JAWAHARLAL NEHRU JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
COURSE STRUCTURE
(for Academic Year 2020-21)

Induction Program – 3 weeks

S.No	CourseNo	CourseName	Category	L-T-P	Credits
		Semester-1(Theory-4,Lab -5)			
1.	20A15101	Linear Algebra and Calculus Common to All branches of Engineering	BS	3-0-0	3
2.	20A15301	Engineering Chemistry Common to CE, MECH, CHEM	BS	3-0-0	3
3.	20A10506	C-Programming & Data Structures Common to CE, MECH, CHEM	ES	3-0-0	3
4.	20A10102	Building Materials and Construction	ES	3-0-0	3
5	20A10303	EngineeringWorkshop Common to CE, MECH, CHEM	LC	0-0-3	1.5
6	20A10508	IT Workshop Common to CE, MECH, CHEM	LC	0-0-3	1.5
7.	20A10104	Civil Engineering workshop	BS	0-0-3	1.5
8.	20A15302	Engineering Chemistry Lab Common to CE, MECH, CHEM	ES	0-0-3	1.5
9.	20A10507	C-Programming & Data Structures Lab Common to CE, MECH, CHEM	ES	0-0-3	1.5
				Total	**19.5**

S.No	CourseNo	CourseName	Category	L-T-P	Credits
		Semester–2(Theory–5,Lab –4, MC-1)			
1.	20A15102	Differential Equations and Vector Calculus Common to all branches of Engineering except CSE	BS	3-0-0	3
2.	20A15203	EngineeringPhysics Common to CE, MECH, CHEM	BS	3-0-0	3
3.	20A15501	Communicative English Common to CE, MECH,	HS	3-0-0	3
4.	20A10101	Strength of Materials-I	ES	3-0-0	3
5.	20A10301	Engineering Drawing Common to CE, MECH, CHEM	LC	1-0-2	2
6.	20A10302	Engineering Graphics Lab Common to CE, MECH, CHEM	LC	0-0-2	1
7.	20A15502	CommunicativeEnglish Lab Common to CE, MECH,	HS	0-0-3	1.5
8.	20A15204	EngineeringPhysics Lab Common to CE, MECH, CHEM	BS	0-0-3	1.5
9.	20A10103	Strength of Materials Lab	ES	0-0-3	1.5
10	20A19101	Universal Human Values Common to CE, MECH, CHEM	MC	3-0-0	0
				Total	**19.5**

*FOR 2020 Admitted Batch only

COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
II – I B.Tech (R20) - COURSE STRUCTURE

CIVIL Engineering

Semester-III					
S.No	**CourseNo**	**CourseName**	**Category**	**L-T-P**	**Credits**
1.	20A35101	Numerical Methods and Probability Theory Common to CE, CHEM	BS	3-0-0	3
2.	20A30101	Strength of Materials - II	PC/ES	3-0-0	3
3.	20A30102	Fluid Mechanics	PC/ES	3-0-0	3
4.	20A30103	Surveying	PC/ES	3-0-0	3
5	20A30104	Concrete Technology	PC/ES	3-0-0	3
6	20A35104	Exploratory Data Analysis Lab	PC/ES	0-0-3	1.5
7.	20A30105	Surveying Lab	PC/ES	0-0-3	1.5
8.	20A30106	Concrete Technology Lab	PC/ES	0-0-3	1.5
9.	20A30107	Skill oriented Course – I Building Planning and Drawing	SC	1-0-2	2
10	20A10803	Mandatory non-credit Course-II Environmental Science Common to CE. MECH. CHEM	MC	3-0-0	0
				Total	**21.5**

Semester–IV					
S.No	**CourseNo**	**CourseName**	**Category**	**L-T-P**	**Credits**
1.	20A40101	Geological Sciences for Civil Engineers	BS	3-0-0	3
2.	20A40102	Structural Analysis	PC/ES	3-0-0	3
3.	20A40103	Hydraulics and Hydraulic Machinery	PC/ES	3-0-0	3
4.	20A40104	Environmental Engineering	PC/ES	3-0-0	3
5.	20A49101a 20A49101b 20A49101c	Humanities Elective – I Common to All Branches Managerial Economics and Financial Analysis Entrepreneurship and incubation Business Ethics and Corporate Governance	HS	3-0-0	3
6.	20A40105	Fluid Mechanics and Hydraulic Machinery Lab	PC/ES	0-0-3	1.5
7.	20A40106	Environmental Engineering Lab	PC/ES	0-0-3	1.5
8.	20A40107	Geological Sciences Lab	PC/ES	0-0-3	1.5
9.	20A40108	Skill oriented Course – II Python Programming	SC	1-0-2	2
10	20A49102	Mandatory non-credit Course-III Design Thinking for Innovation Common to All Branches	MC	2-1-0	0
11	20A49901	NSS/NCC/NSO Activities	-	0-0-2	0
				Total	**21.5**
Community Service Internship/Project (Mandatory) for 6 weeks duration during Summer					

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTAPUR

CIVIL Engineering

S.No.	Course Code	Course Name	L	T	P	Credits
Semester–V
1.	20A50101	Design of Reinforced Concrete Stuctures	3	0	0	3
2.	20A50102	Water Resource Engineering	3	0	0	3
3.	20A50103	Geotechnical Engineering-I	3	0	0	3
4.	20A50104a 20A50104b 20A50104c	Professional Elective-I 1. Advanced Structural Analysis 2. Sub Surface Investigation and Instrumentation 3. Remote Sensing and GIS	3	0	0	3
5.	20A50105	**Open Elective Course – I** (Each department offer one course including Mathematics, Physics, Chemistry andHSS) Experimental Stress Analysis Common to All Branches	3	0	0	3
6.	20A50108	Computer Aided Drafting lab – I	0	0	3	1.5
7.	20A50109	Geotechnical Engineering Lab - I	0	0	3	1.5
8.	20A50110	**Skill oriented course - III** Estimation, Costing and Valuation	1	0	2	2
9.	20A50111	Evaluation of Community Service Project				1.5
10.	20A55401	**Mandatory Non-credit Course** Indian Constitution (CIV, ME, CHEM)	2	0	0	0
**Total**						**21.5**

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.

2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.

3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline

S.No.	CourseCode	Course Name	L	T	P	Credits
		Semester–VI				
1.	20A60101	Design of Steel Structures	3	0	0	3
2.	20A60102	Highway Engineering	3	0	0	3
3.	20A60103	Geotechnical Engineering -II	3	0	0	3
4.	20A60104a 20A60104b 20A60104c	**Professional Elective Course– II** 1. Prestressed Concrete 2. Green Buildings 3. Industrial Waste and Waste- Water Management	3	0	0	3
5.	20A60105	**Open Elective Course – II** (Each department offer one course including Mathematics, Physics, Chemistry andHSS) 1. Disaster Management Common to All Branches	3	0	0	3
6.	20A60106	Highway Materials Lab	0	0	3	1.5
7.	20A60107	Geotechnical Engineering Lab - II	0	0	3	1.5
8.	20A60108	Computer Aided Drafting lab – II	0	0	3	1.5
9.	20A65502	**Skill oriented course - IV** Soft Skills (CIV, ME, Chemical)	1	0	2	2
10.	20A69901	**Mandatory Non-credit Course** Intellectual Property Rights & Patents (CIV, ME, CHEM)	2	0	0	0
Total						**21.5**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation						

Honors / Minor course (the hours distribution can be 3-0-2 or 3-1-0 also) 4 0 0 4

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTAPUR

CIVIL Engineering

S.No.	Course Code	Course Name	L	T	P	Credits
		Semester-VII				
1.	20A70101a 20A70101b 20A70101c	**Professional Elective Course– III** 1. Railways, Airports, Docks and Harbour Engineering 2. Ground Improvement Techniques 3. Repair and Rehabilitation of Structures	3	0	0	3
2.	20A70102a 20A70102b 20A70102c	**Professional Elective Course– IV** 1. Finite Element Methods 2. Advanced Structural Engineering 3. Hydraulic Structures and Water Power Engineering	3	0	0	3
3.		**Professional Elective Course– V (MOOC)** Any MOOC Course which is not studied during the course and available in Swayam, NPTEL	3	0	0	3
4.	20A75401a 20A75401b 20A75401c	**Humanities Elective** **(Common to All Branches)** 1.Management Science 2. Business Environment 3.Organizational Behaviour	3	0	0	3
5.	20A70103	**Open Elective Course – III** (Each department offer one course including Mathematics, Physics, Chemistry andHSS) 1. Building Technology for Engineers **(Common to All Branches)**	3	0	0	3
6.	20A70104	**Open Elective Course – IV** (Each department offer one course including Mathematics, Physics, Chemistry andHSS) 1. Environmental Impact and Assessment **(Common to All Branches)**	3	0	0	3
7.	20A70105	**Skill oriented course – V** Skills on STAAD PRO	1	0	2	2
8.	20A70106	Evaluation of Industry Internship				3
		Total				**23**

S.No.	Course Code	Course Name	Category	L	T	P	Credits
		Semester-VIII					
1.	20A80101	Full Internship & Project work	PR				12
						Total	**12**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTAPUR

HONOURS DEGREE IN <Civil Engineering>

Honors Degree in Structural Engineering

S.No.	Course Code	Course Name	Contact Hours per week		Credits
			L	T	
1	20A01H11	Cost Effective Housing Techniques	3	1	4
2	20A01H12	Pre- Engineered Buildings	3	1	4
3	20A01H13	Design of Bridges	3	1	4
4	20A01H14	Construction Economics & Finance	3	1	4
SUGGESTED MOOCs**					
5	20A01H15a	Advanced Concrete Technology https://onlinecourses.nptel.ac.in/noc22_ce58/preview	--	--	2
6	20A01H16a	Optimization methods for Civil engineering https://onlinecourses.nptel.ac.in/noc22_ce83/preview	--	--	2

** Based on the availability of courses offered by NPTEL SWAYAM with a minimum of 12 weeks duration.

MINORS Degree in Structural Engineering

0
<Construction Technology >

S.No.	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1.	20A01M11	Building Materials & Construction	3	1	0	4
2.	20A01M12	Building Planning and Drawing	3	1	0	4
3.	20A01M13	Estimation , Costing and Valuation	3	1	0	4
4.	20A01M14	Surveying	3	1	0	4
5.	20A01M15a**	Concrete Technology NPTEL				2
6.	20A01M16a**	Green Buildings https://nptel.ac.in/courses/105102195				2

**** Based on the availability of courses offered by NPTEL SWAYAM with a minimum of 12 weeks duration.**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTAPUR

Civil   Engineering

S.No.	Course Code	Open Elective Course – I* Course Name	L	T	P	Credits
1.	20A50105	Experimental Stress Analysis	3	0	0	3
2.	20A50205	Electric Vehicle Engineering	3	0	0	3
3.	20A50305	Optimization Techniques	3	0	0	3
4.	20A50405	Basics of Electronics and Communication	3	0	0	3
5.	20A50505	Introduction to Java Programming	3	0	0	3
6.	20A50805	Energy Conversion and Storage Devices	3	0	0	3
7.	20A55101	Optimization Methods (Mathematics)	3	0	0	3
8.	20A55201	Material Characterization	3	0	0	3
9.	20A55401	E-Business (H & SS)	3	0	0	3
10	20A55301	Chemistry Of Energy Materials (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

S.No.	Course Code	Open Elective Course – II Course Name	L	T	P	Credits
1.	20A60105	Disaster Management(CIVIL)	3	0	0	3
2.	20A60205	Renewable Energy Systems(EEE)	3	0	0	3
3.	20A60305	Solar Energy Systems(MECH)	3	0	0	3
4.	20A60405	Basics of Integrated Circuits	3	0	0	3
5.	20A60505	Introduction to Linux Programming (CSE) (CSE)	3	0	0	3
6.	20A60805	Green Technology(CHEM)	3	0	0	3
7.	20A65101	Mathematical Modelling & Simulation (Common for CIVIL,MECH &CHEM)(Mathemtics)	3	0	0	3
8.	20A65102	Wavelet transforms and its Applications (Common for EEE&ECE) (Mathemtics)	3	0	0	3
9.	20A65103	Statistical Methods for Data Science CSE (Data Science) (Mathemtics)	3	0	0	3
10	20A65201	Physics Of Electronic Materials And Devices (Physics)	3	0	0	3
11	20A65501	Academic Writing and Public Speaking(H & SS)	3	0	0	3
12	20A65301	Chemistry Of Polymers And Its Applications (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTAPUR

Civil   Engineering

S.No.	Course Code	Open Elective Course – III* Course Name	L	T	P	Credits
1.	20A70103	Building Technology for Engineers (CIVIL)	3	0	0	3
2.	20A70204	Battery Management Systems (EEE)	3	0	0	3
3.	20A70304	Modern Manufacturing Methods (MECH)	3	0	0	3
4.	20A70404	Digital Electronics (ECE)	3	0	0	3
5.	20A70504	CyberSecurity (CSE)	3	0	0	3
6.	20A70804	Industrial Pollution Control Engineering (CHEM)	3	0	0	3
7.	20A75101	Numerical Methods for Engineers	3	0	0	3
8.	20A75201	SMART MATERIALS AND DEVICES (Physics)	3	0	0	3
9.	20A75501	Employability Skills (H&SS)	3	0	0	3
10	20A75301	GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

S.No.	Course Code	Open Elective Course – IV* Course Name	L	T	P	Credits
1.	20A70104	Environmental Impact and Assessment	3	0	0	3
2.	20A70205	IOT Applications in Electrical Engineering	3	0	0	3
3.	20A70305	Material Handling Equipment (MECH)	3	0	0	3
4.	20A70405	Principles of Digital Signal Processing (ECE)	3	0	0	3
5.	20A70505	Introduction to DBMS (CSE)	3	0	0	3
6.	20A70805	Solid Waste management (CHEM)	3	0	0	3
7.	20A75102	Number theory and its Applications (Mathematics)	3	0	0	3
8.	20A75202	Sensors and Actuators For Engineering Applications (Physics)	3	0	0	3
9.	20A79102	English Literary Spectrum (H & Ss)	3	0	0	3
10	20A75302	Chemistry Of Nanomaterials And Applications (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
(Common to all branches of Engineering)

Course Code		L	T	P	C
20A15101	**Linear Algebra and Calculus**	3	0	0	3

Pre-requisite   **Semester -I**

Course Objectives:
The objectives of this course are:

1.	This course will illuminate the students in the concepts of calculus and linear algebra.
2.	To equip the students with standard concepts and tools to develop the confidence and ability to handle various real world problems and their applications.

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	develop the use of matrix algebra techniques that is needed by engineers for practical applications
2	Utilize mean value theorems to real life problems
3	familiarize with functions of several variables which is useful in optimization
4	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5	Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

UNIT – I : Matrices

Rank of a matrix by echelon form, solving homogeneous and non-homogeneous system of linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT – II :

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

UNIT – III :
Multivariable calculus :Partial derivatives, total derivatives, chain rule, Euler's theorem, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – IV :
Multiple Integrals :Double integrals, changing to polar coordinates, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals in Cartesian, cylindrical and spherical polar co-ordinates

UNIT – V :
Special Functions :Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Textbooks:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

Reference Books:
1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
5. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
6. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
8. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
9. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

(Common to CE, MECH, CHEM)

Course Code		L	T	P	C
20A15301	**Engineering Chemistry**	3	0	0	3

Pre-requisite   **Semester -I**

Course Objectives:
The objectives of this course are:

1.	To familiarize engineering chemistry and its applications
2.	To impart the concept of soft and hard waters, softening methods of hard water
3.	To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	**List** the differences between temporary and permanent hardness of water, **Explain** the principles of reverse osmosis and electro dialysis. **Compare** quality of drinking water with BIS and WHO standards. **Illustrate** problems associated with hard water - scale and sludge. **Explain** the working principles of different Industrial water treatment processes
2	**Apply** Nernst equation for calculating electrode and cell potentials, **Apply** Pilling Bedworth rule for corrosion and corrosion prevention, **Demonstrate** the corrosion prevention methods and factors affecting corrosion, **Compare** different batteries and their applications
3	**Explain** different types of polymers and their applications, **Solve** the numerical problems based on Calorific valueselectsuitable fuels for IC engines, **Explain** calorific values, octane number, refining of petroleum and cracking of oils
4	**Explain** the constituents of Composites and its classification, **Identify** the factors affecting the refractory material, **Illustrate** the functions and properties of lubricants, demonstrate the phases and reactivity of concrete formation, **Identify** the constituents of Portland cement, **Enumerate** the reactions at setting and hardening of the cement
5	**Summarize**the concepts of colloids, micelle and nanomaterials, **Explain** the synthesis of colloids with examples, **Outline** the preparation of nanomaterials and metal oxides **Identify** the application of colloids and nanomaterials in medicine, sensors and catalysis

UNIT – I:

Water Technology : Introduction –Soft Water and hardness of water, Estimation of hardness of water by EDTA Method - Boiler troubles –Priming, foaming**,** scale and sludge, Caustic embrittlement, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT - II
Electrochemistry and Applications : Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.
Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (Ni-Cad),and lithium ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.
Corrosion: Introduction to corrosion, chemical and electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT - III
Polymers and Fuel Chemistry : Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth and coordination polymerization.
Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC and Bakelite
Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol
Fuels – Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal, **Liquid Fuels** refining of petroleum, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane values, cracking of oils; alternative fuels- propane, methanol, ethanoland bio-fuels.

UNIT – IV
Advanced Engineering Materials : Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications
Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.
Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.
Building materials- Portland Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.

UNIT - V
Surface Chemistry and Applications : SIntroduction to surface chemistry, colloids, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, solid-gas interface, solid-liquid interface, adsorption isotherm, BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors.

Textbooks:
1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:
1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
4. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANATAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Common to (CE, ME, CHEM)

Course Code		L	T	P	C
20A10506	**C-Programming & Data Structures**	**3**	**0**	**0**	**3**

Pre-requisite   **Semester -I**

Course Objectives:
The objectives of this course are:

1.	To illustrate the basic concepts of C programming language.
2.	To discuss the concepts of Functions, Arrays, Pointers and Structures.
3.	To familiarize with Stack, Queue and Linked lists data structures.
4.	To explain the concepts of non-linear data structures like graphs and trees.
5.	To learn different types of searching and sorting techniques.

UNIT – I

Introduction to C Language - C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements, arrays.

UNIT - II
Functions, types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern, Structures, Unions, Strings, string handling functions, and Command line arguments.

UNIT - III
Data Structures, Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

UNIT - IV
Linked Lists– Singly linked list, dynamically linked stacks and queues, polynomials using singly linked lists, using circularly linked lists, insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations.

UNIT - V

Trees- Tree terminology, representation, Binary trees, representation, binary tree traversals. binary tree operations, **Graphs**- graph terminology, graph representation, elementary graph operations, Breadth First Search (BFS) and Depth First Search (DFS), connected components, spanning trees.
Searchingand Sorting– sequential search, binary search, exchange (bubble) sort, selection sort, insertion sort

Textbooks:
1. The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
4. B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
5. Richard F. Gilberg&Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:
1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E.Balaguruswamy, "C and Data Structures", 4th Edition, TataMcGraw Hill.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

Course Code		L	T	P	C
20A10102	**BUILDING MATERIALS AND CONSTRUCTION**	3	0	0	3

Pre-requisite   **Semester -I**

Course Outcomes (CO):

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

1	Identify and characterize the properties of various building materials.
2	Be aware of various Traditional, Organic and Modern building materials emerging materials in the field of civil engineering construction.
3	Understand the manufacturing process of various building materials like stones, Bricks, Ceramics, Glass and Plastic.
4	Understand the basic principles of low-cost, Alternate and Sustainable materials and capable to practice Eco friendly Civil engineering materials
5	Analyze and design the masonry buildings using IS-code provisions.

UNIT – I

INTRODUCTION TO BUILDING MATERIALS
Traditional& OrganicBuilding Materials –Stone–Dressingof Stones– Modern Building Materials – Bricks – Manufacturing process – Ceramic Products – Manufacturing Process –Building Materials for Low Cost Housing – Utilisation of Wastes for Alternative Building Materials – Sustainable Materials in Construction, Concepts of energy efficient building envelopes as per ECBC – National Standards.

UNIT - II
GLASS: Introduction to Fenestration- Functions of Glass in Buildings – Constituents and Classification of Glass – Manufacturing Process –Properties of Glass – Common Types of Glass – Special Glass – Advantages and Disadvantages of Glass – National Standards such as ECBC.
PLASTIC: Introduction – Polymerisation – Classification of Plastics– Commonly Used Plastics – Moulding and Fabricating for Plastic Products – Applications – Advantages – Disadvantages – Intelligent Use of Plastics in Buildings – National Standards such as ECBC.
UNIT – III :
INSULATING MATERIALS : Thermal Insulating Materials: Introduction – Thermal Insulation – Heat Transfer Fundamentals – Thermal Properties of Insulating Materials – Selection of Insulating Materials – Classification of Insulation materials – Reflective Insulation Systems – Commonly Used Building Insulation Materials – Insulation that Should not be Used – National Standards such as ECBC.
Sound Insulating Materials: Introduction – Basics of Acoustics – Sound Absorption or Insulation – Green Insulation – Cool Roof, Green Roof, Power Roof – National Standards such as ECBC

UNIT - IV
STRUCTURAL COMPONENTS:–
Foundations – classification of Foundations – consideration in selection of foundation types– Masonry – Brick and block walls – Cavity walls – Damp–proof courses and membranes – Mortars – Arches and openings – Windows – Glass and glazing –Doors – Stairs – Types and Applications – Cladding to external walls – Flat roofs – Dormer windows – Formwork & Scaffolding – Precast concrete frames – Portal frames – Types – components – Framed structures – Components – Construction Procedure – Panel walls – National Standards such as ECBC.

UNIT - V
INTERNAL CONSTRUCTION AND FINISHES
Internal elements – Internal walls – Construction joints – Internal walls, fire protection –separating walls – Partitions – Plasters and plastering – Domestic floors and finishes – Sound insulation – Timber, concrete and metal stairs–Internal doors – Door sets – Fire resisting doors – Plasterboard ceilings – Suspended ceilings –Paints and painting – Components of Paints – Types of Paint – Considerations in Selecting Paints – Cement Paints – Oil Paints –Emulsion Paints – Whitewash and Colourwash – Application of Paints –Distempers – Varnishes – Safety –Joinery production – Composite boarding – National Standards such as ECBC

Textbooks:
1. Building Material by S K Duggal – New Age International Publishers; Second Edition
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
3. A Textbook on Building Construction by S.K.Sharma, S.ChandPubilishers.
4. Building Materials by M.L.Gambhir, TMH Pubilishers.
5. ECBC (Energy Conservation Building Code).

Reference Books:
1. Building construction by W.B.Mckay, Vol.I, II, III & IV Pearson Publications, 2013 edition.
2. R.Chudly "Construction Technology" VolumesI and II" 2nd Edition, Longman, UK, 1987.
3. Building materials by S.C.Rangawala, CharotarPubilising House, Anand- INDIA.
4. Building Construction by S.C.Rangawala, CharotarPubilishing House, Anand- INDIA
5. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
6. BEE (Bureau of Energy Efficiency) Manuals on Energy efficient building envelope concepts.

Course Code		L	T	P	C
20A10303	**Engineering Workshop** (Common to CE, MECH, CHEM)	**0**	**0**	**3**	**1.5**

Pre-requisite   **Semester -I**

Course Objectives:

The objectives of this course are:

	To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills.

Course Outcomes (CO):

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

1	Apply wood working skills in real world applications.
2	Build different objects with metal sheets in real world applications.
3	Apply fitting operations in various applications.
4	Apply different types of basic electric circuit connections.
5	Understand the operation of power tools.

List of experiments:

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints
   a) Half – Lapjoint
   b) Mortise and Tenonjoint
   c) Corner Dovetail joint or Bridlejoint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets
   a)Taperedtray   b)Conicalfunnel
   c)Elbowpipe   d)Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises
    a) V-fit   b)Dovetailfit   c) Semi-circularfit
    d) Bicycle tyre puncture and change of two wheeler tyre

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections
    a) Parallelandseries   b) Twowayswitch   c)Godownlighting
    d) Tubelighte) Threephasemotorf) Soldering ofwires

Power tools:

Demonstration of a) Circular Saw b) Power Planerc) Zig Saw d) Buffing Machine

Note: In each section a minimum of three exercises are to be carried out.

Course Code		L	T	P	C
20A10508	**IT Workshop** **(Common to CE, ME, CHEM)**	**0**	**0**	**3**	**1.5**

Pre-requisite   **Semester -I**

Course Objectives:
The objectives of this course are:

1.	To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system
2.	To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX
3.	To learn about Networking of computers and use Internet facility for Browsing and Searching
4.	To learn about Google Forms and Google Sites

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
2	Prepare the Documents using Word processors and Prepare spread sheets for calculations. using excel and also the documents using LAteX.
3	Prepare Slide presentations using the presentation tool.
4	Interconnect two or more computers for information sharing.
5	Access the Internet and Browse it to obtain the required information.

Preparing your Computer

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.
Networking and Internet

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.
Productivity tools

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered, Image Manipulation tools.

Task 9: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet

Task 11: LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

Reference :

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint& Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.

