill, 2015.
4. B.K. Bansal 'Non-Conventional Energy Resources' Vikas Publishing Ltd, 2014.

E - Resources:

1. https://nptel.ac.in/courses/121/106/121106014/
2. http://ethesis.nitrkl.ac.in/218/1/Thesis.pdf

Course Outcomes:

The student will be able to

1. **Understand** the need of utilization of alternate energyresources &fundamentals of various non-conventional energy Systems.

2. **Analyse** the knowledge of Biomass and Geothermal energy sources
3. **Describe** the collection of solar energy, storage of solar energy and its applications.
4. **Illustrate** the potential of Wind and bio mass as a renewable source.
5. **Understand** the potential of geothermal energy and ocean energy as a renewable source.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	2	3	-	-	-	-	3	-	3
CO2	2	3	3	-	-	-	2	-	-	-	-	2	-	3
CO3	2	3	3	-	-	-	2	-	-	-	-	2	-	2
CO4	2	2	2	-	-	-	2	-	-	-	-	3	-	3
CO5	3	2	2	-	-	-	2	-	-	-	-	2	-	3
Average	**2.4**	**2.5**	**2.5**	**-**	**-**	**2**	**2.2**	**-**	**-**	**-**	**-**	**2.4**	**-**	**2.8**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech:
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OE</td><td colspan="4" rowspan="2">BASICS OF ROBOTICS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mathematics

Course Objectives:
This course will enable students to:
1. Understand the theoretical aspects of Robotics
2. Acquire practical experience in the field of Robotics through design projects and case studies.
3. Understand the importance of robots in various fields of engineering.
4. Understand trajectory planning and types of motion
5. Expose to various robots and their operational details.

Module 1:
Unit 1: Introduction: Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator.

Unit 2: Components of Industrial robotics - precession of movement - resolution, accuracy & repeatability – Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

Module 2:
Unit 1: Grippers - Mechanical Gripper-Grasping force – Engelberger-g-factors-mechanisms for actuation, Magnetic gripper, vacuum cup gripper-considerations in gripper selection &design. Industrial robots specifications. Selection based on the Application.

Module 3:
Unit 1: Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots

Module 4:
Unit 1: Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme. Control- Interaction control, Rigid Body mechanics, Control architecture- position, path velocity, and force control systems,

computed torque control, adaptive control, and Servo system for robot control.

Module 5:

Unit 1: Programming of Robots and Vision System-Lead through programming methods- Teach pendent- overview of various textual programming languages like VAL etc.

Unit 2: Introduction to Mobile Robots: A brief history of mobile robotics, applications and market. Recent advances in the mobile robotics for RISE (Risky Intervention and Surveillance Environment) applications.

Text Books:

1. Industrial Robotics / Groover M P /Mc Graw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

Reference Books:

1. Theory of Applied Robotics /Jazar/Springer.H. Asada and J. J. E. Slotine, “Robot Analysis and Intelligence”, Wiley Inter-Science. 1986
2. Robotics / Ghosal / Oxford

E - Resources:

1. https://rb.gy/dw0rkv
2. https://rb.gy/iayh9d
3. https://nptel.ac.in/courses/112/105/112105249/
4. https://nptel.ac.in/courses/112/101/112101098/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Apply** the basic components of robots.
2. **Differentiate** types of robots and robot grippers.
3. **Model** forward and inverse kinematics of robot manipulators.
4. **Analyze** forces in links and joints of a robot.
5. **Programme** a robot to perform tasks in differential applications.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	2	2	-	-	-	-	-	-	2		
CO2	3	3	2	2	2	-	-	-	-	-	-	1		
CO3	3	2	2	2	2	-	-	-	-	-	-	1		
CO4	3	2	2	1	1	-	-	-	-	-	-	2		
CO5	1	2	1	2	2	-	-	-	-	-	-	2		
Average	2.6	2	1.8	1.8	1.8	-	-	-	-	-	-	1.6		

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OG</td><td rowspan="2">DIGITAL SYSTEMS USING VHDL
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

Course Objectives:
The students will

1. Learn how a Hardware Description Language (HDL) is used to describe and implement hardware.
2. Learn how to simulate and test that hardware and optimise their designs.
3. Learn in-depth study of combinatorial and sequential hardware systems and the use of finite state machines in the design of sequential systems.
4. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
5. To implement combinational and sequential circuits using VHDL.

Module 1
Unit I
Review of Logic Design Fundamentals: Combinational Logic, Boolean Algebra and Algebraic Simplification, Karnaugh maps, Designing with NAND and NOR Gates, Hazards in Combinational Networks, Flip-flops and latches, Mealy Sequential Network, Equivalent States and reduction of State Tables, Sequential Network Timing, Setup and Hold Times, Synchronous Design, Tristate Logic and Buses.

Module 2
Unit I
Introduction to VHDL: VHDL Description of Combinational Networks, Modeling Flip-flops using VHDL Process, VHDL Models for a Multiplexer, Compilation and Simulation of VHDL Code, Modeling a Sequential Machine, Variables, Signals and Constants, Arrays, operators, Functions, Procedures, Packages and Libraries, VHDL Model for a 74163 Counter.

Module 3
Unit I
Designing with Programmable Logic Devices: Read-Only Memories, Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs) , Other Sequential Programmable Logic devices(PLDs),Design of a Keypad Scanner.

Unit II

Design of Networks for Arithmetic Operations: Design of a Serial Adder with Accumulator, State Graphs for Control Networks, Design of a Binary Multiplier, Multiplication of Signed Binary Numbers, Design of a Binary Divider.

Module 4

Unit I

Digital Design with SM Charts: State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative Realizations for SM Charts using Microprogramming, Linked State Machine.

Unit II

Designing with Programmable gate Arrays and Complex Programmable Logic Devices: Xilinx 3000 Series FPGAs, Designing with FPGAs, Xilinx 4000 Series FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices(CPLDs),Altera FLEX 10K Series CPLDs

Module 5

Unit I

Floating-Point Arithmetic: Representation of Floating-Point Numbers, Floating-point Multiplication, Other Floating-Point Operations.

Unit II

Hardware Testing and Design for Testability: Testing Combinational Logic, Testing Sequential Logic, Scan Testing, Boundary Scan, Build-In Self-Test**.**

Text Books:

1. Charles H,Roth ,"Digital system design using VHDL" , 2nd Edition, PWS publishing co.
2. ZainalabedinNavabi, "VHDL analysis and modeling of digital systems",2nd Edition, MGH, 2004.

References Books:

1. Stphen Brown, "Fundamental of Digital logic with VHDL Design", Tata McGraw Hill, 2008.
2. J.Bhaskar ,"A VHDL primer",3rd edition 2004, Prentice Hall of India Limited.
3. Michael D.Ciletti, "Advanced Digital design with Verilog HDL", 2nd Edition, PHI Ltd, 2005.

E - Resources:

1. https://nptel.ac.in/courses/111/102/111102111/

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1. **develop** a digital logic and apply it to solve real life problems.
2. **practice** combinational and sequential digital circuits using different styles of modeling of VHDL.
3. **analyze**, design and implement sequential logic circuits.

4. **employ** digital system design using PLD.
5. **simulate and implement** combinational and sequential circuits using VHDL systems.

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

<table>
<tr><td rowspan="1">AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:
J41OH</td><td rowspan="2">MATLAB PROGRAMING LANGUAGE
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

Course Objectives:

The students will

1. To understand the basic principles of programming and of implementing mathematical concepts in MATLAB.
2. To write numerical algorithms with MATLAB Programming language.
3. To evaluate the computational results using graphical representations.
4. To gain knowledge about advanced MATLAB Programming methods.
5. To gain knowledge on Simulink used in MATLAB.

Module-1

Unit-I: Introduction to MATLAB

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).

Unit-2

Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

Module-2

Unit-I: **Data Flow in MATLAB**

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

Module-3

Unit-I: MATLAB Programming

Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Module-4

Unit-I: **MATLAB Advanced**

Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface).
Matlab- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Module-5

Unit-1: SIMULINK

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

TEXT BOOKS:

1. Getting Started WithMatlab: A Quick Introduction For Scientists And Engineers (English) by Rudra Pratap, OXFORD University Press.
2. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication.

REFERENCE BOOKS:

1. MATLAB® Programming For Engineers, Fourth edition by Stephen J. Chapman.
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang ,Wenwu Cao, Tae-Sang Chung, John Morris.

Course Outcomes:

By the end of this course, the student will be able to

1. **translate** mathematical methods to MATLAB code.
2. **generalize** results and represent data visually.
3. **apply** computer methods for solving a wide range of engineering problems.
4. **utilize** computer skills to enhance learning and performance in other engineering and science courses.
5. **acquire** knowledge of Advanced Matlab programming methods and Simulink.

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OI</td><td rowspan="2">INTRODUCTION TO PYTHON PROGRAMMING
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

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

Course objectives:

The Student will:

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

Module:1

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

Module 2:

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

Dictionaries

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

Tuples

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

Module 3:

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

Module 4:

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

Module 5:

Files handling and Exceptions: Text files, writing variables, Directories, Pickling. Exceptions: raising exceptions, handling exceptions, exception hierarchy.

Text Books:

1. Python Object Oriented Programming, Dusty Phillips, Packet Publishing, 2010.
2. Programming in Python 3 - A complete Introduction to the Python Language- Second Edition, Mark Summerfields, Addison-Wesley 2010.

Reference Books:

1. Programming Python- 4th Edition, Mark Lutz, O'Reilly, 2011.
2. Object-Oriented Programming in Python, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

E - Resources:

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

Course Outcomes:

The students will be able to

1. Describe to design and program Python applications.
2. Analyse and conversion of to use lists, tuples, and dictionaries in Python programs.
3. Explain the concept to identify Python object types, Components, decision statements, pass arguments in Python.
4. Apply decision for building and package Python modules for reusability, design object-oriented programs with Python classes, use class inheritance in Python for reusability.

5. Apply file handling and Exception handling Concepts in real world using python.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	1	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	3	-	-	-	-	-	-	-	-	1	2
CO4	3	2	1	2	-	-	-	-	-	-	-	-	-	3
CO5	3	2	2	2	-	-	-	-	-	-	-	-	-	3
Average	**3.0**	**2.0**	**1.8**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**2.4**

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OJ</td><td rowspan="2">INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Basic Knowledge on Data base

Course objectives:
The Student will:

1. Evaluate a User Interface for a mobile application using J2ME.
2. Create a small but realistic working mobile application for small computing devices.
3. Categories the challenges posed by developing mobile applications and be able to propose and evaluate and select appropriate solutions.
4. Differentiate between high and low level display screens.
5. Familiar with record management systems.

Module 1:
J2ME Overview: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices
Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants

Module 2:
J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MiDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MlDlets in a MIDlet Suite,J2MEWirelessToolkit J2ME Best Practices and Patterns: The Reality of Working in a J2ME World, Best Practices

Module 3:
Commands, Items, and Event Processing: J2ME User Interfaces, Display Class, The Palm OS Emulator, Command Class, Item Class, Exception Handling.

Module 4:
High-Level Display Screens: Screen Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class. Low-Level Display Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

Module 5:
Record Management System- Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener.

Text Books:

1. J2ME: The Complete Reference, James Keogh, Tata McGrawHjll.
2. Programming for Mobile and Remote Computers, G.T.Thampi, drearntec press.

Reference Books:

1. Enterprise J2ME: Developing Mobile Java Applications — Michael Juntao Yuan, Pearson Education, 2004
2. Beginning Java ME Plafform, Ray Rischpater, Apress, 2009
3. Beginning J2ME: From Novice to Professional, Third Edition, Sing Li, Jonathan B. Knudsen, Apress, 2005
4. Kicking Butt with MIDP and MSA:C,eating Great Mobile Applications, I edition, J.Knudsen, Pearson.

E - Resources:

1. https://www.smartzworld.com/notes/mobile-application-development-notes-pdf-mad-pdf-notes/
2. https://www.slideshare.net/ChromeInfotech/mobile-application-development-process
3. https://nptel.ac.in/courses/106/106/106106156/
4. http://w1236xz.website/j2ee-the-complete-reference-tata-mcgraw-hill pdf

Course outcomes:

The students will be able to

1. **Implement** a User Interface for a mobile application using J2ME.
2. **Design** a small but realistic working mobile application for small computing devices.
3. **Classify** the challenges posed by developing mobile applications and be able to propose and evaluate and select appropriate solutions.
4. **Classify** between high and low level display screens.
5. **Apply** the concepts on record management systems.

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

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

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OK</td><td rowspan="2">FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING THROUGH C++
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Fundamental Knowledge of Programming in C.

Course Objectives:

The students will

1. Be able to explain the difference between object-oriented programming and procedural programming.
2. Be able to program using more advanced C++ features such as composition of objects, operator overloads, inheritance
3. Be able to build C++ classes using appropriate encapsulation and design principles.
4. Improve problem solving skills.
5. Be able to apply object oriented or non-object-oriented techniques to solve bigger computing problems

Module I: Introduction

Unit 1:

What is object-oriented programming? Why do we need object oriented Programming characteristics of object-oriented languages

Unit 2:

C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions.

Module II: Functions and Pointers

Unit 1:

Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.

Unit 2:

Addresses and pointers. The address of operator and pointer and arrays. Pointer and action pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers.

Module III: Classes and Objects

Unit 1:

Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor.

Unit 2: Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const. and classes.

Module IV: Arrays and Strings

Unit 1:

Arrays and string arrays fundamentals. Arrays as class Member Data : Arrays of object, string, The standard C++ String class

Unit 2:

Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.

Module V: Inheritance

Unit 1:

Concept of inheritance. Derived class and based class. Derived class constructors, member function, class hierarchies.

Unit 2:

Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.

Text Books:

1. Object Oriented Programming with C++ by E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education.

Reference Books:

1. C++ and Object-Oriented Programming – Jana, PHI Learning.
2. Object Oriented Programming with C++ - Rajiv Sahay, Oxford

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105151/

Course Outcomes:

The students will be able to

1. Articulate the principles of object-oriented problem solving and programming.
2. Outline the essential features and elements of the C++ programming language.
3. Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading.
4. Program with basic data structures using array.
5. Analyze, write, debug, and test basic C++ codes using the approaches introduced in the course.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart **3/2/1 indicates the strength of the calculation** **3-Strong, 2-Medium, 1-Low**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	3	-	2	-	-	-	-	-	-	-	2	2
CO2	1	2	3	-	2	-	-	-	-	-	-	-	2	2
CO3	-	2	2	-	1	-	-	-	-	-	-	-	1	1
CO4	2	1	2	-	1	-	-	-	-	-	-	-	1	1
CO5	1	2	1	-	2	-	-	-	-	-	-	-	2	1
Average	1.2	1.6	2.2	-	1.6	-	-	-	-	-	-	-	1.6	1.4

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem.</td></tr>
<tr><td>Course Code:
J41OL</td><td rowspan="2">FUNDAMENTALS OF
DATA SCIENCE
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Good mathematical background and programming skills.

Course Objectives:
The students will

1. To explain how math and information sciences can contribute to building better algorithms and software.
2. To develop fundamental knowledge of concepts underlying data science projects.
3. To develop applied experience with data science software, programming, applications and processes.
4. To develop practical data analysis skills, which can be applied to practical problems.
5. To develop practical skills needed in modern analytics.

Module 1: Introduction to Data Science
What is Data Science? - Big Data VS Data Science, Datafication, Current landscape of perspectives and Skill sets needed.

Module 2: Statistics in Data Science
Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model.

Module 3: Exploratory Data Analysis
Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process.

Module 4: Liner Regression for Data Science
Simple Linear Regression, Multiple Linear Regression, other Considerations in the Regression Model,

Module 5: Classification
An Overview of Classification, Why Not Linear Regression?, Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods.

Text Books:

1. Practical Data Science with R”. Nina Zumel, John Mount. Manning, 2014.

Reference Books:

1. Data Science for business", F. Provost, T Fawcett, 2013.

E-Resources:

1. https://www2.cs.duke.edu/courses/compsci190/fall18

Course Outcomes:

1. **Know** basic notions and definitions in data analysis.
2. **Know** standard methods of data analysis
3. **Understand** and Apply Statistical Methods for Data Analysis.
4. **formulate** the problem of knowledge extraction.
5. **translate** a real-world problem into mathematical terms.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	1									2	1
CO2	1	2	2	1									1	2
CO3	2	2	2	2									1	1
CO4	2	2	2	2									2	2
CO5	1	2	2	2									2	1
Average	1.6	2	1.8	1.6									1.6	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem.</td></tr>
<tr><td>Course Code: J41OM</td><td rowspan="2">INTRODUCTION TO NEURAL NETWORKS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nill

Course Objectives:
The students will

1. Understand the differences and similarities neural network, human brain and feedback systems
2. Learn the different learning techniques
3. Familiar with the concept of single layer perceptron and its algorithms.
4. Familiar with the concept of multilayer perceptron and its algorithms
5. Know the self-organization mapping techniques.

Module 1:
Unit 1: Introduction: What is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs.
Unit 2 : Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

Module 2:
Unit 1: Learning Process: Error Correction learning, Memory based learning, Hebbian learning, Competitive.
Unit 2 : Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

Module 3:
Unit 1: Single layer perceptron's: Adaptive filtering problem, Unconstrained Optimization Techniques, Linear least square filters, least mean square algorithm, learning curves.
Unit 2 : Learning rate annealing techniques, perception-convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment.

Module 4:
Unit 1 : Multilayer Perceptron's: Back propagation algorithm XOR problem.
Unit 2 : Heuristics, Output representation and decision rule, computer experiment, feature detection

Module 5:
Unit 1: Self –Organization Maps: Two basic feature mapping models, Self-Organization maps, SOM algorithm.

Unit 2: Hopfield models: Hopfield models, computer experiment.

Text Books:

1. Neural networks A comprehensive foundation, Simon Hhaykin, PHI edition.
2. Artificial neural networks-B.Vegnanarayana Prentice Halll of India P Ltd 2005.