CourseCode		L	T	P	C
20A10104	**Civil Engineering Workshop**	**0**	**0**	**3**	**1.5**

Pre-requisite   **Semester -I**
Course Objectives
The student will be able
1. To analyze the plan and carry out setting out of building with the help of tape and cross staff
2. To construct brick wall of English bond with different thickness
3. To determine the center of gravity & moment of inertia of rolled steel sections by actual measurements
4. To successfully apply the various finishing works onto a wall
5. To successfully install various plumbing fixtures like Tap, T-Joint, Elbow, Bend, threading etc.,

LIST OF EXPERIMENTS:

1) The objectives of this course are:Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.

2) Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.

3) Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

4) Construct a wall of height 50 cm and wall thickness 2 bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

5) Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.

6) Installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, Threading etc;

7) Plastering and Finishing of wall

8) Application of wall putty and painting a wall

9) Application of base coat and laying of Tile flooring of one square meter

10) Preparation of soil cement blocks for masonry and testing for compressive strength

11) Casting and testing of Fly ash Blocks

12) Preparation of cover blocks for providing cover to reinforcement

Course Outcomes
The student will be able to
1. Set-out a building as per the given plan using tape and cross staff
2. Construct brick wall of English bond with different thicknesses
3. Determine the center of gravity & moment of inertia of rolled steel sections by actual measurements
4. Apply the various finishing works onto a wall
5. Install various plumbing fixtures like Tap, T-Joint, Elbow, Bend, threading etc.,

Course Code		L	T	P	C
20A15302	Engineering Chemistry Lab(Common to CE, MECH, CHEM)	**0**	**0**	**3**	**1.5**

Pre-requisite   **Semester -I**

Course Objectives:

The objectives of this course are:

	Verify the fundamental concepts with experiments

Course Outcomes (CO):

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

1	**determine** the cell constant and conductance of solutions .
2	**prepare** advanced polymer materials .
3	**determine** the physical properties like surface tension, adsorption and viscosity.
4	**estimate** the Iron and Calcium in cement .
5	**calculate** the hardness of water .

List of Experiments:
1. Determination of Hardness of a groundwater sample.
2. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
3. Determination of cell constant
4. Conductometric titration of strong acid vs. strong base
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer
8. Determination of percentage of Iron in Cement sample by colorimetry
9. Estimation of Calcium in port land Cement
10. Preparation of nanomaterials by precipitation.
11. Adsorption of acetic acid by charcoal
12. Determination of percentage Moisture content in a coal sample
13. Determination of Viscosity of lubricating oil by Redwood Viscometer 1 &2
14. Determination of Calorific value of gases by Junker's gas Calorimeter

TEXT BOOKS:
1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, PearsonEducation.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

Course Code		L	T	P	C
20A10507	C-Programming & Data Structures Lab	**0**	**0**	**3**	**1.5**

Pre-requisite   **Semester -I**

Course Objectives:
The objectives of this course are:

1.	To get familiar with the basic concepts of C programming.
2.	To design programs using arrays, strings, pointers and structures.
3.	To illustrate the use of Stacks and Queues
4.	To apply different operations on linked lists.
5.	To demonstrate Binary search tree traversal techniques.
6.	To design searching and sorting techniques.

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	Demonstrate basic concepts of C programming language.
2	Develop C programs using functions, arrays, structures and pointers.
3	Illustrate the concepts Stacks and Queues.
4	Design operations on Linked lists.
5	Apply various Binary tree traversal techniques.
6	Develop searching and sorting methods

Week l
Write C programs that use both recursive and non-recursive functions
    i)   To find the factorial of a given integer.
    ii)   To find the GCD (greatest common divisor) of two given integers.
    iii)   To solve Towers of Hanoi problem.

Week 2
a) Write a C program to find both the largest and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
i) Addition of Two Matrices ii) Multiplication of Two Matrices

Week 3

a) Write a C program that uses functions to perform the following operations:
i) To insert a sub-string in to a given main string from a given position.
ii) To delete n characters from a given position in a given string.

Week 4

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
 b) Write a C program to count the lines, words and characters in a given text.

Week 5
a)   Write a C Program to perform various arithmetic operations on pointer variables.
b)   Write a C Program to demonstrate the following parameter passing mechanisms:
      i) call-by-value   ii) call-by-reference
Week 6

Write a C program that uses functions to perform the following operations:
    i)   Reading a complex number
    ii)   Writing a complex number
    iii)   Addition of two complex numbers
    iv)   Multiplication of two complex numbers
    (Note: represent complex number using a structure.)

Week 7
Write C programs that implement stack (its operations) using
i)   Arrays
ii)   Pointers

Week 8
 Write C programs that implement Queue (its operations) using
 i)   Arrays
 ii)   Pointers

Week 9
 Write a C program that uses Stack operations to perform the following:
i)   Converting infix expression into postfix expression
ii)   Evaluating the postfix expression

Week 10
Write a C program that uses functions to perform the following operations on singly linked list.
i) Creation   ii) Insertion   iii) Deletion   iv) Traversal

Week 11
Write a C program that uses functions to perform the following operations on Doubly linkedlist.
i) Creation   ii) Insertion   iii) Deletion   iv) Traversal

Week 12
Write a C program that uses functions to perform the following operations on circular linkedlist.
i) Creation   ii) Insertion   iii) Deletion   iv) Traversal

Week 13
Write a C program that uses functions to perform the following:
i) Creating a Binary Tree of integers
ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 14
Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers:
i)   Linear search
ii)   Binary search

Week 15
Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
i)   Bubble sort
ii)   Selection sort
iii)   Insertion sort

Text Books:
1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.

2. B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.

3. Richard F. Gilberg& Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:
1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.

2. E.Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.

3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.

4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

(Common to all branches of Engineering except CSE)

Course Code		L	T	P	C
20A15102	**Differential Equations and Vector Calculus**	**3**	**0**	**0**	**3**

Pre-requisite   **Semester -II**

Course Objectives:
The objectives of this course are:

1.	To enlighten the students in the techniques to solve differential equations.
2.	To enable the students to use differential equations in various real world applications of engineering

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	solve the differential equations related to various engineering fields.
2	Identify solution methods for partial differential equations that model physical processes.
3	interpret the physical meaning of different operators such as gradient, curl and divergence
4	estimate the work done against a field, circulation and flux using vector calculus.
5	

UNIT – I

Linear differential equations of higher order:
Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT - II
Applications of Linear Differential Equations:
Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications to L-C-R Circuit problems and Mass spring system.

UNIT – III :

Partial Differential Equations: First order partial differential equations, solutions of first order linear and non-linear PDEs.Solutions to homogenous and non-homogenous higher order linear partial differential equations

UNIT - IV
Vector differentiation :

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT - V
Vector integration :

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Textbooks:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books:
1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B.Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
6. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
7. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
8. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
9. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
10. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
11. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
12. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

CourseCode		L	T	P	C
20A15203	**ENGINEERING PHYSICS**	**3**	**0**	**0**	**3**

UNIT – I :

Wave Optics :
Interference-Principle of superposition –Interference of light – Conditions for sustained interference– Interference in thin films (Reflection Geometry)– Colors in thin films – Newton's Rings- Determination of wavelength and refractive index.
Diffraction-Introduction– Fresnel and Fraunhofer diffraction– Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.
Polarization-Introduction– Types of polarization – Polarization by reflection, refraction and double refraction – Nicol's Prism – Half wave and Quarter wave plateswith applications.

UNIT – II :
Lasers and Fiber optics :
Lasers-Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Applications of lasers
Fiber optics-Introduction –Principle of optical fiber – Acceptance Angle– Numerical Aperture – Classification of optical fibers based on refractive index profile and modes –Propagation of electromagnetic wave through optical fibers–Propagation Losses (Qualitative) – Applications.

UNIT – III
Engineering Materials :
Dielectric Materials-Introduction– Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarization (Qualitative) – Lorentz internal field– Clausius-Mossotti equation.

Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para & Ferro– Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.
Nanomaterials- Introduction – Surface area and quantum confinement – Physical properties: electrical and magnetic properties – Synthesis of nanomaterials: Top-down: Ball Milling – Bottom-up: Chemical Vapour Deposition – Applications of nanomaterials.

UNIT - IV
Acoustics and Ultrasonics :
Acoustics- Introduction – Requirements of acoustically good hall– Reverberation – Reverberation time – Sabine's formula (Derivation using growth and decay method) – Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedies.
Ultrasonics- Introduction – Properties – Production by magnetostriction and piezoelectric methods – Detection – Acoustic grating – Non Destructive Testing – Pulse echo system through transmission and reflection modes – Applications

UNIT - V
Crystallography and X-ray diffraction :

Crystallography- Space lattice,Basis, unit cell and lattice parameters – Bravais Lattice – Crystal systems –Packing fraction– Coordination number– Packing fraction of SC,BCC & FCC – Miller indices – Separation between successive (hkl) planes.
X-Ray Diffraction- Bragg's law – Bragg's X-ray diffractometer – Crystal structure determination by Powder method.

Textbooks:
1.Engineering Physics – Dr. M.N. Avadhanulu&Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.

Reference Books:
Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
Engineering Physics – K. Thyagarajan, McGraw Hill Publishers
Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
Engineering Physics – M.R. Srinivasan, New Age Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

(Common to CE, MECH)

Course Code		L	T	P	C
20A155501	**COMMUNICATIVE ENGLISH**	**3**	**0**	**0**	**3**

Pre-requisite   **Semester -II**

Course Objectives:
The objectives of this course are:

1.	Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
2.	Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
3.	Help improve speaking skills through participation in activities such as role plays,discussions and structured talks/oral presentations
4.	Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5.	Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2	Apply grammatical structures to formulate sentences and correct word forms
3	Analyze discourse markers to speak clearly on a specific topic in informal discussions
4	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
5	Create a coherent paragraph interpreting a figure/graph/chart/table

UNIT – I

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself

and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Reading for Writing :**Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

UNIT - II
Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

UNIT - III
Lesson: The Death Trap: Saki

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed   **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.**Writing:** Summarizing, Paragraph Writing **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

UNIT - IV
Lesson: Innovation: Muhammad Yunus

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters/Report Writing **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice

UNIT - V
Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Textbooks:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Raymond Murphy's *English Grammar in Use*Fourth Edition (2012) E-book
- Hewings, Martin. *Cambridge Academic English (B2).* CUP, 2012.
- Oxford Learners Dictionary, 12th Edition, 2011
- Norman Lewis *Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary* (2014)
- *Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words* by David Butler

Online Learning Resources:

- www.englishclub.com
- www.easyworldofenglish.com
- www.languageguide.org/english/
- www.bbc.co.uk/learningenglish
- www.eslpod.com/index.html
- www.myenglishpages.com

Course Code		L	T	P	C
20A10101	**STRENGTH OF MATERIALS-I**	3	0	0	3

Pre-requisite   **Semester -II**

Course Objectives:

The objectives of this course are:

1.	To make the student understand how to resolve forces and moments in a given system
2.	To demonstrate the student to determine the centroid and second moment of area
3.	To impart procedure for drawing shear force and bending moment diagrams for beams.
4.	To make the student able to analyze flexural stresses in beams due to different loads.
5.	To enable the student to apply the concepts of strength of materials in engineering applications and design problems.

Course Outcomes (CO):

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

1	Understand the different types of couples and force systems
2	Determine the centroid and moment of inertia for different cross-sections
3	Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli and strain energy.
4	Develop shear force and bending moment diagrams for different load cases.
5	Compute the flexural stresses for different loading cases and different cross-sections.

UNIT – I

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial systems- Analysis of trusses by Method of Joints & Sections- **Friction**: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions -Motion of Bodies.

UNIT - II
Centroid and Center of Gravity: Introduction – Centroids of rectangular, circular, I, L and T sections - Centroids of built up sections. **Area moment of Inertia**: Introduction – Definition of Moment of Inertia of rectangular, circular, I, L and T sections - Radius of gyration. Moments of Inertia of Composite sections

UNIT - III
Simple Stresses and Strains:
Types of stresses and strains – Hooke's law – Stress – strain diagram for mild steel – working stress – Factor of safety – lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of Varying section – Composite bars – Temperature stresses. Strain energy – Resilience – Gradual, Sudden, impact and shock loadings – simple applications.

UNIT - IV
Shear Force and Bending Moment:
Definition of beam – types of beams – Concept of Shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over changing beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at section of a beam

UNIT - V
Flexural Stresses:
Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/Y = E/R$ – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hallow), I, T, Angle and Channel Sections – Design of simple beam sections.

Textbooks:
1. R.K Bansal, Engineering Mechanics, Lakshmi Publications.
2. R. Subramanian, Strength of Materials, Oxford University Press.

Reference Books:

1. Shesagiri Rao, Engineering Mechanics, Universities Press, Hyderabad.
2. S. Timoshenko, D.H. Young and J.V. Rao, Engineering Mechanics, Tata McGraw-Hill Company.
3. R. K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd.
4. Sadhu Singh, Strength of Materials, Khanna Publishers 11th edition 2015

Online Learning Resources:

(Common to CE, MECH, CHEM)

Course Code		L	T	P	C
20A10301	**Engineering Drawing**	**1**	**0**	**2**	**2**

Pre-requisite   **Semester -II**

Course Objectives:
The objectives of this course are:

1.	Bring awareness that Engineering Drawing is the Language ofEngineers.
2.	Familiarize how industry communicates technicalinformation.
3.	Teach the practices for accuracy and clarity in presenting the technicalinformation.
4.	Develop the engineering imagination essential for successfuldesign.

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	draw various curves applied in engineering.
2	show projections of solids and sections graphically.
3	draw the development of surfaces of solids.

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Drawing and its significance-Conventions in drawing-lettering - BIS conventions. a)Conic sections including the rectangular hyperbola- general methodonly,b) Cycloid, epicycloids andhypocycloid c) Involutes

UNIT - II
Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

UNIT - III
Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliaryviewsmethod.

UNIT - IV

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

UNIT - V

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Textbooks:
1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers,2016.

Reference Books:

1. Dr K.Prahlada Rao, Dr. S. Krishnaiah, Prof.A.V.S. Prasad, Engineering Graphics, Amaravati publications.
2. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right,2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers,2000
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009
5. K.C.John, Engineering Graphics, 2/e, PHI,2013
6. Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Online Learning Resources:

1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

(Common to CE, MECH, CHEM)

Course Code		L	T	P	C
20A10302	**Engineering Graphics Lab**	**0**	**0**	**2**	**1**

Pre-requisite   **Semester -II**

Course Objectives:
The objectives of this course are:

1.	Instruct the utility of drafting & modelling packages in orthographic and isometric drawings.
2.	Instruct graphical representation of machinecomponents.

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	Use computers as a drafting tool.
2	Draw isometric and orthographic drawings using CAD packages.

Computer Aided Drafting:

Introduction to Geometric Modeling: Basic drawing and editing commands:
line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving,
copying, rotating, scaling, mirroring, layers, templates, polylines, trimming,
extending, stretching, fillets,arrays,dimensions.
Dimensioning principles and conventional representations.
Orthographic Projections: Systems of projections, conventions and application to
orthographic projections - simple objects.
Isometric Projections: Principles of isometric projection- Isometric scale;
Isometric views: lines, planes, simple solids.

Textbooks:
1. K. Venugopal, V.Prabhu Raja, Engineering Drawing + Auto Cad, New Age International Publishers.
2. Kulkarni D.M, AP Rastogi and AK Sarkar, Engineering Graphics with Auto Cad, PHI Learning, Eastern Economy editions.

Reference Books:

1. T. Jayapoovan, Engineering Graphics using Auto Cad, Vikas Publishing House
2. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
3. Linkan Sagar, BPB Publications, Auto Cad 2018 Training Guide.
4. K.C.John, Engineering Graphics, 2/e, PHI,2013
5. Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Online Learning Resources:

Additional Sources: 1. Youtube: http-sewor,Carleton.cag, kardos/88403/drawings.html conic sections-online, red woods.edu.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
(Common to CE, MECH)

Course Code		L	T	P
20A15502	**COMMUNICATIVE ENGLISH LABORATORY**	0	0	3

Pre-requisite   **Semester -II**

Course Objectives:

The objectives of this course are:

1.	students will be exposed to a variety of self instructional
2.	students will learn better pronunciation through stress
3.	students will be trained to use language effectively to face interviews
4.	students will be initiated into greater use of the computer in resume preparation
5.	

Course Outcomes (CO):

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

1	Listening and repeating the sounds of English Language
2	Understand the different aspects of the English language proficiency with empha on LSRW skills
3	Apply communication skills through various language learning activities
4	Analyze the English speech sounds, stress, rhythm, intonation and syllable

5	Evaluate and exhibit acceptable etiquette essential in social and professional settings

UNIT – I

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons

UNIT - II

1. Role Play or Conversational Practice
2. JAM
3. Etiquettes of Telephonic Communication

UNIT - III
1. Information Transfer
2. Note Making and Note Taking
3. E-mail Writing

UNIT - IV
1. Group Discussions
2. Resume Writing
3. Debates

UNIT - V
1. Oral Presentations
2. Poster Presentation
3. Interviews Skills

Suggested Software

- Orell
- Walden Infotech
- Young India Films

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Online Learning Resources:

- **www.esl-lab.com**
- **www.englishmedialab.com**
- www.englishinteractive.net

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
(Civil, Mechanical, Chemical)
Semester -II

Course Code		L	T	P	C
20A15204	**Engineering Physics Laboratory**	**0**	**0**	**3**	**1.5**

List of Engineering Physics Experiments
1. Determine the thickness of the wire using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. Determination of particle size using LASER.
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
8. Determination of dielectric constant by charging and discharging method.
9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
10. Measurement of magnetic susceptibility by Gouy's method
11. Study the variation of B versus H by magnetizing the magnetic material (B-H

curve)
12. Determination of ultrasonic velocity in liquid (Acoustic grating)
13. Sonometer: Verification of the three laws of stretched strings
14. Determination of spring constant of springs using Coupled Oscillator
15. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
Semester -II

Subject Code	Title of the Subject	L		P	C
20A10103	**STRENGTH OF MATERIALSLABORATORY**	0	0	3	1.5

Course objectives: By the end of this course student will be able to
1. To determine the tensile strength and yield parameters of mild steel
2. To find out flexural strengths of Steel/Wood specimens and measure deflections
3. To determine the torsion parameters of mild steel bar
4. To determine the hardness numbers, impact and shear strengths of metals
5. To determine the load-deflection parameters for springs

LIST OF EXPERIMENTS :

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
5. Hardness test.
6. Compression test on Open coiled springs
7. Tension test on Closely coiled springs
8. Compression test on wood/ concrete
9. Izod / Charpy Impact test on metals
10. Shear test on metals
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

Course Outcomes:

1. Conduct tensile strength test and draw stress-strain diagrams for ductile metals
2. Perform bending test and determine load-deflection curve of steel/wood
3. Able to conduct torsion test and determine torsion parameters
4. Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths
5. Able to conduct tests on closely coiled and open coiled springs and calculate deflections

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
(Common to All Branches of Engineering)
SEMESTER-II

(Common to CE, MECH, CHEM)

Subject Code	Title of the Subject	L	T	P	C
20A19101	Universal Human Values	3	0	0	0

Learning Objectives:

1. Exposure to the value of life, society and harmony
2. Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
3. Bringing transition from the present state to Universal Human Order
4. Instill commitment and courage to act.
5. Know about appropriate technologies and management patterns

COURSE OUTCOME:

1. Define terms like Natural Acceptance, Happiness and Prosperity
2. Understand awareness of oneself, and ones surroundings (family, society, nature)
3. Apply what they have learnt to their own self in different day-to-daysettings in real life
4. Relate human values with human relationship and human society.
5. Justify the need for universal human values and harmonious existence

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Universal Human Values-I - Self-Exploration - content and process; 'Natural Acceptance' and Experiential Validation - self-exploration - Continuous Happiness and Prosperity - Human Aspirations - current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself!
human being as a co-existence of the sentient 'I' and the material 'Body' - the needs - happiness and physical facility -the Body as an instrument of 'I' - the characteristics and activities of 'I' and harmony in 'I' - the harmony of I with the Body

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Values in human relationship; meaning of Justice; Trust and Respect; Difference between intention and competence; the other salient values in relationship - the harmony in the society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

the harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all- pervasive space - Holistic perception of harmony at all levels of existence.

Unit 5: Implications of the above Holistic Understanding of Harmony on

Professional Ethics

Humanistic Education - Competence in professional ethics: professional competence - people friendly and eco-friendly production systems - appropriate technologies and management patterns for above production systems. Individuals as socially and ecologically responsible engineers, technologists and managers

Textbooks :
1. *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. Teachers' Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

ReferenceBooks

.JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999
1. HumanValues,A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004.
2. The Story of Stuff (Book).
3. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal
4. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
5. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland(English)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)**

(Common to CE, CHEM)

Course Code		**L**	**T**	**P**

20A35101	**Numerical Methods and Probability Theory**	3	0	0	3

Pre-requisite   **Semester -III**

Course Objectives:

The objectives of this course are:

	This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.The theory of Probability and random variables.

Course Outcomes (CO):

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

1	apply numerical methods to solve algebraic and transcendental equations
2	derive interpolating polynomials using interpolation formulae
3	Solve differential and integral equations numerically
4	apply Probability theory to find the chances of happening of events.
5	understand various probability distributions and calculate their statistical constants.

UNIT – I

Solution of Algebraic & Transcendental Equations:
Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method
System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.
UNIT - II
Interpolation
Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula

UNIT - III
Numerical Integration & Solution of Initial value problems to Ordinary differential equations:
Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's
Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

UNIT - IV
Probability theory:
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT - V
Random variables & Distributions:
Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution

Textbooks:
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

Reference Books:
1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. nptel.ac.in/courses/117101056/17
3. http://nptel.ac.in/courses/111105090

Course Code		L	T	P	C
20A30101	**STRENGTH OF MATERIALS – II**	**3**	**0**	**0**	**3**

Pre-requisite   **Semester -III**

Course Objectives:
The objectives of this course are:

1.	To teach the student with basic concepts for determination of principal stresses and strains in various structural elements.
2.	To calculate deflection in beams, column and trusses.
3.	To demonstrate analytical methods for determining strength & stiffness and assess stability of structural members.
4.	To make the student analyze circular shafts subjected to torsion.
5.	To make the student determine critical loads for columns with different end conditions.

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	To understand the principal stresses and principal planes.
2	To determine deflection at any point on a beam under simple and combined loads
3	To understand the systematic methods for find out the strength and stiffness of structural members
4	To analyze members under torsion, deformation in springs
5	To know the effect of eccentricity of load in columns, apply failure criteria to implement in design of structural members.

UNIT – I

Compound Stresses and Strains:
Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr

circle of stress, and its applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain.

SHEAR STRESSES: Derivation of formula for Shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections.

UNIT - II
 Deflection of Beams: Uniformbending – Slope, deflection and radius of curvature – Differential equation for elastic line of a beam – Double integration and Macaulay's methods. Determination of slope and deflection for cantilever and simply supported beams under point loads, U.D.L. uniformly varying load-Mohr's theorems – Moment area method – Application to simply supported and overhanging beams- Analysis of propped cantilever beams under UDL and point loads

UNIT - III
 Torsion: Theory of pure torsion – Assumptions and Derivation of Torsion formula for circular shaft – Torsional moment of resistance – Polar section modulus – Power transmission through shafts – Combined bending and torsion –. Springs -Types of springs – Deflection of close coiled helical springs under axial pull and axial couple – Carriage or leaf springs

UNIT - IV
Direct and Bending stresses:
Introduction-eccentric loading – Columns with eccentric loading – Symmetrical columns with eccentric loading about one axis –About two axes – Unsymmetrical columns with eccentric loading – Limit of eccentricity.

Theories of failure:
Maximum Principal stress theory- Maximum shear stress theory- Maximum strain theory- Maximum strain energy theory-Maximum distortion energy theory

UNIT - V
Columns and Struts:
 Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

Textbooks:
1. Mechanics of Materials – Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
2. Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
3. Strength of Materials by Dr. Sadhu Singh, Khanna Publishers.

Reference Books:

1) R. K. Bansal, A Text book of Strength of materials, Laxmi Publications (P) Ltd., New Delhi.
2) Strength of Materials, Fourth edition, S.S. Bhavikatti, Vikas Publishing House, Pvt. Ltd.
3) D. S. Parkas Rao Strength of Materials by, Universities Press Pvt Ltd, Hyderabad.
4) Schaum's outline series Strength of Materials, Mc Graw hill International Editions.
5) L.S. Srinath, Strength of Materials, Macmillan India Ltd., New Delhi.
6) S. Basavarajaiah and P. Mahadevappa, Strength of Materials in SI units, Universities Press

Pvt Ltd, Hyderabad. 3rd Edition 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

Course Code		L	T	P	C
20A30102	**FLUID MECHANICS**	3	0	0	3

Pre-requisite   **Semester -III**

Course Objectives:
The objectives of this course are:

1.	To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
2.	To impart ability to solve engineering problems in fluid mechanics
3.	To enable the students measure quantities of fluid flowing in pipes, tanks and channels
4.	To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
5.	To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	Understand the principles of fluid statics, kinematics and dynamics
2	Familiarize basic terms used in fluid mechanics

3	Understand flow characteristics and classify the flows	
4	Apply the continuity, momentum and energy principles	
5	Estimate various losses in flow through channel	

UNIT – I

Basic concepts and definitions:
Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility.

UNIT - II
Fluid statics:
Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT - III
Fluid kinematics:
Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three -Dimensional continuity equations in Cartesian coordinates.