Reference Books:

1. Neural networks in Computer intelligence, Li Min Fu TMH 2003.
2. Neural networks James A Freeman David M S kapurapearson education 2004.

E-Resources:

1. https://towardsai.net/p/machine-learning/main-types-of-neural-networks-and-its-applications-tutorial-734480d7ec8e
2. http://neuralnetworksanddeeplearning.com/index.html
3. http://neuralnetworksanddeeplearning.com/chap2.html
4. http://neuralnetworksanddeeplearning.com/chap3.html
5. http://neuralnetworksanddeeplearning.com/chap4.html
6. http://neuralnetworksanddeeplearning.com/chap5.html
7. http://neuralnetworksanddeeplearning.com/chap6.html
8. http://neuralnetworksanddeeplearning.com/chap1.html

Course Outcomes:

Students will be able to:

1. **Know** differences and similarities between neural network, human brain and feedback systems
2. **Get** the knowledge of different learning techniques
3. **Describe** the concept of single layer perceptron and its algorithms.
4. **Describe** the concept of multilayer perceptron and its algorithms.
5. **Analyse** the self-organisation mapping techniques.

<table>
<tr><th colspan="15">CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak</th></tr>
<tr><th rowspan="2">Course Outcomes (COs)</th><th colspan="12">Program Outcomes (POs)</th><th colspan="2">Program Specific Outcomes*</th></tr>
<tr><th>PO 1</th><th>PO 2</th><th>PO 3</th><th>PO 4</th><th>PO 5</th><th>PO 6</th><th>PO 7</th><th>PO 8</th><th>PO 9</th><th>PO 10</th><th>PO 11</th><th>PO 12</th><th>PSO 1</th><th>PSO 2</th></tr>
<tr><td>CO1</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>CO2</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>CO3</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>CO4</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>CO5</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Average</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem.</td></tr>
<tr><td>Course Code: J41ON</td><td rowspan="2">IC APPLICATIONS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Electronic devices and circuits, Switching Theory & Logic Design, Pulse & Digital Circuits.

Course Objectives:
Students will learn to

1. Introduce the basic building blocks of linear integrated circuits.
2. Teach the linear and non – linear applications of operational amplifiers.
3. Introduce the theory and applications of analog multipliers and PLL.
4. Introduce the concepts of waveform generation and introduce some special function ICs.
5. Understand and implement the working of basic digital circuits

Module 1:
Unit 1: Introduction to Linear Integrated Circuits
Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential
Unit 2: Non-Linear Applications of OP-AMP
Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Module 2:
Unit 1: Introduction to IC-555 Applications
Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer -Functional Diagram, Monostable, and Astable Operations, Applications.
Unit 2: Timer and Phase Locked Loops(PLL)
Applications
IC565 PLL – Block Schematic, Description of Individual Blocks, Applications.

Module 3:
Unit 1: Converters of DAC
Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC

Unit 2: Converters of ADC

Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Module 4:

Unit 1: Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications and Applications of TTL-74XX

Unit 2: Applications of Digital ICs

Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators

Module 5:

Unit 1: Combinational Circuits Using TTL 74XX ICS

Familiarity with commonly available 74XX &
CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Unit 2: Memories

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static& Dynamic RAMs.

Text Books:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILLEDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E-Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20 Notes.pdf.
3. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20L DIC(Linear%20 and%20Digital%20IC%20Applications).pdf

4. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Course Outcomes:

Students will be able to

1. **Understanding** of operational amplifiers with linear integrated circuits.
2. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
3. **Analyse** the functioning of various design circuits using operational amplifiers for various applications.
4. **Design** various techniques to develop a/d and d/a convertors.
5. **Acquire** hands-on laboratory experience on ic based project kits in above areas according to specifications.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	3	3
CO3	1	2	2	-	-	-	-	-	-	-	-	-	1	2
CO4	1	2	1	-	2	-	-	-	-	-	-	1	1	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	3
Average	1.6	2	1.7	-	2	-	-	-	-	-	-	1	1.75	2.5

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech.
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OP</td><td rowspan="2">INTRODUCTION TO GEOLOGY
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
1. To introduce rock types and their physical properties
2. To acquaint with different structures occurring in rocks
3. To get idea about Ground water, and aquifers
4. To get idea about coal formation and its stages.
5. To know about minerals occurring in India.

Module 1
Unit - 1: Introduction, Definitions, Importance of geology in mining, Types of rocks, Physical properties of rocks.

Module 2
Unit - 1: Structural Geology: Definition, terminology, and Primary and secondary structures: Bedding, lineation, foliation, cleavage, Strike and dip.
Unit - 2: Definition of faults, folds and joints and their types, Unconformities and its kinds.

Module 3
Unit - 1: Ground Water: Introduction, Hydrological Cycle, origin and occurrence of groundwater, water table.
Unit - 2: Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers.

Module 4
Unit - 1: Coal: Stages of formation, composition, theories of formation of coal.

Module 5
Unit - 1: Occurrence and distribution of important metallic mineral deposits in India: Iron, Copper, Lead, Zinc, Manganese, Aluminum, Chromium.
Unit - 2: Occurrence and distribution of important non-metallic mineral deposits in India: Asbestos, Kyanite, Sillimanite.

Textbooks:
1. Structural Geology – Billings, M.P. Prentice Hall.
2. Engineering geology –by Dr. Chennkeshavulu.

Reference Books:

1. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.

E-resources:

1. http://www.publiclandsforthepeople.org/wp-content/uploads/2015/06/Introduction-to-Geology-and-Hard-Rock-Mining-2015.pdf
2. https://www.eolss.net/Sample-Chapters/C01/E6-15-08-03.pdf
3. https://pubs.usgs.gov/of/2001/0151/pdf/of01-151.pdf
4. https://digitalworks.union.edu/cgi/viewcontent.cgi?article=1008&context=ajes

Course Outcomes:

The student will be able to:

1. **Understand** about rocks and their properties
2. **Learn** about different structures occurring in rocks
3. **Understand** about ground water, water table and aquifers
4. **Learn** about coal and its formation theories
5. **Distinguish** metallic and non-metallic minerals.

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

<table>
<tr><td>AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">INTEGRAL TRANSFORMS AND INTEGRAL EQUATIONS
(Common to CE, EEE, ECE, ME, CSE, IT, ECM & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Differential Equations

Course Objectives:
The students will

1. approximation of real-valued periodic functions to suitably restricted non-periodic functions f(x) defined for all real numbers
2. how to use Laplace transform methods to solve ordinary and partial differential equations
3. make them familiar with the methods of solving differential equations, partial differential equations.
4. the properties of Z-Transform and associating the knowledge of properties of ROC in response to different operations on discrete signals.
5. discretization techniques to find approximate solutions of differential equations different types of errors involved in such solutions, their measures and practical applications.

MODULE-I: Applications of Differential Equations
Basic introduction of the course using precise examples like periodic functions, signal propagation, solving mathematical models corresponding to Electrical Circuits.

MODULE-II: Laplace Transforms
UNIT-I: Laplace Transform (LT) – definition – linearity property of LT. Existence Theorem – First and Second Translation theorems. Change of scale property, LT of derivatives, multiplication by t and division by t – Initial and Final Value theorems.

UNIT-II: Inverse Laplace Transforms: definition – standard forms. First and Second shifting theorems. Change of scale property – Use of partial fractions, Inverse transforms of derivatives, Inverse Laplace Transform of integrals – definition of convolution – Convolution theorem

MODULE–III : Fourier Transforms
Fourier Transforms – Fourier integral formula, Inverse Theorem for Fourier Transform; Fourier Sine Transform, Inverse formula for Fourier Sine Transform; Fourier Cosine Transform, Inverse formula for Fourier Cosine Transform; linearity property, change of scale property, shifting property.

MODULE–IV : Z-Transforms
Definition and properties of Z-Transform, Standard functions of Z-Transform, Unit step

Function. Unit Impulse function, Initial value Theorem and Final value Theorem, Inverse Z-Transform, Partial fraction method, Difference Equation using Z-Transforms.

MODULE-V: Henkel Transforms

Henkel Transforms- Henkel Transform of the derivatives of a function.- Application of Henkel Transforms in boundary value problems.

TEXT BOOKS:

1. A.R.Vashista, Dr. R.K.Gupta, Integral transforms - Krishna Prakasham Mandir urray
2. .R.Spiegel, Theory and problems of Laplace transforms - Shamus Outline Series Tata Mac Grawhill

REFERENCES:

1. Brian Daries, Integral Transforms & their applications - Springers
2. L Debnath, D Bhatta, Integral Transforms & their Applications – Chapman & Hall/CRC
3. Chorafas, Integral Transforms & their Applications

E-RESOURCES

1. https://nptel.ac.in/content/storage2/courses/112104158/lecture8.pdf
2. https://tutorial.math.lamar.edu/classes/de/inversetransforms.aspx
3. http://www.thefouriertransform.com/
4. http://dsp-book.narod.ru/TAH/ch06.pdf
5. https://www.henkel-adhesives.com/in/en.html

Course outcomes:

At the end of this course students will be able to

1. understand the concepts of integral transforms
2. Determine Laplace transform of a function and understand the fundamental properties and apply Laplace transform in solving ODEs.
3. Determine Fourier and inverse Fourier transform of a function and understand the fundamental properties and apply Fourier transform in solving ODEs.
4. apply the Z transform techniques to solve second-order ordinary difference equations.
5. apply the Hankel transform in the infinite 2-dimensional plane

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

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – I Sem			
Course Code:	**NDT and VACUUM TECHNOLOGY** (Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE) (Open Elective-III)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. study various Non-Destructive Testing and types of defects.
2. know the basics of non-destructive techniques using ultrasonic interferometer.
3. provide a basic level of understanding on Vacuum technology.
4. understand the importance Pressure gauges.
5. introduce the fundamental concepts vacuum pumps.