UNIT - IV
Fluid Dynamics:
 Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

UNIT - V
Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

Textbooks:
   1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House
     C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010
Reference Books:

1. Fluid Mechanics and Hydraulic Machines, S.C.Gupta, Pearson publication
2. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi.
3. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill
4. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
5. K. Subramanya, Open Channel flow, Tata Mc.Grawhill Publishers.
6. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill,New Delhi

Online Learning Resources:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU B.Tech (R-20 Civil Engineering)

Course Code		L	T	P	C
20A30103	**SURVEYING**	3	0	0	3

Pre-requisite   **Semester -III**

Course Objectives:

The objectives of this course are:

1.	To make the student to get well conversant with the fundamentals of various basic methods and instruments of surveying.
2.	To introduce to the students the techniques in Plane table surveyingand Levelling
3.	To identify reduced level of the ground and its profile for finding areas and volumes of embankments and cuttings
4.	To make the student to use angular measuring instruments for horizontal and vertical control

5.	To enable the student to set simple horizontal curves

Course Outcomes (CO):

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

1	To make the student to get well conversant with the fundamentals of various basic methods and instruments of surveying.
2	To introduce to the students the techniques in Plane table surveyingand Leveling
3	To identify reduced level of the ground and its profile for finding areas and volumes of embankments and cuttings
4	To make the student to use angular measuring instruments for horizontal and vertical control
5	To enable the student to set simple horizontal curves

UNIT – I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions Linear distances-Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections - Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

UNIT - II
Plane table surveying: Introduction – Methods of Plane Table Surveying **-**.**Levelling** - Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

UNIT - III
Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.
Computation of Areas and Volumes: Areas - Determination of areas consisting of irregular boundary and regular boundary, Planimeter. Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - IV
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.
Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT - V
Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry. **Curves**: Types of curves and their necessity, elements of simple circular curve,

setting out of simple horizontal circular curves - Basics of Total Station .

Textbooks:
1. C.Venkatramaiah, "Text book of surveying", 2nd edition, Universities press, 2018
2. S K Duggal, "Surveying" (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004

Reference Books:

1. Arora K R "Surveying" Vol 1, 2 & 3, Standard Book House, Delhi, 2004.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain,"Surveying" (Vol – 1, 2 & 3), - Laxmi Publications (P) ltd., New Delhi.
3. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
4. Bhavikatti "Surveying" Vikas publishing house ltd.
5. R. Agor Khanna Publishers 2015 "Surveying and leveling".
6. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.

Online Learning Resources:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

Course Code		L	T	P	C
20A30104	**CONCRETE TECHNOLOGY**	3	0	0	3

Pre-requisite   **Semester -III**

Course Objectives:
The objectives of this course are:

1.	To explain the functional role of ingredients of concrete and apply this knowledge to mix design philosophy
2.	To develop fundamental knowledge in the fresh and hardened properties of concrete
3.	To inculcate the testing methodology to evaluate the properties of concrete during fresh and hardened stage
4.	To impart the knowledge on the behavior of concrete with response to stresses developed.
5.	To impart the knowledge on the special concretes And design a concrete mix which fulfils the required properties for fresh and hardened concrete

Course Outcomes (CO):

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

1	To explain the functional role of ingredients of concrete and apply this knowledge to mix design philosophy
2	To develop fundamental knowledge in the fresh and hardened properties of concrete
3	To inculcate the testing methodology to evaluate the properties of concrete during fresh and hardened stage
4	To impart the knowledge on the behavior of concrete with response to stresses developed.
5	To impart the knowledge on the special concretes And design a concrete mix which fulfils the required properties for fresh and hardened concrete

UNIT – I

Ingredients of concrete:
Cement-chemical composition-hydration process-Bogue's compound-Tests on properties of cement-Types of cement - I.S. Specifications. Aggregates- Classification of aggregate – Tests on properties of aggregates - characteristics of aggregate - I.S. Specifications. Water-Quality of water - Characteristics of water - I.S. Specifications. Admixtures – Classification of chemical admixtures – Properties and limitations – Classification of mineral admixtures – Properties and limitations - I.S. Specifications.

UNIT - II
Properties of concrete:
Fresh concrete: Mixing of concrete-Workability-Factors influencing workability- Measurement of workability for conventional concrete (Slump Cone, Compaction Factor and Vee-Bee test) & SCC (V-Funnel, L-Box, U- Box, Slump Flow and J–Ring). **Hardened concrete**: Water/Cement Ratio(Abram's Law)-Gel Space Ratio-Tests on hardened concrete-Destructive Tests (Compression, Split Tensile and Flexural)-Semi Destructive Tests (Core Cutter and Pull out test) and Non Destructive Tests (Rebound Hammer-UPV - Radiological methods) .

UNIT - III

Elasticity, Shrinkage and Creep:
Curing of concrete -Methods of curing-Effects of improper curing-self curing-Modulus of Elasticity-Poisson's Ratio-Dynamic Modulus of Elasticity- Shrinkage and various types -Factors Affecting Shrinkage-Moisture Movement-Creep of Concrete-Factors Influencing Creep.

UNIT - IV
Concrete Mix Design:
Proportioning of Concrete Mixes-Factors influencing - Road Note. No. 4 and IS Code Methods-IS 456 provisions on Durability-Quality Control and Statistical Methods – Mix Design of High Strength concrete (using ACI method).

UNIT - V
Special Concretes:
Light Weight Concretes –Light Weight Aggregate Concrete- Cellular Concrete - No Fines Concrete-High Density Concrete – Fiber Reinforced Concrete-Polymer Concrete-Self Compacting Concrete and its Mix Design using EFNARC guidelines.

Textbooks:
1. A. M. Neville,"Properties of Concrete", Pearson Publication – 4th Edition
2. M.S. Shetty, A. K. Jain, "Concrete Technology Theory and Practice", S. Chand and Company Limited, New Delhi

Reference Books:
1. M. L. Gambhir, "Concrete Technology", Tata Mc. Graw Hill Publishers, New Delhi
2. N. Krishna Raju, "Design of Concrete Mixes", CBS Publishers.
3. P. K. Mehta And J. M. Monteiro, "Concrete: Micro Structure, Properties and Materials" Mc-Graw Hill Publishers
4. J. Prasad, C.G.K. Nair, "Non-Destructive Test and Evaluation of Materials", Tata Mcgraw Hill Publishers, New Delhi

Online Learning Resources:

Course Code		L	T	P	C
20A35104	**Exploratory Data Analysis Lab**	**0**	**0**	**3**	**1.5**

Pre-requisite   **Semester –III**

COURSEDESCRIPTION: StatisticalandNumericalTechniques–
Measuresofcentraltendency/dispersion, Curve fitting by method of least squares, linear regression and correlation,ANOVA; Data analysis using R, NumericalSolution of algebraic, transcendental and ordinarydifferentialequations,Inverseand Eigenvalues ofamatrix– Numerical method.

CEO 1: To impart knowledge on the application of Statistical and Numerical techniques – analysisof data, solution of algebraic, transcendental and differential equations, Matrices, transformationfromtimedomain to frequencydomain.

CEO 2: To develop skills in analyzing the data using appropriate statistical tools, solving algebraicand differential equations, matrices using appropriate numerical methods, obtaining amplitude andfrequencyofatimesignal

COURSE OUTCOMES: After completion of the course, a successful student is able to

CO1 : Developskills in designingappropriatestatistical method for
    (a) Determiningthemeasuresofcentraltendency/dispersion.
    (b) Box plotrepresentationusingOriginSoftware.
    (c) Findingabestfitcurvetoa givensetofdata.
    (d) Determiningthecoefficientofcorrelationandlinearregression.

CO2:Develop skillsinusingsuitablestatisticaltechniquefor
    (a) Analyzingvariance(ANOVA)foronevariable.
    (b) DeterminationofRfunctionfora givensetofdata andappropriateinterpretation.
    (c) Representingthreedimensional datain contourplot usingMATLAB.

CO 3 : Transform a time signal / pulse to a frequency domain using concepts of

Fourier seriesCO4 : Develop skills usingsuitablenumerical techniquefor
    (a) Solvingalgebraic,transcendentalanddifferentialequations.
    (b) DeterminingEigenValuesanddominant Eigenvalueofamatrix.
    (c) Differentiation,integrationandsolutionofdifferentialequations.

LIST OF EXPERIMENTS

Required softwares: SPSS, ORIGIN, MATLAB, R-LAB, MS OFFICE 2010.

I. Statistical and Fourier series Techniques:

To a given set of data:
1. Determine measures of central tendency/dispersion - Mean, Median, Mode, Range and Variance; Box plot representation using Origin Software.
2. Fit a straight line, parabola, exponential curve.
3. Determine the coefficient of correlation and regression.
4. Analysis of variance (ANOVA) for one variable.
5. Determine R function and give interpretation.
6. Transforming signal in time domain into frequency domain.
7. Represent in contour plot using MATLAB.

II.   Numerical Techniques:

8. Solving algebraic and transcendental equations using Regula - Falsi and Newton - Raphson methods.
9. Determine the inverse of a matrix; solving system of algebraic equations using Gauss- Siedal method.
10. Determine the Eigen values of a matrix and dominant Eigen value by power method.
11. Numerical differentiation and integration.
12. Numerical solution of Ordinary differential equations - Modified Euler method & R-K fourth order method.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU

B.Tech (R-20 Civil Engineering)

Subject Code	Title of the Subject	L	T	P	C
20A30105	**SURVEYING LAB**	0	0	3	1.5

Semester-III

Course objectives:
1. To find the area of a given boundary through Plane Table Survey and solve two point problem
2. To determine the RLs of different points through fly leveling
3. To draw longitudinal and cross sections of Road profile
4. To determine the horizontal & vertical angles with a Theodalite and find heights and distances via Tachometry
5. To determine areas and remote heights using total station traversing

LIST OF EXPERIMENTS:

1. Plane table survey; finding the area of a given boundary
2. Two Point Problem by the plane table survey.
3. Fly leveling: Height of the instrument method and rise and fall method.
4. Fly leveling: Longitudinal Section and Cross sections of a given road profile.
5. Theodolite Survey: Determining the Horizontal and Vertical Angles
6. Finding the distance between two inaccessible points using Theodolite
7. Tachometric survey: Heights and distance problems using tachometric principles.
8. Total Station Determination of area using total station. Traversing and Contouring
9. Total Station: Determination of Remote height.
10. Developing a Contour map

Course Outcomes:

1. Conduct Plane Table Survey and determine areas and be able to solve two point problem
2. Perform fly leveling and determine RLs of different locations and draw contour maps
3. Able to use fly Levels and draw Longitudinal and Cross section profiles of Roads
4. Perform Theodalite survey and measure horizontal & vertical angles and compute heights and distances through Tachometry

5. Able to handle Total Station for complete survey of a given Topography

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU

B.Tech (R-20 Civil Engineering)

Semester-III

Subject Code	Title of the Subject	L	T	P	C
20A30106	**Concrete Technology Lab**	0	0	3	1.5

Course Objectives: By the end of this course student will be able to

1. To determine the Physical Properties such as Specific gravity, Grading curve and Bulking of Coarse and Fine Aggregates for use in concrete
2. To determine Physical properties of cement such as specific gravity, Fineness, soundness and consistency
3. To determine setting times of cement
4. To determine compressive strength of cement for its Grade
5. To determine workability and Compressive strength of Concrete

LABORATORY EXPERIMENTS

1. Grading Curve of Coarse aggregates and Fine aggregates
2. Bulking of Fine aggregate
3. Specific gravity of coarse aggregate and Fine aggregate
4. Specific gravity of Cement
5. Fineness and Soundness test of Cement
6. Normal Consistency of Cement
7. Initial and final setting times of Cement
8. Compressive Strength test of Cement
9. Workability Test on Fresh Concrete
10. Compressive Strength test of Concrete

Course Outcomes :

1. Conduct sieve analysis and other physical tests and draw the Grading curve & obtain

properties of given Coarse and Fine aggregate samples

2. Perform tests on cement and determine its specific gravity, Fineness, soundness and consistency

3. Able to perform setting time tests with Vicat Apparatus and determine the setting times
4. Conduct compressive strength test on cement and identify its Grade.
5. Conduct slump & compaction factor tests and compressive strength tests for assessing the quality of concrete in both fresh and hardened states

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)**

Semester-III

Subject Code	Title of the Subject	L	T	P	C
20A30107	**Building Planning and Drawing**	1	0	2	2

Course Objective:
To impart the practical knowledge in detailing and drawing of various components of building and Different types of Buildings.

1. Detailing & Drawing of Sign Conventions.
2. Detailing & Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators &Roofs.
7. Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building.
9. Drawing of Plan, Elevation & Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

Course Outcomes:
At the end of the course, the student will be able to apply the knowledge in detailing and drawing of various components of building and Different types of Buildings.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

Semester-III
(Common to CE, MECH, CHEM)

Subject Code	Title of the Subject	L	T	P	C
20A10803	**Environmental Science**	3	0	0	0

Course Objectives:

The objectives of this course are:

	To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by theengineers

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.
NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies

– Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT - II
ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of Biodiversity.

UNIT - III
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :
a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards
SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT - IV
SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT - V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Textbooks:

(1) Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by Palaniswamy – Pearson education
(3) Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

Reference Books:

(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Pubilishing House
(6) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

Semester-IV

Course Code		L	T	P	C
20A40101	**Geological Sciences for Civil Engineers**	3	0	0	3

Course Objectives:

The objectives of this course are:

1.	Type of rocks,civil engineering importance of rock forming minerals.
2.	Geological structures, reasons of formation for each type and their side effects on the engineering projects
3.	.Study ground water, factors affecting on the variation of water table depth methods of searching for ground water.
4.	Study the geophysical investigation methods
5.	Study the dams and geology of dam site.

Course Outcomes (CO):

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

1	To apply the geological knowledge to civil engineering. Constructions at different stages .The kind of study exposes the Geological drawbacks if any
2	To help the site engineers to take suitable precautionary measures to over come the drawbacks but also to take advantage of the site geology findings wherever possible. To take precautionary measures in civil engineering constructions based on geological parameters
3	To develop a native construction plan incorporating all relevant aspects of geology.
4	To know seismic and electrical methods to investigate the subsurface geology
5	To characterize of engineering properties of rocks and soils

UNIT – I

INTRODUCTION:
Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.
WEATHERING OF ROCKS: Its effect over the properties of rocks importance of weathering with REFERENCE to dams, reservoirs and tunnels weathering of common rock like "Granite"
MINERALOGY:
Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar , Quartz , Flint , Jasper, Olivine , Augite , Hornblende , Muscovite , Biotite , Asbestos, Chlorite , Kyanite , Garnet, Talc , Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite, Chrorite , Galena , Pyrolusite , Graphite, Magnesite, and Bauxite.
UNIT - II

PETROLOGY:
Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of Igneous. Sedimentary and Metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

STRUCTURAL GEOLOGY:
Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults un conformities, and joints – their important types. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India

UNIT - III

GROUND WATER, EARTH QUAKE & LAND SLIDES:-
Groundwater, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and land slides.

UNIT - IV

GEOPHYSICAL STUDIES:-
Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivitymethods, and seismic refraction methods. Improvement of competence of sites by grouting etc.

UNIT - V

GEOLOGY OF DAMS, RESERVOIRS AND TUNNELS:
Types of dams and importance of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors Contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs. Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (ie. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

Textbooks:
1. Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005
1. Engineering geology by Duggal, TMH Publishers.
2. Engineerring Geology by Vasudev Kanthi, Universities press, Hyderabad.

Reference Books:
1. Engineerring geology by Prabinsingh, KatsonPubilcations
2. Engineering Geology by SubinoyGangopadhyay, Oxford University press.
3. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications
4. K. S. Valdiya, " Environmental Geology",, Tata Mc Grew Hills.

Course Code		L	T	P	C
20A40102	**STRUCTURAL ANALYSIS**	3	0	0	3

Pre-requisite   **Semester -IV**

Course Objectives:

The objectives of this course are:

1.	Ability to understand the concepts of various classical methods for indeterminate structures.
2.	Ability to analyse whether a structures is statically determinate or in-determinates.
3.	Ability to analyse statically determinate trusses, beams and frames and obtain internal reactions.
4.	Ability to determine shear and moment functions and diagrams for beams for beam structures.
5.	Ability to evaluate deflection of beams and frames using classical methods.

Course Outcomes (CO):

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

1	to understand the concepts of various classical methods for indeterminate structures.
2	to analyse whether a structures is statically determinate or in-determinates.
3	to analyse statically determinate trusses, beams and frames and obtain internal reactions.
4	to determine shear and moment functions and diagrams for beams for beam structures.
5	to evaluate deflection of beams and frames using classical methods.

UNIT – I

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-Deflections of simple beams and pin jointed trusses.

UNIT - II
ANALYSIS OF INDETERMINATE STRUCTURES: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's theorem.

UNIT - III
FIXED BEAMS & CONTINUOUS BEAMS : Introduction to statically indeterminate beams with 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 – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT - IV
SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations-application to continuous beams with and without settlement of supports - Analysis of single bayportal frames without sway.

UNIT - V
MOMENT DISTRIBUTION METHOD: Introduction to moment distribution method-Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames without sway.

Textbooks:
  (1) Analysis of Structures – Vol-I&II by V.N.Vazirani&M.M.Ratwani, Khanna Publications, New Delhi.
  (2) Structural Analysis by S SBhavikatti – Vikas Publishing House.
  (3) Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.

Reference Books:
  (1) Structural analysis – Hibbler – Pearson education
  (2) Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
  (3) Structural Analysis – D.S.Prakasarao - Univeristy press.
  (4) Introduction To Structural Analysis-Nautial- New Age Pubilishers
  (5) Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, NewDelhi.
  (6) Structual analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.P Perumal – Laxmi publications.
  (7) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.

Online Learning Resources:

Course Code		L	T	P	C
20A40103	**HYDRAULICS AND HYRAULIC MACHINERY**	**3**	**0**	**0**	**3**

Pre-requisite   **Semester -IV**

Course Objectives:
The objectives of this course are:

1.	To Introduce concepts of laminar and turbulent flows
2.	To teach principles of uniform flows through open channel.
3.	To teach principles of non-uniform flows through open channel.
4.	To impart knowledge on design of turbines.
5.	To impart knowledge on design of pumps

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	Understand characteristics of laminar and turbulent flows.
2	Analyze characteristics for uniform flows in open channels.
3	Analyze characteristics for non-uniform flows in open channels.
4	Design different types of turbines
5	Design centrifugal and multi stage pumps.

UNIT – I

Laminar & Turbulent flow in pipes:
Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram – Introduction to boundary layer theory.

UNIT - II
Uniform flow in Open Channels:
Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections**:** Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors

UNIT - III
Non-Uniform flow in Open Channels:

Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

UNIT - IV
Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency

Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

UNIT - V
pumps:

Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies

Textbooks:
1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House
2. K. Subramanya, Open channel Flow, Tata McGraw Hill.

Reference Books:
1. Rajput, Fluid mechanics and fluid machines , S. Chand & Co
2. D. S. Kumar Fluid Mechanics & Fluid Power Engineering, Kataria& Sons.
3. Srinivasan, Open channel flow by, Oxford University Press
4. Banga & Sharma, Hydraulic Machines, Khanna Publishers.
5. Fluid Mechanics and Hydraulic Machines, S.C.Gupta, Pearson publications,
6. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi

Online Learning Resources:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

Course Code		L	T	P	C
20A40104	**ENVIRONMENTAL ENGINEERING**	3	0	0	3

Pre-requisite   **Semester -IV**

Course Objectives:
The objectives of this course are:

1.	To teach requirements of water and its treatment.
2.	To impart knowledge on sewage treatment methodologies
3.	To impart knowledge on basic concepts about sewerage system
4.	To enable with design concepts of wastewater treatment UNITs
5.	To throw light on importance of plumbing

Course Outcomes (CO):
On Completion of the course, the students will be able to:

1	The student will be able toUnderstand about quality of water and purification process
2	The student will be able toSelect appropriate technique for treatment of waste water.
3	The students would estimate sewage Generation,Understand the Characteristics and Composition of sewage
4	The student will be able toUnderstand consequences of solid waste and its management
5	The student will be able toDesign domestic plumbing systems.

UNIT – I

Water quality and treatment:

Water quality: Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system
Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes

UNIT - II
Sewage and Treatment-I

Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems

UNIT - III
Sewage and Treatment-II

Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment – COD & BOD- Aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – Quality requirements for various purposes.

UNIT - IV
Solid Waste Management-

Municipal solid waste-Composition - Chemical and physical parameters - Collection, transport, treatment and disposal. waste from commercial establishments and other urban zones- Construction activities - Biomedical wastes, Effects of solid waste on environment. Disposal of solid waste- Disposal methods- Integrated solid waste management.

UNIT - V
Domestic Plumbing

Types of home plumbing systems for water supply and waste water disposal, high rise building plumbing-Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings. Role of Government authorities in water supply, sewerage disposal.

Textbooks:
1. G. S. Birdi,"Water supply and sanitary Engineering", Dhanpat Rai & Sons Publishers.
2. Peavy, H.S, Rowe, D. R. Tchobanoglous, "Environmental Engineering", Mc-Graw –Hill International Editions, New York 1985.

Reference Books:
1. B.C. Punmia, Ashok Jain & Arun Jain, "Water Supply Engineering", Vol. 1, Waste water Engineering, Vol. II, Laxmi Publications Pvt. Ltd, New Delhi.
2. MetCalf and Eddy,"Wastewater Engineering", Treatment, Disposal and Reuse, Tata McGraw- Hill, New Delhi.
3. S. M. Patil, "Plumbing EngineeringTheory, Design and Practice",1999.
4. K. N. Duggal, "Elements of Environmental Engineering", S. Chand Publishers.

Online Learning Resources:

Course Code		L	T	P	C
20A49101a	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	3	0	0	3

Pre-requisite   **Semester -IV**

Course Objectives:

The objectives of this course are:

1.	To inculcate the basic knowledge of micro economics and financial accounting
2.	To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
3.	To know the various types of Market Structures & pricing methods and its strategies
4.	To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5.	To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

UNIT – I

Managerial Economics
Introduction – Nature, meaning, significance, functions and advantages. Demand-Concept, Function, Law of Demand – DemandElasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to
State the Nature of Managerial Economics and its importance
   ➢ Understand the concept of demand andits determinants
   ➢ Analyze the Elasticity and degree of elasticity
   ➢ EvaluateDemand forecasting methods
   ➢ Design the process of demand estimation for different types of demand

UNIT - II
Production and Cost Analysis
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination–Shortrun and longrun Production Function- Isoquants andIsocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost&Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - III
Business Organizations and Markets
Introduction – Nature, meaning, significance, functions and advantages.Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

UNIT - IV
Capital Budgeting
Introduction – Nature, meaning, significance, functions and advantages. Typesof Working Capital,Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals,Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT - V
Financial Accounting and Analysis
Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis -* Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:
1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

(Common to All Branches)

Course Code		L	T	P	C
20A49101b	**ENTREPRENEURSHIP& INCUBATION**	3	0	0	3

COURSE OBJECTIVES: The objective of this course is	
1	To make the student understand about Entrepreneurship
2	To enable the student in knowing various sources of generating new ideas in setting up ofnew enterprise
3	To facilitate the student in knowing various sources of finance in starting up of a business
4	To impart knowledge about various government sources which provide financial

	assistance to entrepreneurs/ women entrepreneurs
5	To encourage the student in creating and designing business plans

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Concepts related to the Entrepreneurship and Incubators
CO2	Understand the concept of Entrepreneurship and challenges in the world of competition.
CO3	Apply the Knowledge in generating ideas for New Ventures.
CO4	Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO5	Evaluate the role of central government and state government in promoting Entrepreneurship.
CO6	Create and design business plan structure through incubations.

UNIT-I: Entrepreneurship

Introduction-Nature, meaning, significance, functions and advantages. concept, characteristics-knowledge and skills requirement - process - Factors supporting entrepreneurship - Differences between Entrepreneur and Intrapreneur - entrepreneurial mindset and personality - Recent trends.

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to
 - ➢ Understand theconcept of Entrepreneur and Entrepreneurship in India
 - ➢ Analyzerecent trends in Entrepreneurship across the globe
 - ➢ Develop a creative mind set and personality in starting a business.

UNIT-II: Women Entrepreneurship

Introduction – Nature, meaning, significance, functions and advantages. Growth of women entrepreneurship in India. - Issues & Challenges - Entrepreneurial motivations.Entrepreneurship Development and Government. Role, of Central and State Government - incentives, subsidies and grants – Export-oriented Units - Fiscal and Tax concessions.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to
 - ➢ Understand the role of government in promoting women entrepreneurship
 - ➢ Analyze the role of export-oriented units
 - ➢ Evaluate the tax concessions available for Women entrepreneurs

UNIT-III:Product Development

Introduction – Nature, meaning, significance, functions and advantages. Startup Initiatives - Generating business/ Service idea – Sources and methods –Identifying opportunities - Feasibility study - Market feasibility, technical/operational feasibility, Financial feasibility. Developing business plan, Preparing project report, Presenting business plan to investors.

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to
 - ➢ Analyze the sources of new methods in generating business idea
 - ➢ Evaluate market feasibility, financial feasibility and technical feasibility
 - ➢ Design and draw business plansinproject preparation and prepare project reports

UNIT-IV:Startups

Introduction – Nature, meaning, significance, functions and advantages. Fundamentals of Business

Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence theType/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure -Value proposition

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to:
 ➢ Understand the importance of business incubation
 ➢ Apply brilliant ideas in the process of business incubation
 ➢ Analyze the process of business incubation/incubators.
 ➢ Design their own business incubation/incubators as viable-business unit.

UNIT-V: Finance

Introduction – Nature, meaning, significance, functions and advantages. Sources - Long term and Short term - Institutional Finance – Commercial Banks, SFC's and NBFC's in India, Role in small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey-Institutions supporting entrepreneurship development.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to
 ➢ Understand the various sources of finance in Starting the new venture
 ➢ Analyze the role of banks and other financial institutions in promoting entrepreneurship in India
 ➢ Evaluatethe need and importance of MSMEs in the growth of country

TEXT BOOKS

 1. D F Kuratko and T V Rao, **Entrepreneurship** - A South-Asian Perspective –
 Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit :login.cengage.com)
 2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

REFERENCES

1.Vasant Desai,Small Scale Industries and Entrepreneurship, Himalaya
Publishing 2012.
2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.
3.B.JanakiramandM.Rizwana‖ Entrepreneurship Development: Text &
Cases, Excel Books, 2011.
4.Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
E-RESOURCES
1. Entrepreneurship-Through-the-Lens-of-enture Capital
 2.http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3.http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4.http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
(Common to All Branches)

Course Code		L	T	P	C
20A49101c	**BUSINESS ETHICS AND CORPORATE GOVERNANCE**	3	0	0	3

Course Objectives:

The objectives of this course are:

1.	To make the student understand the principles of business ethics
2.	To enable them in knowing the ethics in management
3.	To facilitate the student's role in corporate culture
4.	To impart knowledge about the fair-trade practices
5.	To encourage the student in creating knowing about the corporate governance

UNIT – I

ETHICS

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior - Value systems - Business Ethics,Types, Characteristics, Factors, Contradictions and Ethical Practices inManagement- Corporate Social Responsibility – Issues of Management – Crisis Management.

UNIT - II
ETHICS IN MANAGEMENT

Introduction Ethics in production, finance, Human Resource Management and, Marketing Management - Technology Ethics and Professional ethics - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

UNIT - III
CORPORATE CULTURE

Introduction, Meaning,definition,Nature, Scope, Functions,andsignificance–
Cross cultural issues in Ethics - - Emotional Honesty – Virtue of humility – Promote happiness –
karma yoga – proactive – flexibility and purity of mind. The Ethical Value System –
Universalism, Utilitarianism, Distributive
Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics –
Ethical Values in different Cultures, Culture and Individual Ethics.

UNIT - IV

LEGAL FRAME WORK

Law and Ethics, Agencies enforcing Ethical Business Behavior, Legal Impact– Environmental Protection, Fair Trade Practices,legal Compliances, Safeguarding Health and wellbeing of Customers.

UNIT - V
CORPORATE GOVERNANCE

Introduction, meaning – scope Nature - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work, corporate scams, committees in India and abroad, corporate social responsibility. of BoDs composition, Cadbury Committee - various committees - reports - Benefits and Limitations.

Textbooks:
1. Murthy CSV: Business Ethics and Corporate Governance, HPH
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH.

Reference Books:

1.Dr. K. Nirmala, KarunakaraReddy: Business Ethics and Corporate Governance, HPH

2. H.R.Machiraju: Corporate Governance

3. K. Venkataramana, Corporate Governance, SHBP.

4. N.M.Khandelwal : Indian Ethos and Values for Managers

Subject Code		L	T	P	C
20A40105	**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**	0	0	3	1.5

*OBJECTIVE:*By the end of this course student will be able
1. To determine coefficient of discharge for Venturimeter and orifice meter.
2. To determine coefficient of discharge for small orifice and mouth piece
3. To determine discharge co-efficient of Notches
4. To determine the efficiency of Pelton wheel Turbine and centrifugal pump
5. To evaluate impact of jets on vanes in different angles

LABORATORY EXPERIMENTS

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Performance test on Pelton wheel turbine.
10. Efficiency test on centrifugal pump.

Course Outcomes:-

1. Perform flow tests and determine coefficient of discharge for venturimeter and orifice meters
2. Conduct flow tests and determine Coefficient of discharge for a small orifice and external mouthpiece.
3. Perform tests on rectangular & triangular notches and evaluate flow regimes
4. Evaluate the efficiency of Pelton wheel turbine and centrifugal pumps

5. Conduct impact of jets test on Vanes located in different angles and draw velocitytriangles

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)
Semester-IV

Subject Code		L	T	P	C
20A40106	**ENVIRONMENTAL ENGINEERING LAB**	0	0	3	1.5

OBJECTIVES: The object of the course is to enable the students

1. To determine water quality parameters such as pH, conductivity, Alkalinity and Total Hardness

2. To determine chlorides content in water sample.
3. To determine COD and BOD values for water/waste water
4. To determine optimum coagulant dose for water treatment
5. To determine DO and chlorine demand

LABORATORY EXPERIMENTS
1. Determination of pH and Electrical Conductivity (Salinity) of Water.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of total solids.
6. Determination of Dissolved Oxygen with D.O. Meter &Wrinklers Method and B.O.D.
7. Physical parameters – Temperature, Color, Odour, Turbidity, Taste.
8. Determination of C.O.D.
9. Determination of Optimum coagulant dose.
10. Determination of Chlorine demand.

Course Outcomes (CO):

1. Conduct water quality tests and calculate pH, conductivity, Alkalinity and Total Hardness of given water sample

2. Perform tests and find out Chlorides content in a given water sample
3. Able to use apparatus and determine COD and BOD of water/waste water
4. Derive optimum coagulant dose for treatment of water/waste water
5. **Compute dissolved oxygen and chlorine demand from laboratory tests**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU B.Tech (R-20 Civil Engineering)

Semester-IV

Subject Code		L	T	P	C
20A40107	**GEOLOGICAL SCIENCES LAB**	0	0	3	1.5

Course Objectives
1. Enable the students to understand physical properties of minerals and identify the same
2. Familiarize the students with different igneous rocks & their properties and enable them to identify igneous rocks
3. Familiarize the students with different sedimentary rocks & their properties and enable them to identify such sedimentary rocks
4. Teach physical properties of different metamorphic rocks & their properties and enable them with skills to identify metamorphic rocks.
5. Drawing sections for geological maps showing tilted beds, faults, uniformities etc., and solve Simple Structural Geology problems.

.
List of Experiments:

1. Study of physical properties and identification of following minerals referred under theory.

   A) Feldspar B)Garnet C) Kyanite   D) Amethyst

2. Study of physical properties and identification of following minerals referred under theory.

   A) Talc   B) Muscovite Mica   C) Bauxite   D) Rose Quartz

3. Study of physical properties and identification of following minerals referred under theory.

   A) Asbestos   B) Magnetite   C) Pyrite   D) Flint

4. Study of physical properties and identification of following minerals referred under theory.

   A) Gypsum   B) Biotite Mica   C) Calcite   D) Smoky Quartz

5. Study of physical properties and identification of following minerals referred under theory.

   A) Graphite   B) Galena C) Transparent Quartz   D) Hematite

6. Megascopic description and identification of Igneous Rocks referred under theory.

   A) Granite   B) Dolerite C) Basalt D) Pink Granite E) Vesicular Basalt

7. Megascopic description and identification of Sedimentary Rocks referred under theory.

   A) Shale   B) Lime Stone   C) Sand Stone D) Conglomerate

8. Megascopic description and identification of Metamorphic Rocks referred under theory.

   A) Gneiss B) Schist   C) Quartzite   D) Marble

9. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.

10. Simple Structural Geology problems.

   LAB EXAMINATION PATTERN:

   1. Description and identification of SIX minerals

   2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)

3. Interpretation of a Geological map along with a geological section.

   4. Simple strike and Dip problems.

COURSE OUTCOMES

Upon successful completion of this course, student will be able to:

1. Identify the minerals based on their physical properties by simple tests
2. Understand the physical properties of igneous, sedimentary and metamorphic rocks
3. Classify rocks using basic geologic classification systems.
4. Interpret the geological structures in the geological maps and sections.
5. Solve various geological problems involving strike and Dip.

Books:-

1. Elementary Exercises in Geology by CVRK Prasad, Universities press.

2. B.S.SatyanarayanaSwamy, Engineering Geology Laboratory Manual , DhanpatRai Sons, New Delhi

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)**

Semester-IV

Subject Code		L	T	P	C
20A40108	**Python Programming**	1	0	2	2

Course Objectives:
- To learn the basic concepts of software engineering and life cycle models
- To explore the importance of Databases in application Development
- Acquire programming skills in core Python
- To understand the importance of Object-oriented Programming
-

Course Outcomes (CO):
Students should be able to
- Identify the issues in software requirements specification and enable to write SRS documents for software development problems
- Explore the use of Object oriented concepts to solve Real-life problems
- Design database for any real-world problem
- Solve mathematical problems using Python programming language

Module 1.Basic concepts in software engineering and software project management

Basic concepts: abstraction versus decomposition, the evolution of software engineering techniques,   Software development life cycle
Software project management: project planning and project scheduling

Task:

1. [Identifying the Requirements from Problem Statements](#)

Module 2. Basic Concepts of Databases

Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, [Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)](#), [Data Manipulation Language(DML) Statements](#)

Task:

1. Implement [Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)](#)

2. Implement [Data Manipulation Language(DML) Statements](#)

Module 3. Python Programming:

a. **Introduction to Python:** Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements

b. **Python Data Structures:** Lists, Dictionaries, Tuples.

c. **Strings:** Creating strings and basic operations on strings, string testing methods.

d. **Functions:** Defining a function- Calling a function- Types of functions-Function Arguments-Anonymous functions- Global and local variables

e. **OOPS Concepts;** Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

f. **Modules and Packages:** Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages

g. **Working with Data in Python:** Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions-Loading Data with Pandas-Numpy

Tasks:

1. OPERATORS

a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.

b. Read your name and age and write a program to display the year in which you will turn 100 years old.

c. Read radius and height of a cone and write a program to find the volume of a cone.

d. Write a program to compute distance between two points taking input from the user (Hint: use Pythagorean theorem)

2. CONTROL STRUCTURES

a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if…elif…else statement.

b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while loop.

c. Write a Program to find the sum of a Series $1/1! + 2/2! + 3/3! + 4/4! + \ldots\ldots + n/n!$. (Input :n = 5, Output : 2.70833)

d. In number theory, an abundant number or excessive number is a number for which the

sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST
    a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
    b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10,   15, 14, 63], odd numbers sum = 101, even numbers sum = 24)
    c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).
    d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE
    a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a   list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
    b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test_list = [("GFG", "IS", "BEST"), ("GFg", "AVERAGE"), ("GfG",), ("Gfg", "CS")], Output : [(„GFG", „IS", „BEST")]).
    c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET
    a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
    b. Write a program to perform union, intersection and difference using Set A and Set B.
    c. Write a program to count number of vowels using sets in given string (Input : "Hello World", Output: No. of vowels : 3)
    d. Write a program to form concatenated string by taking uncommon characters from two strings using set concept (Input : S1 = "aacdb", S2 = "gafd", Output : "cbgf").

6: DICTIONARY
    a. Write a program to do the following operations:
            1. Create a empty dictionary with dict() method
        ii. Add elements one at a time
        iii. Update existing key"s value
        iv. Access an element using a key and also get() method
        v. Deleting a key value using del() method
    b. Write a program to create a dictionary and apply the following methods:
i. pop() method
        ii. popitem() method
        iii. clear() method
    c. Given a dictionary, write a program to find the sum of all items in the dictionary.
    d. Write a program to merge two dictionaries using update() method.

7: STRINGS
    a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
    b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.
    c. Write a program to read a line of text and remove the initial word from given text.

(Hint: Use split() method, Input : India is my country. Output : is my country)

d.   Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

a.   A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.

b.   Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.

c.   Write a fact() function to compute the factorial of a given positive number.

d.   Given a list of n elements, write a linear_search() function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

a.   Write a program to demonstrate the working of built-in statistical functions mean(), mode(), median() by importing statistics library.

b.   Write a program to demonstrate the working of built-in trignometric functions sin(), cos(), tan(), hypot(), degrees(), radians() by importing math module.

c.   Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.

d.   Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

a.   Write a program to create a BankAccount class. Your class should support the following methods for
        1'. Deposit
        2. Withdraw
        3.GetBalanace
        4.PinChange

b.   Create a SavingsAccount class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).

c.   Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info() method and also using dictionary (__dict__).

d.   Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

a.   . Write a program to read a filename from the user, open the file (say firstFile.txt) and then perform the following operations:
        i.   Count the sentences in the file.
        ii. Count the words in the file.
        iii. Count the characters in the file.

b.   . Create a new file (Hello.txt) and copy the text to other file called target.txt. The target.txt file should store only lower case alphabets and display the number of lines copied.

c.   Write a Python program to store N student"s records containing name, roll number and branch. Print the given branch student"s details only.

References:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
3.Reema Thareja, "Python Programming - Using Problem Solving Approach", Oxford Press, 1st Edition, 2017.
4. Larry Lutz, "Python for Beginners: Step-By-Step Guide to Learning Python Programming", CreateSpace Independent Publishing Platform, First edition, 2018

Online Learning Resources/Virtual Labs:
1. http://vlabs.iitkgp.ernet.in/se/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
3. https://python-iitk.vlabs.ac.in

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech (R-20 Civil Engineering)

(Common to All Branches)

Course Code		L	T	P	C
20A49901	**Design Thinking for Innovation**	**2**	**1**	**0**	**0**

Pre-requisite   **Semester -IV**

Course Objectives:

The objectives of this course are:

	The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes (CO):

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

1	Define the concepts related to design thinking.
2	Explain the fundamentals of Design Thinking and innovation
3	Apply the design thinking techniques for solving problems in various sectors.
4	Analyse to work in a multidisciplinary environment
5	Evaluate the value of creativity

UNIT – I

Introduction to Design Thinking Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II
Design Thinking Process
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.
UNIT - III
Innovation
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.
UNIT - IV
Product Design
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT - V
Design Thinking in Business Processes
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.
Activity: How to market our own product, About maintenance, Relibility and plan for startup.

Textbooks:
    1.Change by design, Tim Brown, Harper Bollins (2009)
    2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.
Reference Books:
1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William Lidwell, Kritinaholden, Jill Butter.
4. The era of open innovation – Chesbrough.H

Online Learning Resources:
https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

Course Code   **Design of Reinforced Concrete Structures**   **L   T   P   C**

20A50101   **3   0   0   3**

Course Objectives:
1. To teach the students about the design of reinforced concrete beam, column, slab, footing and retaining wall.
2. To enable the students to understand the various design philosophies based on both working stress and limit state methods.
3. To enhance competence in design of reinforced concrete structures.
4. To understand the concepts of designing reinforced cement concrete structures.
5. To familiarize the students with the concepts of designing concrete mixes using different methods of proportioning and to understand the effects of various parameters

Course Outcomes (CO):
1. Classify the basic concepts of reinforced concrete analysis and design.
2. Classify the behaviour and various modes of failure of reinforced concrete members.
3. Analyze and design various reinforced concrete members such as beams, columns, footings and slabs
4. Draw the section and reinforcement details for columns using IS code provisions,
5. Draw the section and reinforcement details for the footings and stair cases.

UNIT - I   Introduction
Concepts of Reinforced concrete Design – Introduction to Working Stress Method - Limit State method – Material Stress- Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS – 456:2000.
Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections

UNIT - II   Shear and Torsion
Limit state analysis and design of section for shear and torsion – Concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing;

UNIT - III   Columns
Short and Long columns – Under axial loads, Uniaxial bending and biaxial bending – I S Code provisions.

UNIT - IV   Footings
Different types of footings – Design of isolated, square, rectangular, circular footings

UNIT - V   Slabs & Stair Case
Design of one way slab, Two-way slabs and continuous slab using I.S. Coefficients, Limit state design for serviceability for deflection, cracking and IS code provision. Design of doglegged staircase.

Codes/Tables: IS 456-2000 and relevant sheets (Pertaining to columns) of SP 16 Code books to be permitted into the examinations Hall.

Exam Pattern :
The end examination paper should consist of Part A and Part B. Part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B shouldconsist of five questions on design out of which three are to be answered. Weightage forPart - A is 40% and Part- B is 60%.

Textbooks:
1. Limit state designed of reinforced concrete by P. C. Varghese, Prentice Hall of India, NewDelhi
2. Structural Design and Drawing: Reinforced Concrete and Steel, Fourth Edition, N Krishna Raju, Universities Press, 2022

Reference Books:
1. Limit State Design of Reinforced Concrete by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, , Laxmi, Publications Pvt. Ltd., New Delhi
2. Fundamentals of reinforced concrete by N. C. Sinha and S. K Roy, S. Chand publishers
3. Design of Reinforced concrete structures by N.Subramanian, Oxford university press.
4. IS 456- 2000 Code of practice for Reinforced Concrete Structures.

Online Learning Resources:
https://nptel.ac.in/courses/105105105

Course Code	Water Resource Engineering	L	T	P	C
20A50102		3	0	0	3
	Semester		V		

Course Objectives:
1. To introduce the phenomena of hydrology, different parts involved in hydrologic cycle.
2. To know diverse methods of collecting the hydrological informationand know the basic principlesand movement of ground water.
3. To know the necessity and importance of irrigation and other key elements like Duty, delta , water requirements of crops etc.,
4. To introduce the various silt theories associated with irrigation channels and ill effects of water logging and their preventive measures like canal lining and their design
5. To introduce various types of cross drainage works and their floor design by Bligh and Khoslas theory.

Course Outcomes (CO):
1. Provide a background in the theory of hydrological processes and their measurement
2. Apply the concepts and techniques necessary for an understanding and runoff hydrographs and unit Hydrographs and can define the key components of a functioning groundwater
3. Understand the basic requirements of irrigation and various irrigation techniques, requirements of the crops
4. Understand various silt theories associated with irrigation channels and ill effects of water logging and their preventive measures like canal lining and their design
5. Establish the understanding of cross drainage works and their floor design by Bligh and Khoslas theory.

UNIT - I
INTRODUCTION TO HYDROLOGY: Engineering hydrology and its applications; Hydrologic cycle; precipitation- Types and forms, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, presentation and interpretation of rainfall data.
DESCRIPTIVE HYDROLOGY:Evaporation- Factors affecting evaporation, measurement of evaporation; Infiltration- Factors affecting infiltration, measurement of infiltration, infiltration indices; Run off- Factors affecting run- off, Computation of run-off; Design Flood; Estimation of maximum rate of run-off; separation of base flow.
UNIT - II

HYDROGRAPH ANALYSIS: Hydrograph; Unit Hydrograph- Construction and limitations of Unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; S-hydrograph.

GROUND WATER: Introduction; Aquifer; Aquiclude; Aquifuge; aquifer parameters-porosity, Specific yield, Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; storage coefficient-coefficient of permeability and transmissibility

UNIT - III

IRRIGATION: Introduction; Necessity and Importance of Irrigation; advantages and ill effects of Irrigation; types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty.

WATER REQUIREMENT OF CROPS: Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil-water-plant relationship; vertical distribution of soil moisture; soil moisture tension; soil moisture stress; various soil moisture constants; Limiting soil moisture conditions; Depth and frequency of irrigation; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation; Irrigation efficiencies; Determination of irrigation requirements of crops; Assessment of Irrigation water. Consumptive use of water-factors affecting consumptive use, direct measurement and determination by use of equations (theory only)

UNIT - IV

CHANNELS – SILT THEORIES: Classification; Canal alignment; Inundation canals; Cross–section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories–Kennedy's theory, Kennedy's method of channel design; Drawbacks in Kennedy's theory; Lacey's regime theory- Lacey's theory applied to channel design; Defects in Lacey's theory; Comparison of Kennedy's and Lacey's theory.

WATER LOGGING AND CANAL LINING: Water logging; Effects of water logging; Causes of water logging; Remedial measures; Saline and alkaline soils and their reclamation; Losses in canal; Lining of irrigation channels – Necessity, advantages and disadvantages; Types of lining; Design of lined canal.

UNIT - V

DIVERSION HEAD WORKS: Types of diversion head works; Diversion and Storage head works; weirs and barrages; Layouts of diversion head works; components; Causes and failure of hydraulic structures on permeable foundations; Blighs creep theory; Khoslas theory; Determination of uplift pressure, impervious floors using Blighs and Khoslas theory; Exit gradient.

Textbooks:

1. Irrigation and water power engineering by Punmia&Lal, Laxmi publications pvt. Ltd., New Delhi 17th edition 2021

2. Engineering Hydrology by K. Subramanya, The Tata Mcgraw Hill Company, Delhi 5th edition 2020

Reference Books:

1. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi 36th edition

2. Engineering Hydrology by Jayarami Reddy, Laxmi publications pvt. Ltd., New Delhi 3rd edition 2016

3. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House 6th edition 2020

Online Learning Resources:

Course Code	Geotechnical Engineering - I	L	T	P	C
20A50103		3	0	0	3
	Semester		V		

Course Objectives:
1. To enable the student to find out the index properties of the soils and their classification.
2. To enable the student to determine permeability of soils using various methods , and to understand the concept of seepage of water through soil
3. To enable the students to estimate the stresses due to applied loads
4. To enable the students to understand the difference between compaction and consolidation.
5. To impart knowledge on shear strength and its importance

Course Outcomes (CO):
1. carry out soil classification
2. solve any practical problems related to soil permeability and seepage
3. estimate the stresses under any system of foundation loads
4. solve practical problems related to consolidation settlement and time rate of settlement
5. Determine the shear strength of soil

UNIT - I

INTRODUCTION: Soil formation – Soil structure – Adsorbed water – Mass- Volume relationship – Relative density. Index Properties Of Soils: Moisture Content, Specific Gravity, In-situ density, Grain size analysis – Sieve and Hydrometer methods – Consistency limits and indices – I.S. Classification of soils.

UNIT - II

PERMEABILITY: Soil water – Capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting – Laboratory determination of coefficient of permeability – Permeability of layered systems.

SEEPAGE THROUGH SOILS: Total, neutral and effective stresses –Quick sand condition – Seepage through soils – Flow nets : Characteristics and Uses.

UNIT - III

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Wester guard's theories for point loads and areas of different shapes – Newmark's influence chart .

Compaction: Mechanism of compaction – Factors affecting – effects of compaction on soil properties. – Field compaction Equipment – Compaction control.

UNIT - IV

CONSOLIDATION : Types of compressibility – Primary consolidation and secondary consolidation - Stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre-consolidation pressure and its determination – Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods.

UNIT - V

SHEAR STRENGTH OF SOILS : Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – Critical void ratio –Liquefaction.

Textbooks:
1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors Delhi 7th edition 2009
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).

Reference Books:
1. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi 17th edition 2017
2. Geotechnical Engineering by Iqbal H.Khan, PHI pubilishers 4th edition.
3. Basic and Applied Soil Mechanics by Gopal Ranjan& ASR Rao, New age International Pvt . Ltd, New Delhi 3rd edition 2016

Online Learning Resources:

https://nptel.ac.in/courses/105101201

https://nptel.ac.in/courses/105105185

Course Code	Advanced Structural Analysis	L	T	P	C
20A50104a		3	0	0	3
	Semester		V		

Course Objectives:

1. Ability the behavior of arches and their methods of analysis
2. To ability various classical methods for analysis of indeterminate structures
3. Ability to analyze the beam and frames for vertical and horizontal loads and draw SFD and BMD
4. To ability the effect of support settlements for indeterminate structures. Able to calculate forces in members of truss due to load by stiffness method
5. Ability to analyze and perform plastic analysis on various structural elements

Course Outcomes (CO):

1. To demonstrate the behavior of arches and their methods of analysis
2. To use various classical methods for analysis of indeterminate structures
3. Ability to analyze the beam and frames for vertical and horizontal loads and draw SFD and BMD.
4. To determine the effect of support settlements for indeterminate structures. Able to calculate forces in members of truss due to load by stiffness method
5. Ability to analyze and perform plastic analysis on various structural elements

UNIT - I

ARCHES : Three hinged and Two hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature-Determination of horizontal thrust bending moment, normal thrust and radial shear – Rib shortening and temperature stresses.

UNIT - II

MOMENT DISTRIBUTION METHOD FOR FRAMES:-Analysis of single bay single storey portal frame including side sway –Substitute frame analysis by two cycle method.

UNIT - III

KANI`S METHOD:-

Analysis of continuous beams with and without settlement of supports -Single bay single storey portal frames with and without side sway.

UNIT - IV

FLEXIBILITY METHOD :-

Flexibility methods- Introduction- Application to continuous beams including support settlements Analysis of Single bay single storey portal frames without and with side sway

UNIT – V

STIFFNESS METHOD:

Stiffness methods- Introduction-application to continuous beams including support settlements- Analysis of Single bay single storey portal frames without and with side sway.

Textbooks:
1. Analysis of structures by Vazrani&Ratwani – Khanna Publications.
2. Theory of structures by Ramamuratam, jain book depot , New Delhi.

Reference Books:
1. Structural analysis by R.S.Khurmi, S.Chand Publications, New Delhi.
2. Basic Structural Analysis by K.U.Muthu*et al.,*I.K.International Publishing House Pvt.Ltd
3. Theory of Structures by Gupta S P, G S Pundit and R Gupta, Vol II, Tata McGrawHill   Publications company Ltd.
4. D S Prakash Rao, **"Structural Analysis: A Unified Approach"**, Universities PressOnline Learning Resources:

Course Code	Sub Surface Investigation and Instrumentation	L	T	P	C
20A50104b		3	0	0	3
	Semester		V		

Course Objectives:
1. To discuss the importance of site investigation
2. To narrate various exploration techniques
3. To describe soil sampling techniques
4. To train with in-situ sub soil exploration methods
5. To demonstrate instrumentation for sub soil exploration

Course Outcomes (CO):
1. Plan and execute sub soil investigation programme.
2. Handle both laboratory and in-situ testing techniques
3. Carry out collection, handling and preservation of samples

4. Handle instruments during sub soil exploration process
5. Handle instrumentation for sub soil exploration

UNIT - I
Exploration and geophysical methods:
Exploration program planning -Methods of exploration- Preliminary and detailed design- spacing and depth of bores, data presentation. Geophysical exploration and interpretation, seismic and electrical methods, cross bore hole, single bore hole – Up hole -Down hole methods.