Module 1: Introduction to Non-destructive testing
Introduction, Objectives of Non-destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

Module 2: Methods of Non-destructive Testing
Liquid penetration method, Dye penetration method, Ultrasonic Inspection method, Pulse Echo method, Radiographic testing Magnetic particle testing, Eddy current Testing.

Module 3: Introduction to Vacuum Technology
Unit-1: Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance.
Unit-2: Flow meters: Molar flow, Mass flow.
.
Module 4: Pressure gauges
Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge.

Module-5: Vacuum Pumps
Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps.

Text Books:

1. "Engineering Physics",B K Pandey and S Chaturvedi, Cengage Learning India, Revised Edition, 2014.

2. “A User’s guide to Vacuum technology”, John. F. O’Hanlon, Wiley, 3rd Edition, 2003.

Reference Books:

1. “Physics for Engineers”, R Srinivasan, New Age international, 1st reprint, 2007.
2. “Engineering Physics”, R K Gaur and S L Gupta, Dhanpat rai, Reprint, 2006.
3. “Hand Book of Thin film deposition”, Krishna Seshan, Noyes, 2nd Edition, 2002

E - Resources:

1. http://www.enfm.net/catalog/catalog/enfm-usa.pdf
2. http://web.itu.edu.tr/~arana/ndt.pdf
3. http://www.issp.ac.ru/ebooks/books/open/Nondestructive_Testing_Methods_and_
4. New_Applications.pdf
5. https://www.journals.elsevier.com/ndt-and-e-international/https://www.journals.elsevier.com/vacuum
6. http://nptel.ac.in/courses/114106035/35
7. http://nptel.ac.in/courses/112101004/37.

Course Outcomes:

On completion of the course, the students will be able to:

1. **Describe** the Types of defects and analyze them.
2. **Analyze** the principles of NDT methods.
3. **Analyze** Vacuum technology and concepts of flow meters.
4. **Develop** pressure gauges.
5. **Understand** the concepts of different vacuum pumps.

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

<table>
<tr><td rowspan="1">AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Nano Chemistry
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. To know about the scope of Nanoscale materials and synthesis.
2. Understand the properties of Nanomaterials.
3. Give knowledge of various instrumental techniques to the analysis the Nanomaterials.
4. learn about the different applications of Nanomaterials.
5. Analyze the Nano technology in Environmental purpose.

Module 1: Synthesis of Nano materials:
Introduction -synthesis of Nanostructure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

Module 2: Properties of Nano materials:
Properties of Nanomaterials-Electronic properties, Energy bands and gaps in semiconductors, Fermi Surfaces-Optical properties- Fluorescence, Photoluminescence, Electroluminescence. Magnetic properties-mechanical properties-thermal properties.

Module 3: Instrumental Analysis:
Characterization techniques- Principle and block diagram of Scanning Electron Microscopy (SEM), Electron Dispersion Spectroscopy(EDS). Principle and block diagram of Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

Module 4: Carbon Nano structures and Applications:
Carbon Nano structures, carbon clusters, types and preparation of carbon Nano tubes-optical and telecommunication applications, Nano structured crystals (graphite), graphene, carbon fibers, fullerenes and their applications. Nano solar cells and its applications

Module-5: Environmental Nanotechnology:
Implications of Nanotechnology & Research Needs-Nanostructured Catalysts TiO_2 Nanoparticles for Water purification- Nano membranes in drinking water treatment and desalination, Nanomembranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

Text Books:

1. “Nanotechnology a gentle introduction to the next big idea”,Mark A. Ratner, D. Ratner. Pearson Education Inc., Asia, 2003.
2. “Nano: The essentials-understanding Nanoscience and Nanotechnology”, Pradeep.T. Tata Mc.Graw Hill, New Delhi, 2007.

Reference Books:

1. “Nanomaterials: Synthesis, Characterization, and Applications”, A. K. Haghi, Ajesh K. Zachariah, Nandakumar Kalariakkal. Apple Academic Press, 2013.
2. “Nanomaterials and Nanochemistry”, Brechignac C., Houdy P., Lahmani M. (Eds.) (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
3. “Principles of Nanotechnology”, Phanikumar. SciTech Publications 2nd Edition, 2010.
4. “Environmental Nanotechnology”Preetijain, Shankar lalGarg. Lap lambert Academic publishing, 2015.

E - Resources:

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/nanochemistry.html
2. https://www.sciencedirect.com/book/9780444519566/nanochemistry
3. https://www.researchgate.net/publication/320068992_Introduction_to_Nano-chemistry_and_Nano-materials
4. https://www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/nanochemistry
5. https://www.cambridge.org/core/books/engineering-chemistry/nanochemistry/D6DB35E32E530525DD927E68CED43197

Course Outcomes:

On completion of the course, the students will be able to:

1. **Learn** the different synthetic methods of the Nano materials.
2. **Know** the student Electronic, optical and magnetic properties of Nan materials.
3. **Acquire** the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS &AFM).
4. **Know** the carbon nanotubes, carbon Nano fibers, Nano structured catalysts and Nano solar cells.
5. **Learn** usage of Nano materials in the purification of water.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	1	-	-	-	-	-	-	-	2	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	1	-	-
CO3	2	2	-	1	-	-	-	-	-	-	-	2	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-		-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	2	-	-
Average	2.2	1.6	1.6	1	-	-	-	-	-	-	-	1.4	-	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">TEAMWORK AND TEAM BUILDING
(COMMON TO ALL)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Objectives:
The students will
1. Know the working experience in the group and team
2. Understand the process and role of the team
3. Apply the knowledge of team building
4. Understand the role of team leader.
5. Plan the meetings and understanding the role of meetings

Module -I Working in Groups and Teams
Introduction-defining Types of Groups and Teams- Understanding the role of Teams in Organization; Recognizing differences between group and Teams-ensuring team success-empowering teams- working with a distributed team- technology @work: virtual worlds.

Module -II Exploring Team Roles and Processes
Defining common team roles-selecting team members-choosing the optimal team size-establishing team rules-clarifying team objectives-making collective decisions etc.

Module -III Building and Developing Team
Understanding the benefits of working in teams-fostering Resistance-using team-building activities-creating a team identity-coping with conflict and ego-dealing with difficult team members and celebrating successes.

Module -IV Leading a Team
Pursuing team leadership-preparing to be a team leader-getting start with your team-taking a project management approach- managing a team diplomatically-being sensitive to intangibles and concluding team activities.

Module -V Managing Meetings
Scheduling meeting-developing meeting agenda- planning meetings-understanding the role of meetings-conducting meetings effectively-taking notes and publishing minutes-concluding meetings and creating action plans and solving common meeting problems.

Reference/text book:
1. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.

E-Resources:

1. https://smallbusiness.chron.com/difference-between-team-building-teamwork-10981.html

Course outcomes:

1. **Recognize** differences between group and team, ensuring team success, and empowering teams.
2. **Define** common team roles, establishing team rules, selecting team members, and making collective decisions
3. **Understand** the benefits of working in teams, fostering Resistance, using team-building activities
4. **Manage** a team diplomatically, and preparing to be a good team leader.
5. **Create** action plans and solving common meeting problems

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td colspan="4" rowspan="2">INTELLECTUAL PROPERTY RIGHTS
(Open Elective - III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives:

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

Module 1:

UNIT - I:

Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Module 2:

UNIT - I:

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter.

UNIT – II: Selecting and evaluating trade mark, trade mark registration processes.

Module 3:

UNIT - I:

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

UNIT - II

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Module 4:

UNIT - I:

Trade Secrets: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.

UNIT - II:
Unfair competition: Misappropriation right of publicity, false advertising.

Module 5:
UNIT - I:
New development of intellectual property: New developments in trade mark law; copy right law, patent law, intellectual property audits.
UNIT – II:
International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing Company Ltd.
3. Managing Intellectual Property-The Strategic Imperative, Second Edition by Vinod V Sople, PHI.

Reference Books:

1. Intellectual Property –Copyrights, Trademarks and patents by Richard Stim, Cengage Learning.
2. Niraj Pandey & Khushdeep Dharani –Intellectual Property rights
3. V.K. AHUJA – Law relating to Intellectual Property

E-Resources:

1. www.Ipindia.nic.in
2. www.Iprlwawindia.org
3. www.mondaq.com

Course outcomes:
The students once they complete their academic projects, they get:

1. **Awareness** of the legal environment.
2. **Understanding** of different acts under the national and international laws.
3. **Acquiring** the patent and copyright for their innovative works.
4. **Awareness** of trade secrets and method of advertising.
5. **Knowledge** of plagiarism in their innovations which can be questioned legally.

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

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course
Code:
J42OA</td><td colspan="4" rowspan="2">AIR POLLUTION & CONTROL
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Environmental Science

Course Objectives:
This course will enable students to:
1. Introduce students to basic concepts of pollution.
2. understand the causes of air pollution.
3. Study about the health related to air pollution.
4. Develop skills relevant to control of air pollution.
5. understand the quality of air.

Module 1:
Unit-1:
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution- stationary and mobile sources

Module 2:
Unit-1: Effects of Air pollutants on man, material and vegetation; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

Module 3:
Unit-1:
Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_x; NO_x; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

Module 4:
Unit-1: Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

Module 5:
Unit-1: General Methods of Control of NO_x and SO_x emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards.

Text Books:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution by Wark and Warner.- Harper & Row, New York

Reference Books:

1. Air pollution and control By K.V.S.G. Murali Krishna, Kaushal Publishers. Kakinada

E-Resources:

1. http://mjcetenvsci.blogspot.in/2013/11/air-pollution-causes-effects-and.html
2. https://www.britannica.com/technology/air-pollution-control
3. http://www.yourarticlelibrary.com/air-pollution/5-effective-methods-to-control-air-pollution-explained-with-diagram/28360/
4. http://www.transportlinks.org/rtkb/english/Module%205%5C5_4a%20Environmental%20Impact%20Assessment.pdf

Course Outcomes:

On completion of the course, the students will be able to:

1. **Acquired** knowledge on the basic elements of causes and occurrence of the air pollution.
2. **Have awareness** on the different causes of the air pollution.
3. **Have awareness** about different health related problems caused due to air pollution.
4. **develop** concepts in controlling and prevention of air pollution.
5. **analyse** air quality.

CO-PO/PSO Mapping Chart (Draft) (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	-	-	-	-	1	2	-	-	-	-	1	-	-
CO2	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO3	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO4	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO5	-	-	-	-	-	1	2	-	-	-	-	1	-	-
Average	0.2	-	-	-	-	1	2	-	-	-	-	1	-	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code: J42OB	**DISASTER MANAGEMENT** (Open Elective-IV)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Environmental Science

Course Objectives:
This course will enable students to:

1. Provide basic conceptual understanding the difference between the hazard and a disaster.
2. Knowledge about the various disasters and their impacts.
3. Provide basic understanding about the hazard and vulnerability profile of India.
4. Have conceptual understanding about the disaster management phases.
5. Approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, Disasters, disaster prevention and risk reduction.

Module 1:
Unit-1: Understanding Disaster:
Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)
Unit-2: Hazards and Vulnerabilities:
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

Module 2:
Unit-1: Disaster Management Mechanism:
Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

Module 3:
Unit-1: Capacity Building:
Capacity Building: Concept - Structural and Non-structural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Module 4:

Unit-1: Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

Module 5:

Unit-1: Planning for disaster management:

Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Text Books:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014. 3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

Reference Books:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

E-Resources:

1. https://nptel.ac.in/courses/105/104/105104183/
2. https://nptel.ac.in/courses/124/107/124107010/

Course Outcomes:

On completion of the course, the students will be able to:

1. **Acquire** knowledge on various types of disasters and hazards
2. **Distinguish** between the hazard and a disaster can be analyzed
3. **Acquire** knowledge on the various approaches of Disaster Risk Reduction (DRR)
4. **Ability** to understand the relationship between vulnerability. disasters, disaster prevention and risk reduction
5. **Develop** ability to respond to different disasters

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

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:
J42OC</td><td rowspan="2">SPECIAL ELECTRICAL MACHINES
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives:

This course will enable students to:

1. Introduce the concepts of permanent magnets and to study the construction, operation, characteristics & control of PMBLDC motor.
2. Study construction, operation characteristics and control of PMSM.
3. Understand the construction, operation, characteristics, power controllers and control of SRM.
4. Study the operation of stepper motor, its types, control and its applications.
5. Understand the operation & characteristics of other special machines.

MODULE 1: PERMANENT MAGNET BRUSHLESS DC MOTORS

Fundamentals of permanent magnets – types - principle of operation- magnetic circuit analysis - EMF and torque equations, Characteristics and control.

MODULE 2: PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers – performance characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor.

MODULE 3: SWITCHED RELUCTANCE MOTORS

Constructional features – Principle of operation - Torque prediction – performance Characteristics-Power controllers – Control of SRM drive - Sensor less operation of SRM – Applications.

MODULE 4: STEPPER MOTORS

Constructional features –Principle of operation –Types – Torque equation – Linear and Nonlinear analysis – Characteristics – Drive circuits – Closed loop control – Applications.

MODULE 5: OTHER SPECIAL ELECTRICAL MACHINES

Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear induction motor – Applications.

TEXT BOOKS:

1. T.J.E. Miller, Brushless magnet and Reluctance motor drives, Claredon press, London, 1989.
2. R.Krishnan, Switched Reluctance motor drives, CRC press, 2001.
3. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, New Delhi, 2000.
4. K. Venkataratnam, Special Electrical Machines, Universities Press, 2014.

REFERENCES:

1. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.
2. R.Krishnan, Electric motor drives, Prentice hall of India, 2002.
3. D.P.Kothari and I.J.Nagrath, Electric machines, Tata Mc Graw hill publishing company, New Delhi,Third Edition, 2004.
4. Irving L.Kosow, Electric Machinery and Transformers, Pearson Education, Second Edition, 2007.

E-RESOURCES:

1. https://nptel.ac.in/courses/108/102/108102156/
2. https://www.academia.edu/9885014/SPECIAL_ELECTRICAL_MACHINES_NPTEL_NOTES
3. https://easyengineering.net/ee6703-special-electrical-machines/

Course Outcomes:

The students will be able to:

1. **Analyze** given magnetic circuit and understand operation, characteristics and control of PMBLDC motor.
2. **Understand** the construction, operation performance characteristics of PMSM and its power controllers.
3. **Understand** the construction, operation and control of SRM drive and its power controllers.
4. **Understand** the construction, operation, characteristics and control of stepper motor.
5. **Understand** the operation & characteristics of other special electrical machines.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	3	3	3	-	-	-	-	-	-	-	-	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.8	2.2	3	3	-	-	-	-	-	-	-	-	3	3

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OD</td><td rowspan="2">ELECTRICAL SAFETY ENGINEERING
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives

The students will

1. To expose the students to electrical hazards.
2. To impart knowledge on prevention of electrical shocks.
3. To create awareness about various first aid methods.
4. To study about Hazardous zones-causes of sparks and flash overs in electrical plants
5. To study about safety management.

MODULE –I: INTRODUCTION

Unit-I: General Background-Objectives of safety and security measures-Hazards associated with electric current and voltage-principles of electrical safety- Approaches to Prevent Accidents.

Unit-II: Fire Prevention and Fire Fighting-Objectives and scope of IE act and IE rules-General requirements for electrical safety as per IE rules.

MODULE –II: ELECTRICAL SHOCKS AND THEIR PREVENTION

Unit-I: Primary and Secondary Electric Shocks- Occurrence of Electric Shock -Shocks Due to Flashovers/Spark-overs- Lightning Strokes on Overhead Transmission Lines and Outdoor Substations.

Unit-II: Safety Precautions in Small LV Installations, Residential Buildings, Shops - Safety Procedures in Electrical Plant Installation and description of Earthing System-Equipment Earthing - Substation Earthing.

MODULE –III: FIRST AID

Unit-I: Introduction- Removal of Contact with Live Conductor- First Principles of Actions after Electric Shock - Artificial Respiration - Schafer's Prone Pressure Method- Silvester's Method- Nielson's Arm-lift Back-pressure Method- Mouth to Mouth Method.

Unit-II: Use of Artificial Resuscitator- External Cardiac Massage- Cardiac Pulmonary Resuscitation-First aid treatment of Heat Exhaustion and heat stroke.

MODULE –IV: ELECTRICAL SAFETY IN HAZARDOUS AREAS

Introduction-Classification of Hazardous zones-causes of sparks and flashovers in electrical plants and machines-functional requirements of electrical equipment and installations for hazardous area/zones-classification of equipment/enclosure for hazardous locations.

MODULE –V: ELECTRICAL SAFETY MANAGEMENT

Introduction-Principles of safety management-management's safety policy-safety organization-organization charts for construction phase of a project, maintenance mode of a plant and for safety department – safety auditing-training and supervision-annual reports - motivation to managers, supervisors and employees.

TEXT BOOKS:

1. S. Rao and H.L. Saluja, "Electrical Safety, Fire Safety and Safety Management", Khanna Publishers, 2012.
2. W.F. Cooper, "
3. Electrical Safety Engineering", Butterworth and Company, London, 1998.