UNIT - II
Exploration Techniques
Methods of boring and drilling, non-displacement and displacement methods, drilling in difficult subsoil conditions, limitations of various drilling techniques, stabilization of boreholes, bore logs.

UNIT - III
Soil Sampling
Sampling Techniques – Quality of samples – Factors influencing sample quality - Disturbed and undisturbed soil sampling advanced sampling techniques, offshore sampling, shallow penetration samplers, preservation and handling of samples.

UNIT - IV
Field Testing In Soil Exploration
Field tests, penetration tests, Field vane shear, Insitu shear and bore hole shear test, pressure meter test, dilatometer test - Plate load test–Monotonic and cyclic; field permeability tests – Block vibration test. Procedure, limitations, Correction and data interpretation.

UNIT - V
Instrumentation
Instrumentation in soil engineering, strain gauges, resistance and inductance type, load cells, earth pressure cells, settlement and heave gauges, pore pressure measurements - Slope indicators, sensing units, case studies.

Textbooks:
1. Alam Singh and Chowdhary G. R., "Soil Engineering in Theory and Practice, Volume-2, Geotechnical testing and instrumentation", CBS Publishers and Distributors, New Delhi, 2006.
2. Dunnicliff J., and Green, G. E., "Geotechnical Instrumentation for Monitoring Field Performance", John Wiley, 1993.

Reference Books:
1. Bowles J. E., "Foundation Analysis and Design", 5th Edition, The McGraw-Hill companies, Inc., New York, 1995.
2. C. Venkataramiah, "Geotechnical Engineering", New age International Pvt . Ltd, (2002).
3. Hanna T. H., "Field Instrumentation in Geotechnical Engineering", Trans Tech., 1985.

4. Hunt R. E., "Geotechnical Engineering Investigation Manual", McGraw Hill, 1984.

Online Learning Resources:

Course Code	Remote Sensing and GIS	L	T	P	C
20A50104c		3	0	0	3
	Semester		V		

Course Objectives:
1. Apply the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain .
2. Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
3. Illustrate Energy interactions with atmosphere and with earth surface features, Interpretation of satellite and top sheet maps
4. Understand different components of GIS and Learning about map projection and coordinate system
5. Develop knowledge on conversion of data from analogue to digital and working with GIS software.

Course Outcomes (CO):
1. Comparing with ground, air and satellite based sensor platforms.
2. Interpret the aerial photographs and satellite imageries.
3. Create and input spatial data for GIS application.
4. Apply RS and GIS concepts in water resources engineering.
5. Applications of various satellite data.

UNIT - I
Introduction to photogrammetry : Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

UNIT - II
Remote sensing :Basic concepts and foundation of remote sensing – Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. 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.

UNIT - III
Geographic information system :Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. 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.

UNIT - IV
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.

UNIT - V
Water resources applications : Land use/Land cover in water resources, Surface water mapping and inventory -Watershed management for sustainable development and Watershed characteristics - Reservoir sedimentation, Fluvial Geomorphology - Ground Water Targeting, Identification of sites for artificial Recharge structures - Inland water quality survey and management, water depth estimation and bathymetry.

Textbooks:
1. Remote Sensing and GIS by B. Bhatta, Oxford University Press, New Delhi 3rd edition 2021
2. Remote Sensing and its applications by L. R. A. Narayana, University Press 1999.

Reference Books:
1. Fundamentals of remote sensing, by George Joseph, Universities press, Hyderabad 3rd edition 2018
2. Advanced surveying: Total station GIS and remote sensing, by SatheeshGopi, Pearson publication 2nd edition 2017
3. Concepts & Techniques of GIS, by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
4. Remote sensing and GIS, by M. Anji Reddy B. S. Publications, New Delhi.
Online Learning Resources:
https://nptel.ac.in/courses/105103193

Open Elective Course-I

Course Code	Experimental Stress Analysis	L	T	P	C
20A50105		3	0	0	3
	Semester		V		

Course Objectives:
1. To understand different methods of experimental stress analysis
2. To understand the use of strain gauges for measurement of strain
3. To be exposed to different Non destructive methods of concrete
4. To understand the theory of photo elasticity and its applications in analysis of structures
5. To understand different methods of photo elasticity

Course Outcomes (CO):
1. Understand different methods of experimental stress analysis
2. Understand the use of strain gauges for measurement of strain
3. Expose to different Non destructive methods of concrete
4. Understand the theory of photo elasticity and its applications in analysis of structures
5. Understand different methods of photo elasticity

UNIT - I
PRINCIPLES OF EXPERIMENTAL APPROACH:Merits of Experimental Analysis Introduction, uses of experimental stress analysisAdvantages of experimental stress analysis, Different methods –Simplification of problems.

UNIT - II
STRAIN MEASUREMENT USING STRAIN GAUGES :Definition of strain and its relation of experimental Determinations Properties of Strain-
Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – Various types –Gauge factor – Materials of adhesion base.

UNIT - III
STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE:
Introduction – The three elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge.
Ultrasonic Pulse Velocity method –Application to Concrete. Hammer Test – Application to Concrete.
UNIT - IV
THEORY OF PHOTOELASTICITY: Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polar scope for various arrangements – Fringe Sharpening. Brewster's Stress Optic law.
UNIT - V
TWO DIMENSIONAL PHOTOELASTICITY:Introduction – Isochramic Fringe patterns-Isoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation

methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials.

Textbooks:
1. Experimental stress analysis by J.W.Dally and W.F.Riley, College House Enterprises2005
2. Experimental stress analysis by Dr.SadhuSingh.khanna Publishers 4th edition

Reference Books:
1. Experimental Stress analysis by U.C.Jindal, Pearson Pubilications 2012 edition
2. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.

Online Learning Resources:
https://nptel.ac.in/courses/112106068

Course Code	Computer Aided Drafting lab – I	L	T	P	C
20A50106		0	0	3	1.5
	Semester		V		

Course Objectives:
1. Introduce AutoCAD software as a drafting tool for civil engineering student.
2. Use AutoCAD software for detailing and drawing of bonds in masonry doors, windows and ventilators.
3. Teach drawing of line diagrams, plans, elevations & sections for residential buildings using AutoCAD software
4. Teach drawing of line diagrams, plans, elevations & sections for multi-storey residential buildings using AutoCAD software
5. Creating 3D solid models into 2D drawing-different views, sections

List of Experiments:

1. Introduction to computer aided drafting
2. Practice exercises on CAD software
3. Detailing & Drawing of English Bond using CAD Software
4. Detailing & Drawing of Flemish Bond using CAD Software
5. Detailing & Drawing of Doors using CAD Software
6. Detailing & Drawing of Windows using CAD Software
7. Detailing & Drawing of Ventilators &Roofsusing CAD Software
8. Detailing of Building Components using CAD Software.
9. Drawing of Line diagram of Residential Building Using CAD software.
10. Drawing of Plan, Section & Elevation for Residential Buildings Using CAD Software.
11. Drawing Line diagram for Multi Storey Residential Buildings.
12. Drawing of Plan, Section & Elevation for Residential Multi Storey Buildings Using

CAD Software.

Course Outcomes (CO):
1. To understand features of AutoCAD software as a drafting tool.
2. To draw and detail masonry doors, windows and ventilators.
3. To draw line diagrams, plans, elevations & sections for residential buildings using AutoCAD software
4. To draw line diagrams, plans, elevations & sections for multi-storey residential buildings using AutoCAD software.
5. Able to convert2D drawings into 3D models for residential buildings

Course Code	Geotechnical Engineering Lab - I	L	T	P	C
20A50107		0	0	3	1.5
	Semester		V		

Course Objectives:
1. To enable the students to know the various index properties of soils
2. To carry out laboratory tests and to identify soils as per BIS
3. To obtain the relationship between moisture content and dry density by conducting compaction test
4. To perform the shear tests and estimate the shear strength of soil
5. To estimate the seepage properties of soil

Course Outcomes (CO):

At the end of the course, the student will be able to:
1. Able to identify various soils based on their index properties of soils
2. Able to classify the soil based on their grain size and plasticity properties of soil
3. Estimate the OMC and MDD of soil
4. Able to determine permeability and CBR values of soil
5. Estimate the shear strength of soil.

List of Experiments:

1. Specific gravity
2. Grain size analysis by sieving
3. Field density-Core cutter and Sand replacement methods

4. Atterberg's Limits.
5. Proctor Compaction test
6. Permeability of soil - Constant and Variable head tests
7. CBR Test
8. Direct Shear test
9. Differential Free Swell Index
10. Laboratory one-point liquid limit test

Textbooks
1. Soil Mechanics and Foundation Engg by K. R. Arora, Standard Publishers and Distributors, Delhi 7th edition 2009.
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt .Ltd, (2002).

References:
1. Soil Mechanics and Foundation by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi 17th edition 2017.
2. Basic and Applied Soil Mechanics by GopalRanjan& A. S. R. Rao, New age International Pvt . Ltd, New Delhi 3rd edition 2016.
3. Principles of Geotechnical Engineering by Braja M. Das Cengage Learning

Online Learning Resources/Virtual Labs:

Course Code	ESTIMATION, COSTING AND VALUATION	L	T	P	C
20A50108		1	0	2	2
	Semester	V			

Course Objectives:
1. To impart basic knowledge on different types of estimation
2. To enrich with specifications and tender procedures.
3. To give insights on various types of contract agreements.
4. To prepare detailed estimates
5. To inculcate data preparation for abstract estimation
6. To teach procedure for valuation of buildings.

Course Outcomes (CO):
1. Understand basics on methods and types of estimation.
2. Formulate specifications and write tender documents.
3. Prepare Detailed and Abstract Estimates
4. Determine rate analysis of different items.
5. Valuation of buildings.

LIST OF EXPERIMENTS

1. Activity based learning on methods and types of estimates
2. Preparation of Detailed estimate for a single storey residential building using wall to wall method
3. Preparation of Detailed estimate for a single storey residential building using centre line method for Earthwork, foundations, Super structure, Fittings including sanitary and electrical fittings & Paintings.
4. Preparation of Detailed estimate for a two storey residential building using centre line method for Earthwork, foundations, Super structure, Fittings including sanitary and electrical fittings & Paintings.
5. Activity based learning of Estimate Data and Rate Analysis
6. Preparation of Abstract Estimate for the detailed estimate in Exercise No.3
7. Preparation of Abstract Estimate for the detailed estimate in Exercise No.4
8. Writing of Measurement book and Bill preparation as per AP State Govt Procedure for detailed estimate in No. 3 and abstract estimate of No. 6
9. Writing of detailed specifications for various items of estimate and preparing a model Tender document for the work Listed in No. 3 and 6
10. Activity based learning for Valuation of Buildings, Cost escalation procedures and Value Analysis for any one work

Textbooks:
1. Estimating and Costing in Civil Engineering (Theory & Practice) by Dutta, B. N., UBS Publishers, 28th edition 2021
2. Civil Engineering Contracts and Estimates", by B. S. Patil, Universities Press Pvt Ltd, Hyderabad. 4th Edition 2015.

Reference Books:
1. Estimation, Costing and Specifications by M. Chakraborthi, Laxmi publications 24th edition
2. Standard Schedule of rates and standard data book by public works department.
3. I. S. 1200 (Parts I to XXV, "Method of Measurement of Building and Civil Engineering works – B.I.S.)" 1974

Online Learning Resources:
https://onlinecourses.swayam2.ac.in/nou20_cs11/preview

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)ANANTAPUR
CONSTITUTION OF INDIA
(Common to CE, MECH, CHEM)

Subject Code	Title of the Subject	L	T	P	C
20A59101	**INDIAN CONSTITUTION**	2	0	0	0

COURSE OBJECTIVES :The objective of this course is	
1	To Enable the student to understand the importance of constitution
2	To understand the structure of executive, legislature and judiciary
3	To understand philosophy of fundamental rights and duties
4	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
5	To understand the central-state relation in financial and administrative control

Syllabus

UNIT-IIntroduction to Indian Constitution
 Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

LEARNING OUTCOMES: -After completion of this unit student will

- ➢ Understand the concept of Indian constitution
- ➢ Apply the knowledge on directive principle of state policy
- ➢ Analyze the History and features of Indian constitution
- ➢ Learn about Preamble, Fundamental Rights and Duties

UNIT-II Union Government and its Administration
Structure of the Indian Union - Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

LEARNING OUTCOMES: -After completion of this unit student will

- ➢ Understand the structure of Indian government
- ➢ Differentiate between the state and central government
- ➢ Explain the role of President and Prime Minister
- ➢ Know the Structure of supreme court and High court

UNIT-III State Government and its Administration
 Structure of the State Govt. - Governor - Role and Position -CM and Council of Ministers - State Secretariat- Organization Structure and Functions

LEARNING OUTCOMES: -After completion of this unit student will

- ➢ Understand the structure of state government
- ➢ Analyze the role of Governor and Chief Minister
- ➢ Explain the role of State Secretariat
- ➢ Differentiate between structure and functions of state secretariat

UNIT-IV Local Administration

District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Panchayati Raj - Functions– PRI – Zilla Parishath - Elected officials and their roles – CEO, ,Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES: -After completion of this unit student will

- ➢ Understand the local Administration
- ➢ Compare and contrast district administration's role and importance
- ➢ Analyze the role of Mayor and elected representatives of Municipalities
- ➢ Learn about the role of Zilla Parishath block level organization

UNIT-V Election Commission

Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

LEARNING OUTCOMES: -After completion of this unit student will

- ➢ Know the role of Election Commission
- ➢ Contrast and compare the role of Chief Election commissioner and Commissionerate
- ➢ Analyze the role of state election commission
- ➢ Evaluate various commissions viz SC/ST/OBC and women

TEXT BOOKS
1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust

REFERENCES:
1. J.A. Siwach, Dynamics of Indian Government & Politics,
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. .J.C. Johari, Indian Government and Politics, Hans India
4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

E-RESOURCES:
1.nptel.ac.in/courses/109104074/8
2.nptel.ac.in/courses/109104045/

3.nptel.ac.in/courses/101104065/
4.www.hss.iitb.ac.in/en/lecture-details
5.www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	State the historical background of the constitution making and its importance for building a democratic India.
CO2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO3	Demonstrate the value of the fundamental rights and duties for becoming good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-government
CO5	Appraise the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
CO6	Develop themselves as responsible citizens and pave way to build a democratic country.

Course Code	Design of Steel Structures	L	T	P	C
20A60101		3	0	0	3
	Semester	VI			

Course Objectives:
1. To introduce steel structures and its basic components
2. To introduce structural steel fasteners like welding and bolting
3. To teach design tension members, compression members, beams and beam-columns
4. To teach design column splices and bases
5. To teach design of various steel structures.

Course Outcomes (CO):
1. Learn the basic elements of a steel structure
2. Learn the fundamentals of structural steel fasteners
3. Able to design basic elements of steel structure like tension members, compression members, beams and beam-columns
4. Able to design column splices and bases.
5. Able to design the various steel structures.

UNIT - I
Concepts of Plasticity, Yield strength of steel, Section Classification. Loads and combinations, wind loads on roof trusses., Concept of limit State Design of steel structures – Different Limit States as per IS 800 -2007 – Design Strengths- Deflection limits – Serviceability - Bolted connections – Welded connections – Design Strength – Efficiency of joint – Prying action Types of Welded joints - Design of Tension members

UNIT - II
Design of Steel Compression members – Buckling class – slenderness ratio / strength design – Laced – Battened columns – Design of Column bases – Slab base only.

UNIT - III
Design of Beams – Plastic moment – Bending and shear strength, design of laterally supported beams – Built up sections – Large plates Web buckling, Crippling and Deflection of beams

UNIT - IV
Design of eccentric connections with brackets, Beam end connections – Web angle – Un-stiffened and stiffened seated connections (bolted and Welded types) Design of truss joints

UNIT - V
Plate Girder: Design consideration – I S Code recommendations - Design of welded plate girder – Curtailment of flange plates- stiffeners.

Textbooks:
1. Limit state design of Steel Structures by Subramanyam.N, Oxford University press, New Delhi 2nd edition 2018

2. Limit State Design of steel structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi 3rd edition 2019

Reference Books:
1. Structural Design and Drawing by N.KrishnaRaju, University Press, Hyderabad 3rd edition 2009
2. Structural design in steel by SarwarAlamRaz, New Age International Publishers, New Delhi
3. Design of Steel Structures by Edwin Gaylord,CharlesGaylord,JamesStallmeyer, Tata Mc.Graw-Hill, New Delhi.
Online Learning Resources:

Course Code	Highway Engineering	L	T	P	C
20A60102		3	0	0	3
	Semester		VI		

Course Objectives:
1. To make the student understand the importance of Highway Development in Social and Economic Development of a Nation
2. To impart the concepts of Geometric Design of various Highway Infrastructure elements like Superelevation, Sight Distances, Radius of Curve, Extra widening etc
3. To make the student aware of Basic Traffic Parameters and Surveys needed for Collecting Data about them
4. To make the student understand the need for Management of Traffic in Urban areas and the measures available
5. To familiarize the students with types of Road Intersections and their design elements

Course Outcomes (CO):
1. Understand the importance of Highway Development in Social and Economic Development of a Nation
2. Understand the concepts of Geometric Design of various Highway Infrastructure elements like Superelevation, Sight Distances, Radius of Curve, Extra widening etc
3. Undestand of Basic Traffic Parameters and Surveys needed for Collecting Data about them
4. Understand the need for Management of Traffic in Urban areas and the measures available
5. Familiar with types of Road Intersections and their design elements

 UNIT - I
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.

UNIT - II
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.

UNIT - III

TRAFFIC ENGINEERING STUDIES

Basic Parameters of Traffic-Volume, Speed and Density – Definitions and their inter relation – Highway capacity and level of service concept – factors affecting capacity and level of service - 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 – Condition Diagram and Collision Diagrams. Design of Traffic Signals – Webster Method.

UNIT - IV

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

UNIT - V

Types of pavements – Difference between flexible and rigid pavements – Pavement Components – Sub grade, Sub base, base and wearing course – Functions of pavement components – Design Factors – Flexible pavement Design methods – G.I method, CBR Method, (as per IRC 37-2002) –Design of Rigid pavements – Critical load positions - Westergaard's stress equations – computing Radius of Relative stiffness and equivalent radius of resisting section – stresses in rigid pavements – Design of Expansion and contraction joints in CC pavements. Design of Dowel bars and Tie bars.

Textbooks:
1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 7th edition (2000).
2. Transportation Engineering, Volume I, C Venkatramaiah, Universities Press, 2015

Reference Books:
1. Principles of Highway Engineering by L.R.Kadiyali, Khanna Publishers
2. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications 9th edition
3. Highway Engineering – Dr.S.K.Sharma, S.Chand Publishers 2014 edition
4. Transportation Engineering, R Srinivas Kumar, Universities Press, 2020
5. Pavement Design, R Srinivasa Kumar, Universities Press, 2013

Online Learning Resources:

https://nptel.ac.in/courses/105105107

https://nptel.ac.in/courses/105107123

Course Code	Geotechnical Engineering - II	L	T	P	C
20A60103		3	0	0	3
	Semester		VI		

Course Objectives:
1. To enable the student to carry out the soil exploration program.
2. To enable the student to determine the earth slope stability.
3. To enable the student to estimate lateral earth pressure using various theories.
4. To enable the student to select a particular type of foundation and its bearing capacity
5. To enable the student to analyze the load carrying capacity of pile foundation and Selection of a shape of well foundation

Course Outcomes (CO):
1. Able to understand different soil exploration techniques.
2. Able to analyze the earth slope stability.
3. Able to estimate earth pressure using various theories.
4. Able to estimate the allowable bearing pressure and Choice of selection of a foundation.
5. Able to analyze the load carrying capacity of pile foundation and understand the components of well foundation.

 UNIT - I
SOIL EXPLORATION: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – Planning of Programme and preparation of soil investigation report.

UNIT - II
EARTH SLOPE STABILITY: Infinite and finite earth slopes – Types of failures – Factor of safety of infinite slopes – Stability analysis by Swedish arc method, standard method of slices, Friction Circle method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.

UNIT - III

EARTH PRESSURE THEORIES: Rankine's theory of earth pressure – Earth pressures in layered soils – Coulomb's earth pressure theory – Rebhann's and Cullman's graphical method

RETAINING WALLS: Types of retaining walls – stability of retaining walls.

UNIT - IV

SHALLOW FOUNDATIONS: Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi`s, Meyerhoff's and Skempton`s Methods

ALLOWABLE BEARING PRESSURE: Safe bearing pressure based on N- value – Allowable bearing pressure; safe bearing capacity and settlement from plate load test – Allowable settlements of structures – Estimation of Consolidation of settlement.

UNIT - V

PILE FOUNDATION: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests – Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

WELL FOUNDATIONS: Types – Different shapes of wells – Components of wells – functions and Forces on well foundation – Sinking of wells – Tilts and shifts.

Textbooks:
1. Geotechnical Engineering by C.Venkataramaiah, New Age Pubilications(2002).
2. Soil Mechanics and Foundation Engineering by Arora, Standard Publishers and Distributors, Delhi 7th edition 2009
3. Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi 17th edition 2017

Reference Books:
1. Soil Mechanics and Foundation Engineering by Purushtoma Raj, Pearson Pubilications 2nd edition 2013
2. Principles of Foundation Engineering by Das, B.M., - (1999)–6th edition (Indian edition) Thomson Engineering
3. Foundation Engineering by Varghese,P.C., Prentice Hall of India., New Delhi.
4. Foundation Engineering by V.N.S.Murthy, CRC Press, New Delhi.
5. Foundation Analysis and Design by Bowles, J.E., (1988)– 4th Edition, McGraw-Hill Publishing company, Newyork.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.

Online Learning Resources:
https://nptel.ac.in/courses/112106068

Course Code	Prestressed Concrete		L	T	P	C
20A60104a			3	0	0	3
		Semester			VI	

Course Objectives:
1. Understand the principles & necessity of prestressed concrete structures
2. Get the knowledge on various losses of prestress.
3. Analyse PSC beams with straight, concentric, eccentric, bent and parabolic tendons and design beams of rectangular and I section for flexure.
4. Design shear reinforcements, structural elements for shear, torsion and anchorage as per the provisions of BIS.
5. Interpret the transmission mechanism of pre-stressing force by bond and compute deflection of beams under loads

Course Outcomes (CO):
1. Understand the concepts of pre-stressing and methods of pre stressing.
2. Compute losses of pre-stress in pre-stressed concrete members.
3. Design PSC beams under flexure and shear.
4. Estimate the short- and long-term deflections of PSC beams.
5. Apply prestressing concepts for composite beams.

UNIT - I   Introduction

Principles of pre-stressing – Pre stressing systems - Pre-tensioning and post tensioning- Advantages and limitations of Pre stressed concrete- Need for high strength materials. Methods of pre-stressing: Pre-tensioning (Hoyer system) and Post-tensioning methods

(Freyssinet system and Gifford- Udall System).

UNIT - II   Losses of pre-stress
Loss of pre-stress in pre-tensioned and post-tensioned members due to elastic shortening, shrinkage and creep of concrete, relaxation of stress in steel, anchorage slip and frictional losses.

UNIT - III   Flexure and shear
Analysis of beams for flexure and shear - Beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons- Kern line - Cable profile - Design of PSC beams (rectangular and I sections) using IS 1343. Analysis and design of rectangular and I beams for shear. Introduction to Transmission length and End block (no Design and Analytical problems).

UNIT - IV   Deflections
Control of deflections- Factors influencing deflections - Short term deflections of uncracked beams- Prediction of long time deflections.

UNIT - V   Composite beams
Different Types- Propped and Un-propped- stress distribution- Differential shrinkage- Analysis of composite beams.

Textbooks:
1. Prestressed Concrete by N. Krishna Raju, Tata Mc.Graw Hill Publications 6th edition 2018
2. Prestressed concrete by N.RajagopalanNarosa Publishing House 2nd edition 2017

Reference Books:
1. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns, John Wiley & Sons 3rd edition 2010
2. Prestressed Concrete Design by Praveen Nagrajan, Pearson publications, 2013.
3. Prestressed Concrete by Ramamrutham, Dhanpatrai Publications 2020 edition
4. BIS code on "prestressed concrete", IS: 1343 to be permitted into the examination Hall.
Online Learning Resources:
https://nptel.ac.in/courses/105106118

Course Code	Green Buildings		L	T	P	C
20A60104b			3	0	0	3
		Semester			VI	

Course Objectives:
1. Exposure to the green building technologies and their significance
2. Understand the judicial use of energy and its management
3. Educate about the Sun-earth relationship and its effect on climate
4. Enhance awareness of end-use energy requirements in the society.
5. Develop suitable technologies for energy management

Course Outcomes (CO):

1. Understand the fundamentals of energy use and energy processes in building
2. Identify the energy requirement and its management
3. Know the Sun-earth relationship vis-a-vis its effect on climate
4. Be acquainted with the end-use energy requirements.
5. Be familiar with the audit procedures of energy

UNIT - I

Introduction to Green Building – Necessity of Green Building- Benefits of Green Buildings, - Green Building Materials and Equipment in India, - key Requisites for Constructing a Green Building, Important Sustainable features for Green Building,

UNIT - II

Green Building Concepts And Practices Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency.