REFERENCE BOOKS:

1. J. Cadick, D. Neitzel and A. Winfield, "Electrical Safety Hand Book", McGraw Hill Education, 2012.
2. J. Maxwell Adams, "Electrical Safety- A Guide to the Causes and Prevention of Electric Hazards", The Institution of Electric Engineers, 3rd Reprint, 2009.
3. Martha J. Boss and Gayle Nicoll, "Electrical Safety - Systems, Sustainability and Stewardship", CRC Press, 2015.

E-Resources:

1. https://onlinecourses.swayam2.ac.in/nou20_cs08/preview
2. https://npti.gov.in/electrical-safety-industries-and-accidents-prevention
3. https://www.kopykitab.com/Electrical-Safety-Fire-Safety-Engineering-And-Safety-Management-Second-Edition-by-S-Rao-Saluja

Course Outcomes:

The students will be able to:

1. **Learn** about Electrical safety, IE act and IE rules.
2. **Understand** Electrical shocks and their prevention
3. **Acquire** knowledge about various first aid measures.
4. **Familiarize** with electrical safety in hazardous areas.
5. **Get** introduced to safety management.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	3	-	3	3	-	-	2	-	-	-	2	-
CO2	3	-	2	-	3	2	-	-	3	-	-	-	2	-
CO3	3	-	2	-	3	3	-	-	2	-	-	-	3	-
CO4	3	-	2	-	3	2	-	-	2	-	-	-	2	-
CO5	3	-	2	-	3	2	-	-	2	-	-	-	2	-
Average	3	-	2.2	-	3	2.4	-	-	2.2	-	-	-	2.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OE</td><td rowspan="2">DIGITAL MANUFACTURING
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Drawing, Basics of CAD modelling.

Course Objectives:
This course will enable students to:
1. Understand the need of digital fabrication
2. Understand about Two dimensional layer by layer techniques
3. Know about extrusion based systems, post processing and the software issues involved in digital fabrication
4. Know the applications of digital fabrication

Module - I:
Unit-1: Introduction to additive manufacturing: Introduction to AM, AM evolution, Classification of Additive Manufacturing, Distinction between AM & CNC Machining, Advantages of AM

Module - II:
Unit-1: Two- dimensional layer- by layer techniques: Stereo-lithography (SL), Solid Foil Polymerization (SFP), Selective Laser Sintering (SLS), Selective Powder Building (SPB), Ballistic Particle Manufacturing (PM)

Module - III:
Unit-1: Extrusion based systems: Introduction, basic principles, Fused Deposition Modeling, Materials, and Limitations of FDM
Unit-2: Post processing: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements

Module - IV:
Unit-1: Software issues for additive manufacturing: Introduction, Preparation of CAD Models: The STL file, Problems with STL files, STL file manipulation, Beyond the STL file, Additional software to assist AM

Module - V:
Unit-1: AM applications: Applications in design, Applications in Engineering Analysis and Planning
Unit-2: Medical Applications: Customized Implants and Prosthesis, Aerospace applications and Automotive Applications
Unit-3: Other Applications: Jewelry Industry, Coin Industry, Tableware Industry.

TEXT BOOKS:

1. Ian Gibson, David W Rosen, Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer 2010.
2. Chuaa Chee Kai, Leong Kah Fai, “Rapid Prototyping: Principles & Applications”, World Scientific, 2010.

REFERENCES:

1. Ali K.Karmani, EmandAbouel Nasr, “Rapid Prototyping: Theory and Practice”, Springer 2006.
2. Andreas Gebhardt, Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Hanser Publishers, 2013.
3. Hopkinson, N.Haque, and Dickens Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Taylor and Francis, 2007.

E- Resources:

1. shorturl.at/qQT07
2. shorturl.at/etyzN
3. shorturl.at/hBOV6

Course Outcomes:

On completion of the course, the students will be able to:

1. **Understand** the importance of digital fabrication
2. **Identify** different techniques involved in two dimensional layering
3. **Analyze** the software issues involved in digital fabrication and know about extrusion based systems and post processing
4. **Apply** the knowledge gained in the digital fabrication

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3	3	3							3		
CO2	2	2	3	3	3							3		
CO3	2	2	3	3	3							3		
CO4	1	3	3	3	3							3		
CO5	1	2	2	2	2							3		
Average	1.4	2.4	2.8	2.8	2.8							3		

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:J42OG</td><td rowspan="2">CONSUMER ELECTRONICS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

Course Objectives:

The students will

1. Learn how a Consumer Product is developed
2. Learn how to simulate and test that designs.
3. Learn in-depth study of systems and the use of those.
4. To understand concept of Audio Systems.
5. To implement Television Receivers & Video Systems.

Module 1

UNIT-I

Audio Fundamentals and Devices: Basic characteristics of sound signal: level and loudness, pitch, frequency response, fidelity and linearity, Reverberation. Audio level metering, decibel level in acoustic measurement. Microphone: working principle, sensitivity, nature of response, directional characteristics.

UNIT-II

Types: carbon, condenser, crystal, electrets, tie- clip, wireless. Loud speaker: working principle, characteristic impedance, watt capacity. Types: electrostatic, dynamic, permanent magnet, woofers and tweeters. Sound recording: Optical recording, stereophony and multichannel sound, MP3 standard.

Module 2

UNIT-I

Audio systems: CD player, home theatre sound system, surround sound. Digital console: block diagram, working principle, applications.

UNIT-II

FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T . PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification.

Module 3

UNIT-I

Television Systems: Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal: horizontal and vertical sync details, scanning sequence.

UNIT-II

Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera. Transmission standards: PAL system, channel bandwidth

Module 4

UNIT-I

Television Receivers and Video Systems: PAL-D colour TV receiver, block diagram, Precision IN Line colour picture tube. Digital TVs:- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver.

UNIT-II

Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface) , Digital Video Interface . CD and DVD player: working principles, Interfaces.

Module 5

UNIT-I

Home / Office Appliances: FAX and Photocopier. Microwave Oven: types, single chip controllers, wiring and safety instructions, technical specifications. Washing Machine: wiring diagram, electronic controller for washing machine, technical specifications, types of washing machine, fuzzy logic.

UNIT-II

Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices - picture processing - picture storage.

Text Books:

1. Consumer Electronics, Bali S.P., Pearson Education India,2010.
2. Audio video systems : principle practices & troubleshooting, Bali R and Bali S.P., Khanna Book Publishing Co. (P) Ltd., 2010Delhi , India.

REFERENCES:

1. Intellectual Property in Consumer Electronics, Software and Technology Startups, Springer Nature; 2014th edition (24 September 2013),ISBN-10:9781461479116.
2. Consumer Electronics, B.R. Gupta , V. Singhal, S.K. Kataria & Sons; 2013th edition

E- Resources:

1. https://www.allaboutcircuits.com/videos/category/consumer-electronics/
2. https://www.youtube.com/watch?v=IttXKAGl6zE

Course Outcomes:

1. **Learn** how a Consumer Product is developed
2. **Analyze** how to simulate and test that designs.
3. **Apply** in-depth study of systems and the use of those.
4. **understand** concept of Audio Systems.
5. **Develope** Television Receivers & Video Systems.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**2.5**	**2.67**										

2020-21	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code:J42OH	NANO ELECTRONICS (Open Elective-IV)	L	T	P	D
Credits: 3		3	1	0	0

Prerequisites: Basic Electronics

Course Objectives:

The student will

1. understand the basic concepts of Nanotechnology and Nano machines.
2. understand the fundamental logic devices and the need of Quantum computing.
3. mathematically represent the 'Quantum tunneling'.
4. understand the mathematical treatment for the modeling and design of the carbon nanotubes.
5. study the applications such as MEMS, RAM, Mass Storage devices etc.

Module 1

UNIT-I

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size –surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope

UNIT-II

scanning electron microscope – atomic force microscope –scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation– nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation –plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling –applications of nanomaterials;

Module 2

UNIT-I

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing –

UNIT-II

DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

Module 3

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

Module 4

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

Module 5

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devicesfor washing machine, technical specifications, types of washing machine, fuzzy logic.

Text Books:

1. 'Introduction to Nanoelectronics' by V. V. Mitin, V. Kochelap, Michel A Stroscio. Cambridge, 2007.
2. 'Fundamental of Nanoelectronics' by George W Hanson, Prentice Hall, 2008.

References Books:

1. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard
2. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002.

E - Resources:

1. https://nptel.ac.in/courses/bjy/ab1011/102/111102111/

Course Outcomes:

1. **develop** the basic concepts of Nanotechnology and Nano machines.
2. **apply** fundamentals of logic devices and the need of Quantum computing.
3. **illustrate** the operation of Silicon MOSFETS.
4. **describe** the mathematical treatment for the modeling and design of the carbon nanotubes.
5. **understand** the applications such as MEMS, RAM, Mass Storage devices and gain knowledge on Electrodes and Contacts.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:J42OI</td><td rowspan="2">FUNDAMENTALS OF CLOUD COMPUTING
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. A course on “Computer Networks”.
2. A course on “operating systems”.

Course objectives:

The Student will:

1. Understand the fundamentals of the Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

Module 1:

Cloud Computing Overview- Origins of Cloud computing cloud components - Essential characteristics - On-demand self-service Broad network access Location independent resource pooling Rapid elasticity, Measured service.

Module 2:

Cloud scenarios - Benefits: scalability. Simplicity, vendor’ssecurity. Limitations - Sensitive information application development - Security concerns - privacy concern with a third party - security level of third party - security benefits Regularity issues: Government policies.

Module 3:

Cloud architecture: Cloud delivery model - SPI framework SPI evolution, SPI vs.traditional ITModel and Software as a Service (SaaS):SaaS service providers - Google App Engine, Salesforce. Coin, google plat form - Benefits - operational benefits Economic benefits - Evaluating SaaS Platform as a service (PaaS): PaaS service providers - Right Scale - Salesforce. Coin, Rackspace- Force .com, Services and Benefits.

Module 4:

Infrastructure as a Service (IaaS): IaaS service providers - Amazon EC2, GoGrid Microsoft soft implementation and support - Amazon EC service level agreement - Recent developments - Benefits

Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of cloud computing.

Module 5:

Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration. last deployment, reduce infrastructure cost - limitations

Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization

Desktop virtualization: Software virtualization - Memory virtualization - Storage virtualization - Data virtualization - Network virtualization Micro soft Implementation: Microsoft Hyper V - Vmware features and infrastructure - Virtual Box.

Text Books:

1. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenperer TATA McGraw- Hill, New Delhi – 2010.
2. Cloud Computing: Web-Based Application s That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

Reference Books:

1. Cloud Computing: 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. **Learns** the various marketing strategies for an online business.
5. **Explain** the infrastructure and multimedia concepts.

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

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	1	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	**1.7**	-	-	-	-	-	-	-	**2.0**	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:J42OJ</td><td rowspan="2">INTRODUCTION TO BIG DATA ANALYTICS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Database Management Systems, Cloud Computing.

Course objectives:

The Student will:

1. Understand the basics of Big Data and Big Data Platform
2. Attain the knowledge of Big Data analytics, Approaches and Tools
3. Describe Map Reduce fundamentals and HDFC File system
4. Differentiate between Hadoop and RDBMS concepts
5. Apply analytics on Structured and Unstructured Data.

Module 1:

UNIT-1:

Introduction to Big Data: Types of Digital Data**,** what is big data, History of Data Management; Characteristics of Data, Evolution of Big Data, Structuring Big Data; Elements of Big Data; Challenges with Big Data; Why Big Data; Traditional Business Intelligence (BI) versus Big Data.

UNIT-2:

Introduction to Data Analytics: What Big Data Analytics Isn't? Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why is Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; BASE; Few Top Analytics Tools.

Module 2:

UNIT-1:

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

UNIT-2:

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

Module 3:

UNIT-1:

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop

UNIT-2:

Introduction of HDFS: Architecture, HDFS Files, File system types, commands, org.apache.hadoop.io package, HDFS - High Availability; Introducing HBase, Architecture, Storing Big Data with HBase,interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS

Module 4:

UNIT-1:

Big Data Technology Landscape and Hadoop: NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors;

UNIT-2:

HDFS (Hadoop Distributed File System): HDFS Daemons, read, write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

Module 5:

UNIT-1:

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

UNIT-2:

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools.

Text Books:

1. BIG DATA, Black BookTM, Dreamtech Press, 2015 Edition.
2. BUSINESS ANALYTICS 5e, BY Albright |Winston

Reference Books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence – Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, “Business Intelligence Roadmap”, Addison-Wesley It Service.
3. Yuli Vasiliev, “Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012.

E - Resources:

1. https://www.coursera.org/learn/big-data-introduction
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. www.upgrad.com/Big-Data
4. https://www.javatpoint.com/what-is-big-data
5. https://www.edx.org/course/big-data-analytics-using-spark

Course outcomes:

The Student will be able to:

1. **Identify** the basics of Big Data and its environment
2. **Use** Big Data Analytics Tools and its Approaches
3. **Define** Map Reduce fundamentals and HDFC Architecture
4. **Distinguish** between Hadoop and RDBMS concepts
5. **Illustrate** analytics on Structured and Unstructured Data.

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

ourse tcomes COs)	**Program Outcomes (POs)**												**Progra Specif Outcon**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**P**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	
CO2	-	1	-	-	3	-	-	-	-	-	-	-	-	
CO3	1	2	2	1	2	-	-	-	-	-	1	-	2	
CO4	1	-	1	1	-	-	-	-	-	-	-	-	-	
CO5	1	-	1	1	-	-	-	-	-	-	-	-	-	
verage	**1.0**	**1.5**	**1.3**	**1.0**	**2.5**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**2.0**	**2**

<table>
<tr><td rowspan="2">AY 2020-21 onwards</td><td rowspan="2">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year–II Sem.</td></tr>
<tr></tr>
<tr><td>Course Code: J42OK</td><td rowspan="2">FUNDAMENTALS OF E-COMMERCE
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: NIL

Course Objectives:
The students will

1. Introduction to information systems for business and management.
2. to familiarize students with organizational and managerial foundations of systems,
3. to understand the technical foundation for understanding information systems.
4. To get Electronic payment systems.
5. To familiarize with cyber laws and cyber money.

Module 1: Introduction to E Commerce
Unit 1:
E-Commerce Definitions, Business models related to E Commerce, Technical and Economical Challenges.
Unit 2:
Actors and stake holders, Fundamental Sales Process and Technological Elements**.**

Module 2: B2C Business
Unit 1:
The Process Model and its variants, Pricing Challenge, Fulfilment challenge, Payment Challenge.
Unit 2:
B2C Business and CRM, B2C Software Systems.

Module 3: B2B Business
The Process Model and its variants, B2B Software Systems.

Module 4: Impact of E-commerce and Security
Unit 1:
Ethics Morale and Technology, Ethical aspects of ICT, Overall impacts of E-Commerce, Foundations of Risk Management.
Unit 2:
Information Security Management(ISM) and Legal aspects of E-Commerce.

Module 5: Electronic Payment
Business and money, the payment challenges, payment procedures and cyber money.

Text Books:

1. Introduction to E-Commerce by Martin Kutz.

Reference Books:

1. Ravi Kalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.

E-Resources:

1. https://nptel.ac.in/courses/110/105/110105083/

Course Outcomes:

The students will be able to

1. **Understand** the basic concepts and technologies used in the field of E-Commerce
2. **Have** the knowledge of the different types of Business Systems.
3. **Understand** the processes involved in E Business Systems.
4. **Be aware** of the ethical, social, and security issues.
5. **Have** knowledge with Cyber laws and EPS.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes ***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	2	2	-	1	-	-	-	-	-	1	-
CO2	1	1	2	2	2	-	1	-	-	-	-	-	2	-
CO3	1	3	3	3	3	-	2	-	-	-	-	-	2	-
CO4	-	2	2	2	1	-	1	-	-	-	-	-	-	-
CO5	1	2	1	1	1	-	1	-	-	-	-	-	2	-
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:J42OL</td><td rowspan="2">E-WASTE MANAGEMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: NIL

Course Objectives:

The students will

1. Know regarding E-Waste Management in India Global E-Waste Growth
2. Analyze the overview of WEEE.
3. Understanding scenarios for E-Waste management.
4. Visualize the basic concepts of E-Waste Regulation
5. Understand the basic concepts of Recycling technologies.

Module 1:

Unit 1:

Introduction to e-Waste Management in India Global e-waste growth, Dark shadows of digitization on Indian horizon, e-waste generation, migration, Present practice and systems, disposal methods, Present processing practices.

Unit 2:

Initiatives to manage e-waste, Strengths and weaknesses of the current system.

Module 2:

Unit 1:

WEEE (waste electrical and electronic equipment) - toxicity and health Hazardous substances in waste electrical and electronic equipment-toxicity and release.

Unit 2:

Occupational and environmental health perspectives of e-waste recycling.

Module 3:

Unit 1:

Options and Scenarios for e-Waste Management Actions to be considered to achieve goals of ewaste management, Collection/ take back system,

Unit 2:

Closing the Plastic loop: Turning the supply chain into a supply cycle by mining plastics from end-of-life electronics and other durable goods.

Module 4:

Unit 1:

E-waste legislation in the European Union and the Basel Convention. Regulating e-waste: a review of the international and national legal framework on e-waste Extended producer responsibility: a key tool for international rules and regulations on e-waste.

Module 5:

Unit 1:

Recycling technologies for e-waste Recycling of e-scrap in a global environment opportunities and challenges.

Unit 2:

Technologies for recovery of resources from e-waste. Reuse:A Bridge from Unsustainable e-waste to sustainable e-resources.

Text Books:

1. Rakesh Johri, E-waste: Implications, regulations, and management in India and current global best practices.
2. Klaus Hieronymi, Ramzy Kahhat, Eric Williams, E-Waste Management: from Waste to Resource

Reference Books:

1. Satish Sinha, Priti Mahesh,Waste Electrical and Electronic Equipment The EU and India.
2. By Ronald E. Hester, Roy M. Harrison , Electronic Waste Management.