UNIT - III

Green Building Design Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximize System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Ecofriendly captive power generation for factory, Building requirement.

UNIT - IV

Air Conditioning Introduction,CII Godrej Green business centre, Design philosophy, Design interventions, Energy modeling, HVAC System design, Chiller selection, pump selection, Selection of cooling towers, Selection of air handing units,Precooling of fresh air, Interior lighting system, Key feature of the building. Eco-friendly captive power generation for factory, Building requirement

UNIT - V

Material Conservation Handling of non process waste, waste reduction during construction, materials with recycled content, local materials, material reuse, certified wood ,Rapidly renewable building materials and furniture; Indoor Environment Quality And Occupational Health: Air conditioning, Indore air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels

Textbooks:
1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.

2. Green Building Hand Book by Tomwoolley and Samkimings, 2009

Reference Books:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code –ECBC-2020, published by BEE

Online Learning Resources:

Course Code **Industrial Waste and WasteWater Management** **L T P C**

20A60104c   **3   0   0   3**
Semester   VI

Course Objectives:
1. Wastewater quantity generation.
2. To Know the industrial process, water utilization and waste water generation.
3. To Impart knowledge on selection of treatment methods for industrial wastewater.
4. To acquire the knowledge on operational problems of common effluent treatment plants.
5. To gain knowledge on different techniques and approaches for minimizing the generation and application of Physio-chemical and biological treatment methods for recovery, reuse and disposal of industrial wastewater.

Course Outcomes (CO):
1. To understand the fundamental concepts of waste water treatment.
2. To conduct experiments and the ability to analyze the data, interpret results and draw conclusions.
3. To design a component, system or process to meet desired needs and imposed constraints.
4. To Identify, formulate and solve civil engineering problems .
5. To understand the modern techniques skills and tools including computer applications, necessary for engineering practice.

 UNIT - I
Sources of Pollution - Physical, Chemical, Organic & Biological properties of Industrial Wastes - Difference between industrial & municipal waste waters - Effects of industrial effluents on sewers and Natural water Bodies.

UNIT - II
Pre & Primary Treatment - Equalization, Proportioning, Neutralization, Oil separation by Floating-Waste Reduction-Volume Reduction-Strength Reduction.

UNIT - III
Waste Treatment Methods - Nitrification and De-nitrification-Phosphorous removal -Heavy metal removal - Membrane Separation Process - Air Stripping and Absorption Processes - Special Treatment Methods - Disposal of Treated Waste Water.

UNIT - IV
Characteristics and Composition of waste water and Manufacturing Processes of Industries like Sugar, Characteristics and Composition of Industries like Food processing Industries, Steel, and Petroleum Refineries.

UNIT - V
Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries – Joint Treatment of Raw Industries waste water and Domestic Sewage – Common Effluent Treatment Plants(CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects.

Textbooks:
  1. Wastewater engineering Treatment disposal reuse by Metcalf & Eddy, Tata McGraw Hill.
  2. Industrial Water Pollution Control by Eckenfelder, W.W., McGraw-Hill

Reference Books:
1. Industrial Waste by M.N. Rao and Dutta CBS Publishers and Distributors Pvt Ltd; 3rd edition (January 30, 2018)
2. Water & Wastewater Technology by Mark J. Hammer, Mark J. Hammer, Jr., Prentice Hall of India.
3. Theories and practices of Industrial Waste Engineering by N.L. NemerrowAddison-Wesley publishers

4.Principles of Industrial Waste Engineering by C.G. GurnhamWiley publishers
Online Learning Resources:
https://nptelvideos.com/video.php?id=1118

Course Code	Disaster Management	L	T	P	C
20A60105		3	0	0	3
	Semester	VI			

Course Objectives:
1. To give knowledge types of disasters and stages in disaster rehabilitation process.
2. To make awareness on change in climates and their impacts on occurrence of environmental disasters.
3. To impart knowledge on Consideration of wind and water effects as per codal provisions to withstand disasters.
4. To familiarize the student with the Causes of earthquake and their effects and remedial methods to be adopted for buildings.
5. To illustrate the methodology in Planning and design considerations of various structures constructing in disaster prone areas.

Course Outcomes (CO):
1. About various types of disasters and stages in disaster rehabilitation process.
2. Impact of change in climates and their impacts on occurrence of environmental disasters.
3. Adopting suitable codal provisions to study the effect of wind and water effects on various structures constructed at disaster prone areas.
4. Causes of earthquake and their effects and remedial methods to be adopted for buildings.
5. Adopt suitable Planning and design considerations of various structures constructing in disaster prone areas.

 UNIT - I
Brief introduction to different types of natural disaster, Occurrence of disaster in different climatic and geographical regions, hazard (earthquake and cyclone) map of the world and India, Regulations for disaster risk reduction, Post disaster recovery and rehabilitation (socioeconomic consequences)
UNIT - II
Climate change and its impact on tropical cyclone, Nature of cyclonic wind, velocities and pressure, Cyclone effects, Storm surge, Floods, Landslides. Behavior of structures in past cyclones and wind storms, case studies. Cyclonic retrofitting, strengthening of structures and adaptive sustainable reconstruction. Life–line structures such as temporary cyclone shelter.
UNIT - III
Basic wind engineering, aerodynamics of bluff bodies, vortex shedding and associated unsteadiness along and across wind forces. Lab: Wind tunnel testing, its salient features. Introduction to Computational fluid dynamics. General planning/design considerations under

wind storms & cyclones; Wind effects on buildings, towers, glass panels etc, & wind resistant features in design. Codal Provisions, design wind speed, pressure coefficients; Coastal zoning regulation for construction & reconstruction phase in the coastal areas, innovative construction material & techniques, traditional construction techniques in coastal areas.

UNIT - IV

Causes of earthquake, plate tectonics, faults, seismic waves; magnitude, intensity, epicenter, energy release and ground motions. Earthquake effects – On ground, soil rupture, liquefaction, landslides. Performance of ground and building in past earthquakes: Behavior of various types of buildings, structures, and collapse patterns; Behavior of Non-structural elements like services, fixtures, mountings- case studies. Seismic retrofitting- Weakness in existing buildings, aging, concepts in repair, restoration and seismic strengthening.

UNIT - V

General Planning and design consideration; Building forms, horizontal and vertical eccentricities, mass and stiffness distribution, soft storey etc.; Seismic effects related to building configuration. Plan and vertical irregularities, redundancy and setbacks. Various Types and Construction details of: Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under-ground – overhead tanks, staircases and isolation of structures; innovative construction material and techniques; Local practices: traditional regional responses; Computational investigation techniques.

Textbooks:
1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Management by R.B. Singh (Ed) Rawat Publication, New Delhi, 2000

Reference Books:
1. Natural disasters. By Abbott, L. P. (2013) 9th Ed. McGraw-Hill.
2. Earthquake Resistant Design of Structures. By Agarwal, P. and Shrikhande, M. (2009). New Delhi : PHI Learning.
3. Mapping Vulnerability: Disasters, Development and People. byBankoff, G., Frerks, G. and Hilhorst, D. (2004). London :Earthscan.
4. Improving Earthquakes and Cyclone Resistance of Structures:Guidelines for the Indian Subcontinent. TERI
5. Disaster Mitigation, preparedness, recovery and Response. By Sinha, P. C. (2006). New Delhi : SBS Publishers.
6. World Bank. (2009). Handbook for Reconstructingafter Natural Disasters.

Online Learning Resources:

Course Code	Highway Materials Lab		L	T	P	C
20A60106			0	0	3	1.5
		Semester			VI	

Course objectives: By the end of this course student will be able to
1. Test the aggregates for their suitability for use in Road Construction
2. Understand the Test procedures for determination of Crushing Strength , Impact Value, Abrasion Value of Aggregates
3. Understand the Importance of Shape of aggregates and Test Procedures to determine the same
4. Able to Test Bitumen to find out the Penetration Value, Ductility Value, Softening Point and Fire and Flash Point
5. Find out the Optimum Bitumen Content in a Bituminous Concrete by Marshall Stability Test.

List of Experiments:

TESTS ON ROAD AGGREGATES:
- Aggregate Crushing value Test.
- Aggregate Impact Test.
- Abrasion Test.
- Shape tests

TESTS ON BITUMINOUS MATERIALS:
- Penetration Test.
- Ductility Test.
- Softening Point Test.
- Flash and fire point tests.
- Demo on Marshall Stability Test on Bituminous Mixes

The Course Outcomes are:
1. Ability to conduct Tests on Aggregates for their suitability in Road Construction
2. Ability to conduct Tests on Bitumen to know its grade and suitability in Road Construction
3. Knowledge and Hands on experience on Laboratory Tests on Aggregates and

Bitumen
4. Understanding of the Bituminous Concrete Mix Design Procedure
5. Overall knowledge about Highway Materials, Tests on them and Interpretation of Results

References:
> Highway Material Testing and Quality Control (English, Paperback, G. Venkatappa Rao, K. Ramachandra Rao, KausikPahari, D.V. Bhavanna Rao) Dreamtech Press

Course Code	Geotechnical Engineering Lab - II	L	T	P	C
20A60107		0	0	3	1.5
	Semester		VI		

Course Objectives:

1. To enable the students to know the various physical and engineering properties of soils

2. To carry out laboratory tests and find out the grain size distribution

3. To perform laboratory tests to determine the compaction characteristics of the soil

4. To carry out the tests and to determine shear strength and coefficient of consolidation ofsoil

5. To determine the bearing capacity of soil by conducting field tests

List of Experiments:

1. Hydrometer Analysis on soils
2. Shrinkage limit test
3. Modified Proctor Compaction Test
4. Unconfined Compression Test
5. Vane – Shear Test
6. Tri-Axial Compression Test (Quick Test)
7. Determination of Co-Efficient of Consolidation
8. Soaked CBR test
9. Demo on SPT
10. Demo on Plate Load Test

Course Outcomes (CO):
At the end of the course, the student will be able to:

1. Classify the soil based on grain size and Atterberg limits.

2. Effect of compaction energy on OMC and MDD

3. Determine Shear strength parameters of soil by conducting Triaxial compression test

4. Determine the coefficient of consolidation of soil and thereby predicting its settlement

5. Estimate the bearing capacity of soil in natural condition

Course Code	Computer Aided Drafting lab – II	L	T	P	C
20A60108		0	0	3	1.5
	Semester		VI		

Course Objectives
1. Teach drawing of line diagrams, plans, sections and elevations for school building using CAD software.
2. Teach drawing of line diagrams, plans, sections and elevations for hostel building using CAD software.
3. Teach drawing of line diagrams, plans, sections and elevations for hospital building using CAD software.
4. Teach drawing of line diagrams, plans, sections and elevations for a bank using CAD software.
5. Teach drawing of line diagrams, plans, sections and elevations for an assembly building using CAD software.

List of Experiments:
1. Drawing of Line diagram of School Building Using CAD software.

2. Drawing of Plan, Section & Elevation for School Building Using CAD Software.

3. Drawing Line diagram for Hostel Building.

4. Drawing of Plan, Section & Elevation for Hostel Building Using CAD Software.

5. Drawing of Line diagram of Hospital Building Using CAD software.

6. Drawing of Plan, Section & Elevation for Hospital Building Using CAD Software.

7. Drawing Line diagram for Bank Building.

8. Drawing of Plan, Section & Elevation for Bank Building Using CAD Software.

9. Drawing of Line diagram of Assembly Building Using CAD software.

10. Drawing of Plan, Section & Elevation for Assembly Building Using CAD
    Software.

11. Drawing Line diagram for Industrial Building.

12. Drawing of Plan, Section & Elevation for Industrial Building Using CAD Software.

Course Outcomes
1. Able to draw line diagrams, plans, sections and elevations for school building using CAD software.
2. Able to draw line diagrams, plans, sections and elevations for hostel building using CAD software.
3. Able to draw line diagrams, plans, sections and elevations for hospital building using CAD software.
4. Able to draw line diagrams, plans, sections and elevations for a bank using CAD software.
5. Able to draw line diagrams, plans, sections and elevations for an assembly building using CAD software.

References:
Engineering graphics with Auto CAD - R.B. Choudary , Anuradha Publishes
Online Learning Resources/Virtual Labs:

(Common to CE, MECH, CHEM)

Course Code	Soft Skills	L	T	P	C
20A65502		**1**	**0**	**2**	**2**
Pre-requisite					

Course Objectives:
➢ To encourage all round development of the students by focusing on soft skills
➢ To make the students aware of critical thinking and problem-solving skills
➢ To develop leadership skills and organizational skills through group activities
➢ To function effectively with heterogeneous teams

Course Outcomes (CO):
By the end of the program students should be able to

- Define various elements of effective communicative skills
- Understanding people using emotional intelligence
- apply critical thinking skills in problem solving
- analyse the needs of an organization for team building
- Assess the situation and take necessary decisions as a leader
- Creating a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being

UNIT – I   **Soft Skills & Communication Skills**   Lecture Hrs
Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:
Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity
(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)
Inter personal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.
Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches-convincing- negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II   Lecture Hrs
                        Critical Thinking
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking

Activities
:
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis
UNIT – III   Lecture Hrs
                Problem Solving & Decision Making
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles

Activities:
Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion
UNIT – IV   **Emotional Intelligence & Stress**   Lecture Hrs
                         Management
Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:
Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V   **Leadership Skills**   Lecture Hrs
Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities

Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making , Group discussion etc.

NOTE-:
 1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:
1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.)Publisher : Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

1. Reference Books:

   1.Soft skills: personality development for life success by prashantsharma, BPB publications 2018.

2. Soft Skills By Alex K. Published by S.Chand

3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.

4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books

5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press

6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher : Vayu Education Of India

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q

2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

3. https://youtu.be/-Y-R9hDl7lU

4. https://youtu.be/gkLsn4ddmTs

5. **https://youtu.be/2bf9K2rRWwo**

6. **https://youtu.be/FchfE3c2jzc**

JNTUA College of Engineering (Autonomous), Ananthapuramu
Mandatory Non-credit Course VI
INTELLECTUAL PROPERTY RIGHTS & PATENTS
Common to CE, MECH, CHEM
INTELLECTUAL PROPERTY   RIGHTS & PATENTS

Course Code	L	T	P	C
20A69901	**2**	**0**	**0**	**0**

Course Objectives:·
1. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
2. To help them in knowing the significance of real life practice and procedure of Patents.
3. To make the students to understand the statutory provisions of different forms of IPRs in simple forms.

4. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks
5. To enable the students to keep their IP rights alive.

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

CO1:Identify different types of intellectual properties (IPS), the right of ownership, scope of protection
CO2: Understand and defining various types of intellectual properties and their roles in contributing to organizational competitiveness.
CO3: Apply statutory provisions to protect particular form of IPRs.
CO 4: Analyze rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.
CO:5 Evaluate different forms of IPR available at national & international level
CO:6 Develop skill of making search of various of forms of IPR by using modern tools and techniques.

SYLLABUS

UNIT – I:
Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II:
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – III:
Patents: Introduction to Patents – Laws Relating to Patents in India – Patent Requirements,Patent Registration and Granting of Patent – Exclusive Rights – Limitations – Ownership and Transfer — Revocation of Patent. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT – IV:
Trade Secrets: New developments in Patents – Software Protection and Computer related Innovations Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secrets litigation.Unfair competition: Misappropriation - Right of publicity, False advertising.

UNIT – V:
New development of intellectual property: New developments in trade mark law: copy right law, patent law, intellectual property audits.
International overview on intellectual property, international - trade mark law, copy right law, international patent law, international development in trade secrets law.

Textbooks:
   1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
   2. P.Naryan, "Intellectual Property Law", 3rd Ed ,Eastern Law House, 2007.

Reference Books:

R.Myneni, Law of Intellectual Property", 9th Ed, Asia law House, 2019.
PrabuddhaGganguli, ,Intellectual Property Rights Tata Mcgraw Hill, 2001.
 "

Course Code	Railways, Airports, Docks	L	T	P	C
20A70101a	and Harbor Engineering				
		3	0	0	3

Semester -VII

COURSE OBJECTIVE:

The objectives of this course are:

   1   Ability to explain the components of permanent way and its components and their functions and requirements.

2   Ability to explain the geometric design elements of Railway track like cant, radius of curve and degree of curve etc..and their design components.

3   Ability to the Aircraft characteristics and their influence on various design elements of an Airport.

4   Ability to explain the concepts of runway orientation, Airport lighting, Airport components and their planning and geometric design of runways and taxiways.

5   Ability to explain the difference between ports and Harbours, types of Ports and Harbours, various facilities needed in Ports and Harbours and NavigationalAids for ships.

Unit – I
Railway Engineering:
Introduction – Permanent way components – Cross section of permanent way – Functions and requirements of rails, sleepers and ballast – Types of gauges – Creep of rails – Theories related to creep – Coning of wheels – adzing of sleepers – Rail fastenings.

Unit – II
Geometric design of railway track
Gradients – Grade compensation – Cant and negative super elevation – Cant deficiency – Degree of curves – Safe speed on railway track – Points and crossings – Layout and functioning of left hand turn out and right hand turn outs – Station yards – Signaling and interlocking.

Unit –III
Airport Engineering
Airport site selection – Factors affecting site selection and surveys- Runway orientation – Wind rose diagram – basic runway length – Correction for runway length – Terminal area – Layout and functions – Concepts of terminal building – Simple building , Linear concept, pier concept and satellite concept – Typical layouts .

Unit – IV
Geometric design of runways and taxiways
Aircraft characteristics – Influence of characteristics on airport planning and design – Geometric design elements of runway – Standards and specifications - Functions of taxiways – Taxiway geometric design – Geometric elements and standard specifications – Runway and taxiway lighting.

Unit – V
Ports and Harbors
Requirements of ports and harbors – Types of ports – Classification of harbors – Docks and types of docks – Dry docks, wharves and jetties – Breakwaters: layouts of different types of harbors and docks – Dredging operations – navigation aids.

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

1   Understand the components of permanent way and its components and their functions and requirements.

2	Understand the geometric design elements of Railway track like cant, radius of curve and degree of curve etc..and their design components.
3	understand the Aircraft characteristics and their influence on various design elements of an Airport.
4	Understand the concepts of runway orientation, Airport lighting, Airport components and their planning and geometric design of runways and taxiways.
5	Understand the difference between ports and Harbours, types of Ports and Harbours, various facilities needed in Ports and Harbours and NavigationalAids for ships.

Text books:

1. A Text Book of Railway Engineering-S.C.Saxena and S.Arora, Dhanpatrai and Sons, New Delhi.
2. Satish Chandra and Agarwal, M.M. (2007) "Railway Engineering" Oxford Higher Education, University Press New Delhi.
3. Airport Planning and Design- S.K. Khanna and M.G Arora, Nemchand Bros.
4. A Text book of Transportation Engineering – S.P.Chandola – S.Chand& Co. Ltd. – (2001).
5. Railway Track Engineering by J.S.Mundrey

References:

1. Highway, railway, Airport and Harbour Engineering – K.P. Subramanian, Scitechpubilishers.
2. Harbour, Dock and Tunnel Engineering – R. Srinivasan, Charotar Publishing House Pvt. Limited, 2009
3. Dock and Harbour Engineering – Hasmukh P Oza, Gutam H Oza, Chartor Publishers pvt ltd.

Course Code	**Ground Improvement Techniques**	**L**	**T**	**P**	**C**
20A70101b		**3**	**0**	**0**	**3**
	Semester		**VII**		

Course Objectives:
1. Understand the fundamental concept of ground improvement techniques.
2. Apply knowledge of densification methods.
3. Understand the concepts of stabilization mechanical & chemical methods.
4. Impart knowledge of components of reinforced earth & design of reinforced earth walls.
5. Understanding the identification & foundation techniques.
Course Outcomes (CO):
1. Given solution to solve various problems.
2. Use effectively the various methods of ground improvement techniques.
3. The locally available technique for ground improvement so that the design of foundation.
4. Identify different types function & application &geomember.
5. Be able to anticipate & subject the soils test for identification method of determination of swell pressure.

UNIT - I
DEWATERING: Methods of de-watering- Sumps and interceptor ditches- Single, multi stage well points - Vacuum well points- Horizontal wells-foundation drains- blanket drains - Criteria for selection of fill material around drains –Electro-osmosis .
GROUTING: Objectives of grouting- Grouts and their properties- Grouting methods- ascending, descending and stage grouting- hydraulic fracturing in soils and rocks- Post grout test.

UNIT - II
DENSIFICATION METHODS IN GRANULAR SOILS:
In – situ densification methods in granular Soils– Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.
DENSIFICATION METHODS IN COHESIVE SOILS:
In – situ densification methods in Cohesive soils:– Preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

UNIT - III
STABILISATION: Methods of stabilization-mechanical-cement- Lime-bituminous- Chemical stabilization with calcium chloride, sodium silicate and gypsum

UNIT - IV
REINFORCED EARTH: Principles – Components of reinforced earth – Factors governing design of reinforced earth walls – Design principles of reinforced earth walls.
GEOSYNTHETICS: Geotextiles- Types, Functions and applications – Geogrids and geomembranes – Functions and applications.

UNIT - V
EXPANSIVE SOILS: Problems of expansive soils – Tests for identification – Methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – Under reamed piles.

Textbooks:

1. Engineering Principles of Ground Modification, Haussmann M.R. , McGraw-Hill International Edition(1990).
2. Ground Improvement Techniques, Dr.P.Purushotham Raj. Laxmi Publications, New Delhi / University science press, New Delhi 2nd edition 2016
3. Ground Improvement Techniques, NiharRanajanPatraVikas Publications, New Delhi

Reference Books:
1. Ground Improvement, Moseley M.P. Blackie Academic and Professional, Boca Taton, Florida, USA(1993).
2. Ground Control and Improvement, Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) John Wiley and Sons, New York, USA.
3. Designing with Geosynthetics, Robert M. Koerner, Prentice Hall New Jersey, USA

Online Learning Resources:
https://nptel.ac.in/courses/105108075

Course Code	Repair and Rehabilitation of Structures	L	T	P	C
20A70101c		3	0	0	3
	Semester		VII		

Course Objectives:
1. To learn various distress and damages to concrete and masonry structures
2. To understand the importance of maintenance of structures
3. To asses the damage to structures using various tests
4. To study the various types and properties of repair materials
5. To learn various repair techniques of damaged structures, corroded structures

Course Outcomes (CO):
1. Understand corrosion effects
2. Understand the deterioration in structures
3. Understand non-destructive tests
4. Understand the surface repair of structures
5. Understand the concepts of Strengthening and stabilization of structural elements

UNIT - I
Introduction, significance of corrosion, and corrosion mechanisms - Embedded metal corrosion

UNIT - II
Deterioration of cementations systems – Sulphate and Acid attack - Alkali Silica Reaction (ASR), Shrinkage, and others

UNIT - III
Concrete assessment using non-destructive tests (NDT) - Concrete assessment and load effects

UNIT - IV
Surface repair – Condition assessment – Analysis, strategy, and design – Material requirement, surface preparation, placement of repair material

UNIT - V
Strengthening and stabilization -Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake-Transportation of Structures from one place to other -Structural Health Monitoring- demolition techniques-Engineered demolition methods-Case studies, Study of structural conditions of heritage buildings.

Textbooks:
1. Concrete Repair and Maintenance by Peter H. Emmons, R.S. Means Company, Kingston, MA, USA.
2. Maintenance Repair & Rehabilitation & Minor Works of Buildings by P.C. Varghese, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Concrete Repair to EN1504 – Diagnosis, Design, Principles and Practice by Michael Raupach and Till Buttner, CRC Press.,
2. Concrete Structures – Protection, Repair and Rehabilitation by R. Dodge Woodson, Butterworth-Heinemann – Elsevier, UK

Online Learning Resources:
https://nptel.ac.in/courses/105106202

Course Code	Finite Element Methods	L	T	P	C
20A70102a		3	0	0	3
	Semester		VII		

Course Objectives:
1. Implement the basics of FEM to relate stresses and strains
2. Formulate the design and heat transfer problems with application of FEM.
3. Solve 1 D, 2 D and dynamic problems using Finite Element Analysis approach
4. To impart preliminary knowledge of analyzing structures using finite element method.
5. To learn advanced methods of structural analysis and to apply these methods for analysis of indeterminate structures.

Course Outcomes (CO):
1. Understand the fundamental ideas of FEM.
2. Develop shape functions and stiffness matrices for different elements
3. Generate global stiffness matrices and global load vectors
4. Have knowledge on generation of shape function for higher order elements using lagrangian interpolation function.
5. Analyze 2D iso-parametric elements

 UNIT - I
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.

UNIT - II
One Dimensional & Two Dimensional Elements :Stiffness matrix for bar element – Shape functions – 1D and 2D elements – Types of elements for plane stress and plane strain analysis – Displacement models – Generalized coordinates – Shape functions – Convergent and compatibility requirements – Geometric invariance – Natural coordinate system – Area and volume coordinates

UNIT - III
Element stiffness matrix : Generation of element stiffness and nodal load matrices for 3-node triangular element and four -noded rectangular elements.

UNIT - IV

Iso-parametric Formulation : Iso-parametric elements for 2D analysis –Formulation of CST element, 4 – nodded and 8-noded Iso-parametric quadrilateral elements – Lagrangian and Serendipity elements.

AXI-SYMMETRIC ANALYSIS: Basic principles-Formulation of 4-noded iso-parametric Axi-symmetric element.

UNIT - V

Solution techniques : Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Textbooks:
1. Finite Element Analysis for Engineering and Technology, by Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad. 2003.
2. Finite Element analysis-Theory & Programming, by C. S. Krishna MurthyTataMc.Graw Hill Publishers.

Reference Books:
1. Finite element analysis and procedures in engineering, by H.V. Lakshminaryana, 3rd edition, Universities press, Hyderabad.
2. Concepts and applications of Finite Element Analysis, by Robert D. Cook, Michael E Plesha, John Wiley & sons Publications
3. Finite element analysis in Engineering Design, by S. Rajasekharan, S. Chand Publications, New Delhi.

Online Learning Resources:
https://nptel.ac.in/courses/105106051

Course Code	Advanced Structural Engineering	L	T	P	C
20A70102b		3	0	0	3
	Semester		VII		

Course Objectives:
1. To teach concepts of concrete beams and slabs by following different codes by BS 8110 - Euro code – ACI - IS 456
2. To Understand Estimation Of Crack width In -Beams , Shrinkage And Thermal Cracking By IS 456 Of BS 8110
3. To impart design procedure of Shear In Flat Slabs And Flat Plates
4. To impart design Of Plain Concrete Walls And Shear Walls
5. To demonstrate design of Design Of Reinforced Concrete Members For Fire Resistance by ISO 834 Standard Heating Conditions

Course Outcomes (CO):
1. Understand the basic concepts of concrete beams and slabs by different codes
2. To know the concepts of deep beams by British practice-ACI –IS 456
3. Apply design concepts to Shear In Flat Slabs And Flat Plates
4. Apply design concepts to Plain Concrete Walls And Shear Walls to Understand the basic concepts of fire resistance
5. Apply design concepts for fire resistance of Reinforced Concrete Members

 UNIT - I
Deflection Of Reinforced Concrete Beams And Slabs: Introduction -Short-Term Deflection Of Beams And Slabs -Deflection Due To - Imposed Loads - Short- Term Deflection Of Beams Due To Applied Loads- Calculation Of Deflection By IS 456 - Calculation Of Deflection By BS 8110 - Deflection Calculation By Euro code – ACI Simplified Method - Deflection Of Continuous Beams By IS 456 - Deflection Of Cantilevers - Deflection Of

Slabs

UNIT - II
Estimation Of Crack Width In Reinforced Concrete Members And Design Of Deep Beams:
Introduction - Factors Affecting Crack width In Beams - Mechanism Of Flexural Cracking
Calculation Of Crack Widths - Simple Empirical Method - Estimation Of Crack width In -
Beams By IS 456 Of BS 8110 - Shrinkage And Thermal Cracking. Deep Beams:
Introduction - Minimum Thickness - Steps Of Designing Deep Beams - Design By IS 456 -
Design According To British Practice - ACI Procedure For Design Of Deep Beams -
Checking For Local Failures - Detailing Of Deep Beams.

UNIT - III
Shear In Flat Slabs And Flat Plates: Introduction - Checking For One-Way (Wide Beam)
Shear - Two-Way (Punching) Shear Permissible Punching Shear - Shear Due To Unbalanced
Moment (Torsional Moments) Calculation Of J Values - Strengthening Of Column Areas
For Moment Transfer By Torsion Which Produces Shear - Shear Reinforcement Design -
Effect Of Openings In Flat Slabs - Recent Revisions In ACI 318 - Shear In Two – Way
Slabs With Beams.

UNIT - IV
Design Of Plain Concrete Walls And Shear Walls: Introduction - Braced And Unbraced
Walls - Slenderness Of Walls- Eccentricities Of Vertical Loads At Right Angles To Wall -
Empirical Design Method For Plane Concrete Walls Carrying Axial Load - Design Of Walls
For In-Plane Horizontal Forces - Rules For Detailing Of Steel In Concrete Walls Design Of
Shear Walls: Introduction - Classification Of Shear Walls - Classification According To
Behavior - Loads In Shear Walls - Design Of Rectangular And Flanged Shear Walls -
Derivation Of Formula For Moment Of Resistance Of Rectangular Shear Walls

UNIT - V
Design Of Reinforced Concrete Members For Fire Resistance : Introduction - ISO 834
Standard Heating Conditions- Grading Or Classification - Effect Of High Temperature On
Steel And Concrete - Effect Of High Temperatures On Different Types Of Structural
Members - Fire Resistance By Structural Detailing From Tabulated Data - Analytical
Determination Of The Ultimate Bending Moment Capacity Of Reinforced Concrete Beams
Under Fire - Other Considerations

Textbooks:
1. Structural Design and Drawing: Reinforced Concrete and Steel, Fourth Edition, N
   Krishna Raju, Universities Press, 2022
2. Reinforced Concrete Structural Elements: Behaviour, Analysis and Design, by
   P.Purushothaman, Tata Mcgraw Hill.
Reference Books:
1. Reinforced Concrete Desigers Hand Bood, by C.E. Reynolds And J.C. Steedman, A View
   Point Publication.
2. Limit State Design Of Reinforced Concrete Structures By P.Dayaratnam, Oxford &Ibh
   Publishers.
3. Advanced Rcc By N.KrishnaRaju, Cbs Publishers & Distributors.
4. Reinforced Cement Concrete Structures – DevdasMenon&Unnikrishna Pillai, Pearson
   Publishers

Online Learning Resources:

Course Code   **Hydraulic Structures and Water Power**   **L**   **T**   **P**   **C**
20A70102c   **Engineering**   **3**   **0**   **0**   **3**
                                           Semester   **VII**

Course Objectives:
1. Introduce the types of irrigation systems and introduce the concepts of planning and design of irrigation systems
2. Understand design methods of erodible and non-erodible canals
3. Know the principles of design of hydraulic structures on permeable foundations
4. Know the concepts for analysis and design principles of storage and diversion works.
5. Learn design principles of canal structures

Course Outcomes (CO):
1. Design various channel systems
2. Design head and cross regulator structures and also identify various types of reservoir and their design aspects.
3. By the Establishes the understanding of cross drainage works and its design.
4. Students understood all type of dams and reservoirs and their designs
5. Students understood Spillways, Gates & Energy dissipaters.

6.

UNIT - I

CANAL REGULATION WORKS: Canal falls: Necessity and location of falls; Types of falls; Classification of falls; Design of sarada type fall.

Canal regulators: head regulators and cross-regulators; design of cross-regulator and distributary head regulator.

CROSS DRAINAGE WORKS: Introduction; types of cross drainage works; selection of suitable type of cross drainage work; classification of aqueducts and siphon aqueducts.

UNIT - II

STREAM GAUGING: Necessity; Selection of gauging sites; Methods of Discharge Measurement Area-Velocity method; Slope-Area method; Tracer method, Electromagnetic induction method, Ultrasonic method; Measurement of depth – Sounding rod, Echo-Sounder; Measurement of velocity: Floats – Surface floats, Sub–Surface float or Double float, Velocity rod; Pitot tube ;Current meter- Rating of current meter, measurement of velocity; chemical method; Measurement of stage-Staff gauge, wire gauge, water stage recorder, bubble gauge recorder; stage-discharge curve.

RIVER ENGINEERING:

Classification of rivers; Meandering; Causes of meandering; Basic factors controlling process of meandering; Aggrading type of river; Degrading type of River.

UNIT - III

RESERVOIR PLANNING:

Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass in flow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams: Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Flood routing; Methods of flood routing-Graphical Method (Inflow – Storage discharge curves method).

DAMS :GENERAL: Introduction; Classification according to use; Classification according to material- Gravity dams, Arch dams, Buttress dams, Steel dams, Timber dams, Earth dams and rock fill dams-Advantages and disadvantages; Physical factors governing selection of type of dam ; selection of site for a dam.

UNIT - IV

GRAVITY DAMS: Introduction; Forces acting on a gravity dam; Combination of loading for design; Modes of failure: stability requirements; principal and shear stresses; Stability analysis; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam- High and low gravity dams; Design of gravity dams–single step method;

EARTH DAMS: Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Design to suit available materials; Seepage control measures;

UNIT - V

SPILLWAYS: Introduction; Types of spillways; Profile of ogee spillway; Energy dissipation below spillways for relative positions of jump height curve and tail water

curve; Stilling basins; Indian standards on criteria for design of hydraulic jump type stilling basins with horizontal aprons; Spillway crest gates-Types and description only.

WATER POWER ENGINEERING: Development of hydro power in India; Classification of hydel plants: runoff river plants, storage plants and pumped storage plants; low, medium and high head schemes.

Textbooks:
1. Irrigation and Water Power Engineering by Dr.B.C.Punmia&Dr.Pande B.B. Lal; Laxmi Publications pvt. Ltd., New Delhi 17th edition 2021
2. Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna Publishers, Delhi 36th edition

Reference Books:
1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
2. Irrigation, Waterpower and Water Resources Engineering by K R Arora; Standard Publication,New Delhi 2010
3. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers 2020

Online Learning Resources:
https://nptel.ac.in/courses/105105110

(Common to All Branches)

Course Code	**MANAGEMENT SCIENCE**	**L**	**T**	**P**	**C**
20A75401a		**3**	**0**	**0**	**3**
Pre-requisite	**Sem-VII**				

COURSE OBJECTIVES: The objectives of this course are

1	To provide fundamental knowledge on management, administration, organization & its concepts.
2	To make the students understand the role of management in Production process and marketing management
3	To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
4	To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
5	To make the students aware of the contemporary issues in management

Course Outcomes (CO): At the end of the course, students will be able to

1	Define the Management, and its Functions
2	Understand the concepts & principles of management and designs of organization in a practical world
3	Apply the knowledge of Work-study principles & Quality Control techniques in industry
4	Analyse the concepts of HRM in Recruitment, Selection and Training & Development.
5	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyse the business through SWOT.
6	Create Modern technology in management science.

UNIT - I   INTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - Systems Theory - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end if the Unit, the learners will be able to
➢ Understand the concept of management and organization
➢ Analyze the organization chart & structure for an enterprise.
➢ Apply the concepts & principles of management in real life industry.
➢ Evaluate and interpret the theories and the modern organization theory.

UNIT - II   OPERATIONS & MARKETING
MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), - Statistical Quality Control- **Materials Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to
➢ Understand the core concepts of Management Science and Operations Management
➢ Apply the knowledge of Method of Production principles in real life industry.
➢ Analyze Marketing Mix Strategies for an enterprise
➢ Evaluate Materials departments & Determine EOQ
➢ Create and design advertising and sales promotion

UNIT - III   HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Evolution of HRM - Definition and Meaning – Nature - Managerial and Operative functions - - Job Analysis - Human Resource Planning (HRP) – Process of Recruitment &Selection - Training and Development - Performance Appraisal - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

LEARNING OUTCOMES: At the end if the Unit, the learners will
- ➢ Understand the concepts of HRM in Recruitment, Selection, Training & Development
- ➢ Apply Managerial and operative Functions of HRM
- ➢ Analyze the need of training
- ➢ Evaluate performance appraisal Techniques
- ➢ Design the basic structure of salaries and wages Administration.

UNIT - IV   **STRATEGIC & PROJECT MANAGEMENT**
Strategy Definition & Meaning - Vision - Mission - Goals - Steps in Strategy Formulation and Implementation - SWOT Analysis **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to
- ➢ Understand Mission, Objectives, Goals & strategies for an enterprise
- ➢ Apply SWOT Analysis to strengthen the project
- ➢ Analyze Strategy formulation and implementation
- ➢ Evaluate PERT and CPM Techniques
- ➢ Creative in completing the projects within given time

UNIT - V   **Contemporary Issues In Management**
The concept of Management Information System (MIS) - Materials Requirement Planning (MRP) - Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Business Process Outsourcing (BPO) - Business Process Re-engineering - knowledge Management.

LEARNING OUTCOMES At the end if the Unit, the learners will be able to
- ➢ Understand modern management techniques
- ➢ Apply Knowledge in Understanding in modern management techniques
- ➢ Analyze Concept of CRM, MRP, TQM
- ➢ Evaluate Six Sigma concept and SCM

Textbooks:
1. A.R Aryasri, Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

Reference Books:
1. Koontz &Weihrich, Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, Management Principles and Guidelines, Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Online Learning Resources:

www.slideshare.net/jhayabesamis/chapter-1-the-nature-and-concept-of-management-122625641?

www.slideshare.net/vivekpratapsingh14/school-of-management-thoughts?

https://www.slideshare.net/89ajpaul/organizational-design-anf-structure

https://www.slideshare.net/sujeet2685/plant-layout-46555840#

https://www.slideshare.net/drmadhurverma/materials-38395397

https://www.slideshare.net/ShaliniShetty3/introduction-to-marketing-management-72210724?

https://www.slideshare.net/srinidhiraman/human-resource-management-ppt-43320777

https://www.slideshare.net/wicaksana/training-and-development-33535063

https://www.slideshare.net/ayushijain107/strategic-management-ppt-58012275

(Common to All Branches)

Course Code	BUSINESS ENVIRONMENT	L	T	P	C
20A75401b		**3**	**0**	**0**	**3**
Pre-requisite	**Sem-VII**				

Course Objectives:

1.	To make the student understand about the business environment
2.	To enable them in knowing the importance of fiscal and monitory policy
3	To facilitate them in understanding the export policy of the country
4.	To Impart knowledge about the functioning and role of WTO
5.	To Encourage the student in knowing the structure of stock markets

Course Outcomes (CO): At the end of the course, students will be able to

1.	Define Business Environment and its Importance.
2.	Understand various types of business environment.
3	Apply the knowledge of Money markets in future investment
4	Analyse India's Trade Policy
5	Evaluate fiscal and monitory policy
6	Develop a personal synthesis and approach for identifying business opportunities

 UNIT - I   **Overview of Business Environment**

Introduction – meaning Nature, Scope, significance, functions and advantages. Types - Internal & External, Micro and Macro. Competitive structure of industries - Environmental analysis -   advantages & limitations of environmental analysis & Characteristics of business.

Learning Outcomes: - After completion of this unit student will
  ➢ Understand the concept of Business environment
  ➢ Classify various types of business environment
  ➢ Evaluate the environmental analysis in business
  ➢ Discuss the Characteristics of Business.

UNIT - II   **Fiscal Policy**

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget - Monetary Policy - Demand and Supply of Money – RBI - Objectives of monetary and credit policy - Recent trends - Role of Finance Commission.

Learning Outcomes: - After completion of this unit student will
- ➢ Understand the concept of public revenue and public Expenditure
- ➢ Identify the functions of RBI and its role
- ➢ Analyze the Monitory policy in India
- ➢ Know the recent trends and the role of Finance Commission in the development of our country
- ➢ Differentiate between Fiscal and Monitory Policy

UNIT - III **India's Trade Policy**

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes: - After completion of this unit student will
- ➢ Understand the role of Indian international trade
- ➢ Understand and explain the need for Export and EXIM Policies
- ➢ Analyze causes for Disequilibrium and correction measure
- ➢ Differentiate between Bilateral and Multilateral Trade Agreements

UNIT - IV **World Trade Organization**

Introduction – Nature, meaning, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round – TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes: - After completion of this unit student will
- ➢ Understand the role of WTO in trade
- ➢ Analyze Agreements on trade by WTO
- ➢ Understand the Dispute Settlement Mechanism
- ➢ Compare and contrast the Dumping and Anti-dumping Measures.

UNIT - V **Money Markets and Capital Markets**

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes: - After completion of this unit student will
- ➢ Understand the components of Indian financial system
- ➢ Know the structure of Money markets and Capital markets
- ➢ Analyze the Stock Markets
- ➢ Apply the knowledge in future investments
- ➢ Understand the role of SEBI in investor protection.

Textbooks:

1.Business Environment Text & Cases: JUNE 2017
2. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.
3. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th
   Revised Edition.HPH2016

Reference Books:
1.K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers,
   New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice
Hall of
   India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4.E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

Online Learning Resources:
https://www.slideshare.net/ShompaDhali/business-environment-53111245
https://www.slideshare.net/jitenparmar313/fiscal-policy-65521889
https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
https://www.slideshare.net/prateeknepal3/ppt-mo

(Common to All Branches)

Course Code	ORGANIZATIONAL BEHAVIOUR	L	T	P	C
20A75401c		3	0	0	3
Pre-requisite	Sem-VII				

Course Objectives:

1	To make them aware of concepts & analysis in organizational behaviour
2	To offer knowledge to students on self-motivation, leadership and management
3	To facilitate them to become powerful leaders
4	To Impart knowledge about group dynamics
5	To make them understand the importance of change and development

COURSE OUTCOMES: At the end of the course, students will be able to

1	Define the Organizational Behaviour, its nature and scope
2	Understand the nature and concept of Organizational behaviour
3	Apply theories of motivation to analyse the performance problems
4	Analyse the different theories of leadership
5	Evaluate group dynamics
6	Develop as powerful leader

UNIT - I   **Introduction Of Organizational Behavior and Various Concepts**

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective - Understanding Individual Behavior – Attitude - Perception - Learning – Personality.

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the concept of Organizational Behavior
- ➢ Contrast and compare Individual & Group Behavior and attitude
- ➢ Evaluate personality types

UNIT - II   **Motivation and Organization Outcome**

Theories of Motivation - Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy - McClelland's theory of needs – Mc Gregor's theory X and theory Y – Adam's equity theory – Locke's goal setting theory –

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the concept of Motivation
- ➢ Analyze the Theories of motivation
- ➢ Explain how employees are motivated according to Maslow's Needs Hierarchy

UNIT - III   **Leadership**

Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Alderfer's ERG theory – traits - Leaders Vs Managers.

Conflict Management - Evaluating Leader - Women and Corporate leadership.

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the concept of Leadership
- ➢ Contrast and compare Trait theory and Managerial Grid
- ➢ Distinguish the difference between Transactional and Transformational Leadership
- ➢ Evaluate the qualities of good leaders

UNIT - IV   **Organizational Culture**

Introduction – Nature, Meaning, scope, definition and functions - Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the importance of organizational change and development
- ➢ Apply change management in the organization
- ➢ Analyze work stress management
- ➢ Evaluate Managerial implications of organization

UNIT - V   **Organizational Change and Development**

Introduction – Nature, Meaning, scope, definition and functions - Organizational

Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

LEARNING OUTCOMES: - After completion of this unit student will

> ➢ Understand the importance of organizational change and development
> ➢ Apply change management in the organization
> ➢ Analyze work stress management
> ➢ Evaluate Managerial implications of organization

Textbooks:
1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011
2. P Subba Rao, Organisational Behaviour, Himalya Publishing House 2017

Reference Books:
- McShane, Organizational Behaviour, TMH 2009
- Nelson, Organisational Behaviour, Thomson, 2009.
- Robbins, P.Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.
- Aswathappa, Organisational Behaviour, Himalaya, 2009

https://www.slideshare.net/payalrchhabra/organisational-behavior-15668552
https://www.slideshare.net/nilendrakumar7/motivation-and-team-building
https://www.slideshare.net/Knight1040/organizational-culture-9608857
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/kohlisudeep18/organisational-developmet

(Common to All Branches)

Open Elective Course- III

Course Code	Building Technology for Engineers	L	T	P	C
20A70104		3	0	0	3
	Semester		VII		

Course Objectives :
1. To make the student familiar with varioustypes of Buildings and its components
2. To teach the students about general requirements of building regarding safety and transportation
3. To impart knowledge on various special requirements of buildings regarding ventilation, insulation acoustics, etc,.
4. To make the student familiar with the concepts of various Prefabrication systems.
5. To Teach the students about various construction equipments used in building.

Course Outcomes:
By the end of this course the student will be able to

1. Classify various types of buildings and its components.
2. Understand the general requirements of building regarding safety and transportation.
3. Understand the Special requirements of buildings regarding ventilation, insulation acoustics, etc,.
4. Familiarize with the concepts of various Prefabrication systems.
5. Understand various construction equipments used in building.

UNIT-1

Building planning: Types of Buildings — components, definitions, economy and design, Principles and aspects of building planning, Definitions and importance of Grouping and circulation; Lighting and ventilation; Sustainability and Green Buildings.

UNIT-II

General requirements: Requirements for safety against fire, termite, damping, earthquakes, Vertical transportation in building — planning of vertical transportation, Stairs, different forms of stairs, Other modes of vertical transportation.

UNIT-III

Special Requirements: Air conditioning — process and classification of air conditioning, Dehumidification. Systems of air-conditioning, ventilation, functional requirements of ventilation. Thermal insulation. Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation.

UNIT-IV
Prefabrication systems: Prefabricated walls, openings, cupboards, shelves etc., planning and modules and sizes of components in prefabrication. Plumbing services — water supply system, maintenance of building pipe line, Sanitary fittings, Design of building drainage.

UNIT-V
Construction Equipment: Introduction and Planning for construction Equipment, Earthmoving and Excavating equipment, Pile driving equipment, Lifting and Concreting Equipment.

Learning Resources:

Text Books:
1. Building Construction, Punmia B. C., Jain A.J., and Jain A.J., Laxmi Publication, 2016, Eleventh Edition.
2. The Text book for Building Construction, Arora S. P., and Bindra S. P., Dhanpat Rai Pubications, 2010.

Reference Books:
1. Building Construction, Varghese P.C., PHI Learning Pvt. Ltd., 2017, 2nd Edition.
2. Construction Planning, Equipment and Methods, Robert P., Clifford J. S., and Aviad S., McGrawHiII Education, 2010

.

(Common to All Branches)

Open Elective Course- IV

Course Code	Environmental Impact Assessment	L	T	P	C
20A70105		3	0	0	3
	Semester		VII		

Course Objectives:
1. To impart knowledge on different concepts of Environmental Impact Assessment.
2. To teach procedures of risk assessment.
3. To teach the EIA methodologies and the criterion for selection of EIA methods.
4. To teach the procedures for environmental clearances and audit.
5. To know the impact quantification of various projects on the environment.

Course Outcomes (CO):
1. To prepare EMP, EIS, and EIA report.
2. To identify the risks and impacts of a project.

3. To choose an appropriate EIA methodology.
4. To evaluation the EIA report.
5. To Estimate the cost benefit ratio of a project.

UNIT - I
Concepts and methodologies of EIA : Initial environmental Examination, Elements of EIA, - Factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters- Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT - II
Impact of Developmental Activities and Land Use :Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT - III
Assessment of Impact on Vegetation, Wildlife and Risk Assessment :Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-Advantages of Environmental Risk Assessment
UNIT - IV   Environmental audit
Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.
UNIT - V   Environmental Acts and Notifications
The Environmental protection Act, The water preservation Act, The Air (Prevention & Control of pollution Act), Wild life Act - Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- Evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Textbooks:
1. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
Reference Books:
1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers

3. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi.

Online Learning Resources:

https://nptel.ac.in/courses/124107160

| **Course Code** | **Skills on STAAD PRO** | **L** | **T** | **P** | **C** |

20A70106   **1   0   2   2**
<div style="text-align: center">**Semester   VII**</div>

Course Objectives:
1. To teach the students to understand the details of STAAD.Pro software package
2. To enable the students to prepare input data for RCC & Steel structures
3. To enable the students to design different components of structures
4. Students will learn the details of STAAD.Pro software package and know the behaviour of RCC and Steel structures.
5. Students will understand the bending moment diagram, drawn in tension face and shear force diagram

Course Outcomes (CO):
At the end of the course, the student will be able to
1. Understand the details of STAAD.Pro software package
2. To prepare input data of STAAD.Pro.
3. Run STAAD.Pro for analysis and desing of structures
4. Design different components of structures
5. Expertise in functionalities like model generation and editing; loading analysis; concrete designing etc.

List of Experiments:
1. Analysis & Design of 2D Frame under pure Vertical loading using Staad Pro Software.
2. Analysis & Design of 2D Frame under both Vertical & Horizontal loading using Staad Pro Software.
3. Analysis & Design of 2D Truss using Staad Pro Software.
4. Analysis & Design of 3D Frames using Staad Pro Software.
5. Analysis & Design of Different types of Beams Using Staad Pro Software.
6. Analysis & Design of Rectangular & Circular Columns Using Staad Pro Software.
7. Analysis & Design of Isolated Footings Using Staad Pro Software.
8. Analysis & Design of Retaining Walls Using Staad Pro Software.
9. Analysis & Design of One Way and Two Way Slabs Using Staad Pro Software.
10. Analysis & Design of Simple Tower by Using Staad Pro Software.

Textbooks
Staad Pro V8i for Beginners:With Indian Examples by T.S.Sarma,Notion Press Media Pvt Ltd

Online Learning Resources/Virtual Labs:

Course Code	Cost Effective Housing Techniques	L	T	P	C
20A01H11		3	1	0	4
	Semester				

Course Objectives:
1. To understand the requirements of structural safety for future construction.
2. To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
3. To know the traditional practices of rural housing
4. To know the different innovative cost effective construction techniques
5. To know the alternative building materials for low cost housing.

Course Outcomes (CO):
1. To know the repair and restore action of earthquake damaged non engineered buildings and ability to understand the requirements of structural safety for future construction
2. To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
3. Apply the traditional practices of rural housing
4. Understand the different innovative cost effective construction techniques
5. Suggest the alternative building materials for low cost housing

UNIT - I
a) **Housing Scenario :**Introducing - Status of urban housing - Status of Rural Housing
b) **Housing Finance**: Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues
c) **Land use and physical planning for housing :**Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities
d) **Housing the urban poor :**Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

UNIT - II
Development and adoption of low cost housing technology
Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall – Fly-ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT - III
Alternative building materials for low cost housing
Introduction - Substitute for scarce materials – Ferro-cement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - alternative building maintenance
Low cost Infrastructure services:
Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

UNIT - IV

Rural Housing: Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT - V

Housing in Disaster prone areas:

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions.