E-Resources:

1. https://nptel.ac.in/courses/105/105/105105169/

Course Outcomes:

At the end of the course, students will be able to:

1. **Demonstrate** knowledge of E-Waste management.
2. **Implementing** environmental health perspectives of E-Waste recycling.
3. **Achieve** goals of E-Waste management.
4. **Develop** the skills in E-Waste extended producer responsibility.
5. **Describe** the technologies for recovery of resources from E-Waste.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart **3/2/1 indicates the strength of the calculation** **3-Strong, 2-Medium, 1-Low**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**2**	**2**	**1**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	**1**	**1**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	**1**	**3**	**3**	**3**	**3**	-	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	**-**	**2**	**2**	**2**	**1**	-	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	1	**2**	**1**	**1**	**1**	-	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year –II Sem.</td></tr>
<tr><td>Course Code: J42OM</td><td rowspan="2">INTRODUCTION TO EMBEDDED SYSTEMS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>AY 2020-21 onwards</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basics Computer Knowledge

Course Objectives:
Students will learn to

1. Understand the basic concepts of embedded systems and 8051 microcontrollers.
2. Compare and contrast the basics of assembly programming language.
3. Identify the unique characteristics of real-time systems
4. Analyze the general structure of a real-time system and define the unique design problems and challenges of real-time systems.
5. Acquaint the embedded software development tools and various advanced architectures.

Module 1:
Unit 1: Embedded Computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples
Unit 2 : The 8051 Architecture: Introduction, 8051 micro controller hardware, input/output ports and circuits, external memory, counter and timers, serial data input/output, interrupts.

Module 2:
Unit 1: Basic Assembly Language Programming Concepts: The assembly language programming process, programming tools and techniques, programming the 8051.
Unit 2: Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions.

Module 3:
Unit 1: Introduction to Real-Time Operating Systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.
Unit 2: Basic Design Using a Real-Time Operating System: Principles, semaphores and queues, hard real-time scheduling considerations, saving memory and power, an example RTOS like uC-OS (open source).

Module 4:

Unit 1: Embedded Software Development Tools: Host and target machines, linker/locators for embedded software, getting embedded software into the target system.

Unit 2: Debugging Techniques: Testing on host machine, using laboratory tools, an example system.

Module 5:

Unit 1: Introduction to advanced Architectures: ARM and SHARC, processor and memory organization and instruction level parallelism.

Unit 2: Networked embedded systems: bus protocols, I2C bus and CAN bus; internet-enabled systems, design example-elevator controller.

Text Books:

1. Wayne Wolf (2008), Computers as Components-principles of embedded computer system design, Elseveir, New Delhi, India.
2. Kenneth J. Ayala (2008), The 8051 Microcontroller, 3rd edition, Cengage Learning, India.

Reference Books:

1. David E. Simon (1999), An Embedded Software Primer, Pearson Education, India.
2. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
3. Raj Kamal (2004), Embedded Systems, Tata McGraw hill, India.

E-Resources:

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://www.edx.org/course/utaustinx/utaustinx-ut-6-02x-embedded-systems-4806

Course Outcomes:

Students will be able to

1. **Program** an embedded system
2. **Analyze** Interfacing with keyboard, A/D & D/A conversions, serial data Communication, LCD and LED display.
3. **Illustrate** Tasks, Semaphores, Message queues, pipes, Timer functions.
4. **Design** embedded systems and real-time systems
5. **Compare** and contrast ARM, SHARC, internet enabled systems.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	2	-	-	-	-	-	1	-	2	2	2	-
CO2	2	2	2	-	-	-	-	-	2	-	2	2	3	1
CO3	2	2	-	-	-	-	-	-	2	-	-	2	3	1
CO4	1	3	-	-	-	-	-	-	2	-	-	2	3	1
CO5	2	1	-	-	-	-	-	-	2	-	2	2	2	1
Average	**1.8**	**1.8**	**2**	**-**	**-**	**-**	**-**	**-**	**1.8**	**-**	**2**	**2**	**2.6**	**1**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech IV Year –II Sem.</td></tr>
<tr><td>Course Code:J42ON</td><td rowspan="2">INTRODUCTION TO NETWORK SECURITY
(Open Elective-IV</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

The students will

1. Learn about Information security, security attacks, threats, services, and mechanisms and Application of each of confidentiality, integrity, and availability.
2. Know the principles of public key encryption and private key encryption and the algorithms used for both.
3. Master in E-mail security understand the algorithms PGP, MIME and S/MIME
4. Analyse IP Security architecture and understand concepts of SSL (Secure socket layer), TLS (transport layer security) and SET (secure electronic transactions)
5. Become familiar with the basic categories of threats to computers and networks.

Module 1:

Unit 1: Attacks on Computers and Computer Security:

Introduction, The need for security, Security approaches, Principles of security.

Unit 2 Security Cryptography:

Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

Module 2:

Unit 1: Symmetric key Ciphesrs:

Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Crypt Analysis Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption, function, Key distribution.

Unit 2: Asymmetric key Ciphers:

Principles of public key crypto systems, Algorithms (RSA, Diffie- Hellman, ECC), Key Distribution.

Module 3:

Unit 1: Message Authentication Algorithms and Hash Functions:

Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

Module 4:

Unit 1: Data visualisation:

Introduction, Types of data visualisation, Data for visualisation:

Unit 2: Data Types and Methods :

Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

Module 5:

Unit 1:Applications:

Applications of Data Science, Technologies for visualisation, Bokeh (Python), recent trends in various data collection and analysis techniques

Unit 2: Technologies:

Various visualization techniques, application development methods of used in data science.

Text Books:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2013.

Reference Books:

1. Jure Leskovek, AnandRajaraman, Jeffrey Ullman, Mining of Massive Datasets. V2.1, Cambridge University Press, 2014.

Web Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
2. https://www.tutorialspoint.com/information_security_cyber_law/cyber_security_strategies.htm
3. https://www.tutorialspoint.com/information_security_cyber_law/index.htm
4. https://www.tutorialspoint.com/information_security_cyber_law/cyber_law_objectives.htm
5. https://www.tutorialspoint.com/information_security_cyber_law/introduction.htm
6. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
7. https://www.tutorialspoint.com/information_security_cyber_law/policies_to_mitigate_cyber_risk.htm

8. https://www.tutorialspoint.com/information_security_cyber_law/information_technology_act.htm

Course Outcomes:

Students will be able to

1. **Understand** cyber-attacks and types of cybercrimes.
2. **Summarize** Cyber Laws and Cyber Forensics.
3. **Understand** frauds in Wireless era.
4. **Analyze** and evaluate the cyber security needs of an organization.
5. **Outline** Data Privacy and privacy policies.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak														
Course Outcomes (Cos)	**Program Outcomes (Pos)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	-	2	2	1	-	-	-	-	1		
CO2	-	-	2	-	1	2	-	-	-	-	-	1		
CO3	2	3	1	-	2	1	1	-	-	-	-	-		
CO4	2	2	2	-	-	-	1	-	-	-	-	1		
CO5	-	-	-	-	-	1	2	-	-	-	-	2		
Average	1.2	1.4	1.4	-	1	1.2	1	-	-	-	-	1		

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech. IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OP</td><td rowspan="2">INTRODUCTION TO MINE ENVIRONMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

The students will

1. To introduce about atmospheric, mine air & their limitations
2. To acquaint with spontaneous heating and explosions in coal mines
3. To get idea about sources of dust, and its control in mines
4. To get idea about miners' diseases & lighting in mines
5. To know about reclamation of mines, impact of mining on environment & sustainable mining

Module 1

Unit - 1: Atmosphere and mine air composition. Origin of gases, properties, limitations of gases in underground mines

Module 2

Unit - 1: Spontaneous Combustion: Factors, control measures.

Unit - 2: Explosions: Causes of firedamp explosion, preventive measures against firedamp explosion.

Module 3

Unit - 1: Dust: Sources in underground and opencast mines, standards and control measures.

Module 4

Unit - 1: Miners diseases, Lighting standards in underground and opencast mines**.**

Module 5

Unit - 1: Reclamation, plantation of surface mines, Impact of mining on environment & sustainable mining.

Textbooks:

1. Elements of Mining Technology (VOL-2) – by D.J. Deshmukh.
2. Surface Mining – by S.K. Das.

Reference Books:

1. Mine Ventilation – by G.B. Mishra.

E-Resources:

1. https://www.ltu.se/cms_fs/1.124549!/file/rapport%20Environmental%20Aspects%20of%20mining_low.pdf
2. https://pubs.usgs.gov/pp/1802/b/pp1802b.pdf
3. https://www.elaw.org/files/mining-eia-guidebook/Chapter1.pdf

Course Outcomes:

The student will be able to:

1. **Learn** about atmospheric and mine air
2. **Learn** about spontaneous combustion and explosion in coal mines
3. **Understand** about dust sources and its control in mines
4. **Learn** about miners' diseases, mine lighting and its standards
5. **Learn** about reclamation of mines, impacts of mining on environment and sustainable mining

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