Requirement's of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

Textbooks:

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy &G.Annamalai. E. & F. N. Spon Publishers

Online Learning Resources:

https://nptel.ac.in/courses/124107001

Course Code	Pre Engineered Buildings	L	T	P	C
20A01H12		3	1	0	4
	Semester				

Unit – I
Need for prefabrication: General Principles of Prefabrication - Comparison with monolithicconstruction, types of prefabrication, site and plant prefabrication, economy of prefabrication,modular coordination, standardization – Materials – Modular coordination – Systems –Production – Transportation – Erection.

Unit – II
Prefabricated Load Carrying Members: Planning for components of prefabricatedstructures, disuniting of structures, design of simple rectangular beams and I-beams,handling and erection stresses, elimination of erection stresses, beams, columns, symmetricframes.

Unit - III
Behaviour of structural components: Large panel constructions – Construction of roof
and floor slabs – Wall panels – Columns – Shear walls.
Joints: Joints for different structural connections, effective sealing of joints for waterproofing, provisions for non-structural fastenings, expansion joints in precast construction.

Unit- IV
Production Technology: Choice of production setup, manufacturing methods, stationaryand mobile production, planning of production setup, storage of precast elements,dimensional tolerances, acceleration of concrete hardening. Hoisting Technology -Equipment for hoisting and erection, techniques for erection of different types of memberslike beams, slabs, wall panels and columns, vacuum lifting pads.

Unit – V
Applications: Designing and detailing of precast unit for factory structures, purlins, principalrafters, roof trusses, lattice girders, gable frames, singe span single storied simple frames,single storied buildings, slabs, beams and columns.
Progressive collapse: Code provisions – Equivalent design loads for considering abnormaleffects such as earthquakes, cyclones, etc., - Importance of avoidance of progressivecollapse.

Text Books:
1. Introduction of Precast Factory, Vijayakandeeban, 2021.
2. Prefabricted Housing: Construction and Design Manual, Phillip Meuser, DOM Publishers, 2020.
3. CBRI, Building materials and components, India, 1990

Reference Books:
1. Knowledge based process planning for construction and manufacturing, Gerostiza C.Z., Hendrikson C. and Rehat D.R., Academic Press Inc., 1994.

2. Manual of precast concrete construction, Vols. I, II and III, Koncz T., Bauverlag, GMBH, 1971.
3. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.
4. Prefabricated Concrete for Industrial and Public Structures, Mokk. L, Publishing House of the Hungarian Academy of Sciences, Budapest, 1964.

Online Resources:

https://www.youtube.com/watch?v=b9WQhnYq81s
https://nptel.ac.in/courses/124/105/124105013/

Course Code	Design of Bridges	L	T	P	C
20A01H13		3	1	0	4
	Semester				

UNIT - I

INTRODUCTION: Importance of site investigation in Bridge design. Highway Bridge loading standards. Impact factor. Railway Bridge loading standards (B.G. ML Bridge) various loads in bridges.
BOX CULVERT : General aspects. Design loads, Design of Box culvert subjected to IRC class AA tracked vehicle only.
BRIDGE BEARINGS : General features – Types of Bearings – Design principles of steel Rocker & Roller Bearings – Design of a steel Rocker Bearing – Design of Elastometric pad Bearing.

UNIT - II
DECK SLAB BRIDGE : Introduction – Effective width method of Analysis Design of deck slab bridge (Simply supported) subjected to class AA Tracked Vehicle only.

UNIT - III
BEAM & SLAB BRIDGE (T-BEAM BRIDGE) : General features – Design of interior panel of slab – Pigeauds method – Design of a T-beam bridge subjected to class AA tracked vehicle only.

UNIT – IV
PLATE GIRDER BRIDGE : Introduction – elements of a plate girder and their design. Design of a Deck type welded plate girder – Bridge of single line B.G.

UNIT V
PIERS & ABUTMENTS: General features – Bed Block – Materials piers & Abutments Types of piers – Forces acting on piers – Stability analysis of piers – General features of Abutments – forces acting on abutments – Stability analysis of abutments – Types of wing walls – Approaches – Types of Bridge foundations (excluding Design).

TEXT BOOKS :

1. Bridge Engineering by Ponnu Swamy, TATA Mcgraw Hill Company, New Delhi.
2. Design of Bridges by N.Krishnam Raju, Oxford & IBH, Publishing Company Pvt.ltd., Delhi.
3. Relevant – IRC & Railway bridge Codes.

REFERENCE :-

1. Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
2. Design of Bridges Structure by D.J.Victor
3. Design of Steel structures by Ramachandra.
4. Design of R.C.C. structures B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
5. Design of Bridges Structure by T.R.Jagadish&M.A.Jayaram Prentice Hall of India Pvt., Delhi.

Course Code	CONSTRUCTION ECONOMICS AND	L	T	P	C
20A01H14	FINANCE	3	1	0	4
	Semester				

Course Objectives:
1. The market structures and integration concepts
2. To study the role & methods of economics & finance concepts applied to construction business.
3. Acquire knowledge of economics to facilitate the process of economic decision making
4. Acquire knowledge on basic financial management aspects
5. Develop the skills to analyze financial statements

Course Outcomes (CO):
1. Evaluate the economic theories, cost concepts and pricing policies
2. Apply Systematic evaluation of cost and benefit associated with different projects.
3. Apply the concepts of financial management for project appraisal
4. Understand accounting systems and analyze financial statements
5. Understand the impact of economic investment and project-management techniques

UNIT - I
Economics- Role of Civil Engineering in Industrial Development-Advances in Civil Engineering and engineering economics- Support matters of Economy as related top Engineering-Market demand and supply-Choice of technology- Quality control and Quality Production-Audit in economic law of returns governing production

UNIT - II
Construction of economics- Construction development in housing, Transport and other infrastructures-Economics of Ecology, environment, energy resources-Local material selection - Form and Functional designs-Construction workers- Urban problems - Poverty-

Migration-Unemployment-pollution.

UNIT - III
Basics of accounting -cash basis of accounting- accrual basis of accounting. Final accounts-trading, profit and loss account-balance sheet. Analysis of financial statement - ratio analysis- Dupont chart - trend analysis-common size statement- cash flow analysis. Completed contract method -percentage completion method.

UNIT - IV
Long term sources of financing-Equity -debenture- long term loan - preference share -- venture capital - leasing. Short term sources of fund -- money market instruments - certificate of deposit - cash credit - repurchase agreement - treasury bill - commercial paper .

UNIT - V
Important decision of finance - investment decision -capital budget technique - procurement decision - dividend policy decision. Cost of capital.

Textbooks:
1. Projects - Planning Analysis Selection Implementation & Review by Prasanna Chandra, Tata McGrawHill Publishing Co., Ltd, New Delhi.
2. Fundamental of Construction Management and Organization by Kwaku A., Tenah and Jose M .Guevera, Prentice Hall of India

Reference Books:
1. Financial and cost concepts for construction Management by Halpin, D.W., John Wiley & Sons, New York,
2. Introduction to Financial Management by Madura J. and Veit, E.T., West PublishingCo.
3. Construction Economics: An Introduction (Building & Surveying Series), by Stephen L. Gruneberg Palgrave Macmillan.

Online Learning Resources:
https://nptel.ac.in/courses/105103023

MINORS

Course Code	Building Material and Construction	L	T	P	C
20A01M11		**3**	**1**	**0**	**4**
	Semester				

Course Outcomes (CO):

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

1. Identify and characterize the properties of various building materials.
2. Be aware of various Traditional, Organic and Modern building materials emerging materials in the field of civil engineering construction.
3. Understand the manufacturing process of various building materials like stones, Bricks, Ceramics, Glass and Plastic.
4. Understand the basic principles of low-cost, Alternate and Sustainable materials and capable to practice Eco friendly Civil engineering materials

5   Analyze and design the masonry buildings using IS-code provisions.

UNIT – I

INTRODUCTION TO BUILDING MATERIALS
Traditional& OrganicBuilding Materials –Stone–Dressingof Stones– Modern Building Materials – Bricks – Manufacturing process – Ceramic Products – Manufacturing Process –Building Materials for Low Cost Housing – Utilisation of Wastes for Alternative Building Materials –Sustainable Materials in Construction, Concepts of energy efficient building envelopes as per ECBC – National Standards.

UNIT - II
GLASS: Introduction to Fenestration- Functions of Glass in Buildings – Constituents and Classification of Glass – Manufacturing Process –Properties of Glass – Common Types of Glass – Special Glass – Advantages and Disadvantages of Glass – National Standards such as ECBC.
PLASTIC: Introduction – Polymerisation – Classification of Plastics– Commonly Used Plastics – Moulding and Fabricating for Plastic Products – Applications – Advantages – Disadvantages – Intelligent Use of Plastics in Buildings – National Standards such as ECBC.
UNIT – III :
INSULATING MATERIALS : Thermal Insulating Materials: Introduction – Thermal Insulation – Heat Transfer Fundamentals – Thermal Properties of Insulating Materials – Selection of Insulating Materials – Classification of Insulation materials – Reflective Insulation Systems – Commonly Used Building Insulation Materials – Insulation that Should not be Used – National Standards such as ECBC.
Sound Insulating Materials: Introduction – Basics of Acoustics – Sound Absorption or Insulation – Green Insulation – Cool Roof, Green Roof, Power Roof – National Standards such as ECBC

UNIT - IV
STRUCTURAL COMPONENTS:–
Foundations – classification of Foundations – consideration in selection of foundation types– Masonry – Brick and block walls – Cavity walls – Damp–proof courses and membranes – Mortars – Arches and openings – Windows – Glass and glazing –Doors – Stairs – Types and Applications – Cladding to external walls – Flat roofs – Dormer windows – Formwork & Scaffolding – Precast concrete frames – Portal frames – Types – components – Framed structures – Components – Construction Procedure – Panel walls – National Standards such as ECBC.
UNIT - V
INTERNAL CONSTRUCTION AND FINISHES
Internal elements – Internal walls – Construction joints – Internal walls, fire protection –separating walls – Partitions – Plasters and plastering – Domestic floors and finishes – Sound insulation – Timber, concrete and metal stairs–Internal doors – Door sets – Fire resisting doors – Plasterboard

ceilings – Suspended ceilings –Paints and painting – Components of Paints – Types of Paint – Considerations in Selecting Paints – Cement Paints – Oil Paints –Emulsion Paints – Whitewash and Colourwash – Application of Paints –Distempers – Varnishes – Safety –Joinery production – Composite boarding – National Standards such as ECBC

Textbooks:
6. Building Material by S K Duggal – New Age International Publishers; Second Edition
7. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
8. A Textbook on Building Construction by S.K.Sharma, S.ChandPubilishers.
9. Building Materials by M.L.Gambhir, TMH Pubilishers.
10. ECBC (Energy Conservation Building Code).

Reference Books:
7. Building construction by W.B.Mckay, Vol.I, II, III & IV Pearson Publications, 2013 edition.
8. R.Chudly "Construction Technology" VolumesI and II" 2nd Edition, Longman, UK, 1987.
9. Building materials by S.C.Rangawala, CharotarPubilishing House, Anand- INDIA.
10. Building Construction by S.C.Rangawala, CharotarPubilishing House, Anand- INDIA
11. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
12. BEE (Bureau of Energy Efficiency) Manuals on Energy efficient building envelope concepts.

Course Code	BUILDING PLANNING AND	L	T	P	C
20A01M12	DRAWING	3	1	0	4
	Semester				

Course Objectives:
1. Understand basic principles of building design and planning.
2. Comprehend local building bye-laws and provisions of National Building Code in respect of building and town planning
3. They will explore building drawing as a way of discovering and developing ideas for designing residential , commercial and public buildings.
4. The student develops basic drawing skills; create multilayer architectural and prepare working drawings, foundation plans and other executable drawings with proper details for residential buildings
5. Explain the principles of planning and design considerations to construct earthquake resistant building

Course Outcomes (CO):
1. The scope of this course is to introduce the concepts of building planning and drawing with emphasis on architectural planning.
2. This subject is designed as an introduction for subjects who wish to develop their competence and skills in the preparation of architectural and building drawings.
3. Able to know the requirements of different rooms and characteristics of various types of residential buildings.
4. Able to know about building byelaws and regulations.
5. Ability to draw line sketch and planning and bi section of a building.

UNIT - I   **PART - A**
PLANING OF BUILDINGS: Types of buildings, Types of residential buildings, site selection for residential building, orientation of buildings; aspect; prospect; privacy; furniture requirement
e;grouping;circulation;sanitation;lighting;ventilation;cleanliness;flexibility;elegancy;Economy; practical considerations.
BUILDING BYELAWS AND REGULATIONS: Introduction- Terminology ;Objectives of building byelaws; Minimum plot sizes; Open space requirements ;Plinth area, floor area, carpet area; Floor area ratio (FAR), Floor space Index (FSI) ;areas for different units; Principles underlying building byelaws ; built up area limitations – Height of Buildings ,Wall thickness, lighting and ventilation requirement, safety from fire, drainage and sanitation; applicability of the bye-laws.
UNIT - II
PLANNING OF RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings– Requirements of different rooms and their grouping – Characteristics of various types of residential buildings
PLANNING OF PUBLIC BUILDING: Planning of Educational institutions, Hospitals, Office buildings, Banks, Industrial buildings, Hotels and Motels, Hostels, Bus Station.
UNIT - III
BUILDINGS: SAFETY AND COMFORT: Aspects of safety-Structural, health, fire and constructional safety. Components of building automation system - HVAC, electrical lighting, Security, fire-fighting, communication etc. design for thermal comfort, ventilation comfort, air conditioning comfort, lighting comfort, noise and acoustic comfort.

UNIT - IV   PART - B

SIGN CONVENTIONS AND BONDS: Brick, Stone, Plaster, Sand filling, Concrete, Glass, Steel, Cast iron, Copper alloys, Aluminum alloys etc., Lead, Zinc, tin, and white lead etc., Earth, Rock, Timber and Marble. English bond & Flemish bond; odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

DOORS WINDOWS, VENTILATORS AND ROOFS: Paneled Door – Paneled and glazed door; glazed windows – Paneled windows; Swing ventilator – Fixed ventilator; Couple roof – Collar roof; Kind Post truss – Queen post truss.

UNIT - V

Given line diagram with specification to draw plan, section and elevation of the following :
1. Residential Building
2. Hospital
3. Schools
4. Post office
5. Corporate Office Building
6. Hotels
7. Bank buildings
8. Bus stations
9. Industrial buildings

FINAL EXAMINATION PATTERN: The end examination paper should consist of Part-A and Part-B. Part- A consists of three questions with either or choice from three units in planning portion .Each question carries 10 marks. Total marks for Part-A is 30 marks. Part- B consists of two questions with either or choice from drawing portion. Question from unit-IV carries 10 marks and question from unit-V carries 30 marks. Total marks for Part-B is 40 marks.

Textbooks:
1. Planning and Designing and Scheduling – Gurucharan Singh and Jagadish Singh- Standard publishers.
2. Building Planning and Design – N.Kumara Swamy and A.Kameswara Rao. Charotar publications.

Reference Books:
1. Building by laws by state and Central Governments and Municipal corporations. National Building Code.
2. Building drawing with an integrated approach to building environment-M.G.Saha, G.M.Kale, S.Y.patki-Tata Mc Graw Hill

Subject Code	Title of the Subject	L	T	P	C
20A01M13	**ESTIMATION, COSTING AND VALUATION**	3	1	0	4

COURSE OBJECTIVES:

The objectives of this course are:

1. To impart basic knowledge on different types of estimation

2. To enrich with specifications and tender procedures.
3. To give insights on various types of contract agreements.
4. To inculcate data preparation for abstract estimation
5. To teach procedure for valuation of buildings.

CO
UR
SE
OU
TC
O

MES

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

1. Understand basics on methods and types of estimation.
2. Formulate specifications and tender documents
3. Prepare contract agreements
4. Determine rate analysis of different items.
5. Valuation of buildings.

UNIT -I:
Estimation : Methods of estimation-advantages-types of estimates-Detailed estimates of residential buildings-Single storied and multi-storied buildings-Earthwork-foundations-Super structure-Fittings including sanitary and electrical fittings-Paintings.

UNIT -II:
Specifications and Tenders : Specifications-Detailed and general specifications-Construction specifications-sources - Types of specifications-Tender notices-types-corrigendum notice-Tender procedures Drafting model tenders.

UNIT -III:

Contracts : Types of contracts-Formation and conditions of contract-Problems-contract for labor, material, design and construction-Drafting of contract documents-Construction contracts- Arbitration and legal requirements.

UNIT -IV:
Rate Analysis and Preparation of Bills : Data-Rate analysis-abstract estimate-Report to accompany estimate-measurement book –Bills-Types.

UNIT -V:
Valuation : Principles of valuation-Value and Cost-Value engineering-Value analysis-Phases in value engineering-Information-Function-escalation-Evaluation-Recommendation-Implementation-Audit.

TEXT BOOKS:

3. Dutta, B. N., "Estimating and Costing in Civil Engineering (Theory & Practice)", UBS Publishers, 2016
4. B. S. Patil, "Civil Engineering Contracts and Estimates", Universities Press Pvt Ltd, Hyderabad. 4th Edition 2015.

REFERENCES:

4. M. Chakraborthi, "Estimation, Costing and Specifications", Laxmi publications.
5. D. D. Kohli & R. C. Kohli, "A Textbook of Estimating and Costing(Civil)", S. Chand and Company Limited, New Delhi
6. Standard Schedule of rates and standard data book by public works department.
7. I. S. 1200 (Parts I to XXV, "Method of Measurement of Building and Civil Engineering works – B.I.S.)" 1974.

Course Code	SURVEYING	L	T	P	C
20A1M14		3	1	0	4

Semester

Course Objectives:
1. To make the student to get well conversant with the fundamentals of various basic methods and instruments of surveying.
2. To introduce to the students in identifying reduced level of the ground and its profile for finding areas and volumes of embankments and cuttings
3. To make the student to use angular measuring instruments for horizontal and vertical control.
4. To enable the student to set simple horizontal curves
5. To introduce the knowledge construction surveys and usage of modern instrument such as total station

Course Outcomes (CO):
1. The student will be able to calculate angles, distances and levels
2. The student will be able to identify data collection methods and prepare field notes
3. The student will be able to understand the working principles of survey instruments
4. The student will be able to understand the basics and elements of different types of curves on roads and surveying applications in setting out of curves
5. The student will be able to able to use modern survey instruments.

UNIT - I
Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions Linear distances-Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip.
Plane table surveying: Introduction, accessories, setting up of plane table, techniques, testing, adjustments, errors, advantages and disadvantages.

UNIT - II
Levelling - Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.
Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.
Computation of Areas and Volumes: Areas - Determination of areas consisting of irregular boundary and regular boundary, Planimeter. Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - III
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.
Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT - IV
Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.
Curves: Types of curves and their necessity, elements of simple circular curve, setting out of simple horizontal circular curves.

UNIT - V
Construction surveys: Introduction-staking out buildings-Pipelines and sewers-Highways-Culverts. Bridge surveys-Determining the length of a bridge-Locating Centres of piers-Surface surveys and tunnel alignment-Underground surveys-connection of surface and underground surveys-Leveling in tunnels.
Total station Surveying: Basic principles, applications, comparison with conventional surveying. Electromagnetic wave theory - Electromagnetic distance measuring system - Principle of working and EDM instruments.

Textbooks:
1. Text book of surveying by C.Venkatramaiah , Universities press,2nd edition2018
2. Surveying" (Vol – 1 & 2), by S K Duggal, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.

Reference Books:
7. Surveying Vol 1, 2 &3, by Arora K R Standard Book House, Delhi, 2004.
8. Surveying (Vol – 1, 2 & 3) by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
9. Higher Surveying by Chandra A M, New age International Pvt. Ltd., Publishers, New Delhi, 2002.

Online Learning Resources:
https://nptel.ac.in/courses/105104101

Open Elective Course – I Civil

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Experimental Stress Analysis	L	T	P	C
20A50105		3	0	0	3
		Semester		V	

Course Objectives:
6. To understand different methods of experimental stress analysis
7. To understand the use of strain gauges for measurement of strain
8. To be exposed to different Non destructive methods of concrete
9. To understand the theory of photo elasticity and its applications in analysis of structures
10. To understand different methods of photo elasticity

Course Outcomes (CO):
6. Understand different methods of experimental stress analysis
7. Understand the use of strain gauges for measurement of strain
8. Expose to different Non destructive methods of concrete
9. Understand the theory of photo elasticity and its applications in analysis of structures
10. Understand different methods of photo elasticity

 UNIT - I
PRINCIPLES OF EXPERIMENTAL APPROACH:Merits of Experimental Analysis Introduction, uses of experimental stress analysisAdvantages of experimental stress analysis, Different methods –Simplification of problems.

UNIT - II
STRAIN MEASUREMENT USING STRAIN GAUGES :Definition of strain and its relation of experimental Determinations Properties of Strain-
Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – Various types –Gauge factor – Materials of adhesion base.

UNIT - III
STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE:
Introduction – The three elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge.
Ultrasonic Pulse Velocity method –Application to Concrete. Hammer Test – Application to Concrete.

UNIT - IV
THEORY OF PHOTOELASTICITY: Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polar scope for various arrangements – Fringe

Sharpening. Brewster's Stress Optic law.

UNIT - V
TWO DIMENSIONAL PHOTOELASTICITY:Introduction – Isochramic Fringe patterns-
Isoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope
Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation
methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of
Photoelastic Materials.

Textbooks:
  3. Experimental stress analysis by J.W.Dally and W.F.Riley, College House Enterprises2005
         4. Experimental stress analysis by Dr.SadhuSingh.khanna Publishers 4th edition

Reference Books:
  3. Experimental Stress analysis by U.C.Jindal, Pearson Pubilications 2012 edition
  4. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.

Online Learning Resources:

Open Elective Course – I EEE

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	ELECTRIC VEHICLE ENGINEERING (OE-I) EEE		L	T	P	C
20A50205			3	0	0	3
Pre-requisite	AC & DC Machines	Semester	V			

Course Objectives: The student will be able to:

- Understand latest trends in Electric Vehicles; parameters used in EV and types of EVs.
- Analyze various energy sources available to run EV like batteries, fuels cells etc.
- Analyze the dynamics and the propulsion system used in EVs, working of fuel cells, battery charging concept.
- Design a electromechanical system using various control techniques.

Course Outcomes (CO): At the end of the course, the student will be able to:

CO1: Understand the difference between conventional and latest trends in Electric Vehicles; understand the various parameters used in EV, types of HEVs.

CO2: Analyze various energy sources available to run EV like batteries, fuels cells etc.

CO3: Analyze the propulsion system of EV, its dynamics and the concept of battery charging.

CO4: Design EV system with battery charger using various fundamental concepts.

UNIT - I	INTRODUCTION TO EV SYSTEMS AND PARAMETERS	Lecture Hrs: 10

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

UNIT - II	EV AND ENERGY SOURCES	Lecture Hrs: 08

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

UNIT - III	EV PROPULSION AND DYNAMICS	Lecture Hrs: 10

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

UNIT - IV	FUEL CELLS	Lecture Hrs: 10

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.

Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples

UNIT - V	BATTERY CHARGING AND VEHICLE CONTROL	Lecture Hrs: 10

Battery charging: Battery Chemistry, Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.

Battery Management System: Introduction and BMS functionality, Battery pack topology, Voltage, Temperature and Current Sensing.

Control: Introduction, modelling of electro mechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Textbooks:C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.
3. Tom Denton, "Electric and Hybrid Vehicles", TAYLOR & FRANCIS; 2nd edition, CBS PUBLISHERS, 2nd Edition, 2020.
4. MehrdadEhsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
5. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Mechanical

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
2050305	**OPTIMIZATION TECHNIQUES**	3	0	0	3

Course Objectives:
   To introduce various optimization techniques i.e classical, linear programming,

   Transportation problem, simplex algorithm, dynamic programming Constrained and unconstrained optimization techniques for solving and optimizing.
   Electrical and electronic engineering circuits design problems in real world situations.
    To explain the concept of Dynamic programming and its applications to project
   Learn the knowledge to formulate optimization problems

UNIT - I

Classical optimization techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints– method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT - II

Numerical methods for optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT - III

Genetic algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems

UNIT – IV

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT V

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam and general optimization model of a machining process.

Course Outcomes:

After completion of this course, the student will be able to explain the need of optimization of engineering systems

understand optimization of electrical and electronics engineering problems

apply classical optimization techniques, linear programming, simplex algorithm,

• transportation problem apply unconstrained optimization and constrained non-linear programming anddynamic programming Formulate optimization problems.

TEXT BOOKS:

Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers

Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers

Engineering Optimization – S.S.Rao, New Age Publishers

REFERENCES:

1.Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers

Genetic Programming- Koza

Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I ECE

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BASICS OF ELECTRONICS AND COMMUNICATION	L	T	P	C
20A50405	ENGINEERING	3	0	0	3
	Semester	V			

Pre-requisite
Applied Physics

Course Objectives:
- To study the basic principle, construction and operation of semiconductor devices.
- To learn the real time applications of semiconductor devices.
- To introduce binary number systems, logic gates and digital logic circuits.
- To get an idea about the basic principles of communication systems and their applications.
- To learn the measurement of physical parameters using Sensors and Transducers.

Course Outcomes (CO): At the end of this course, the students will be able to
- Understand the basic principle, construction and operation of semiconductor devices.
- Learn the real time applications of semiconductor devices.
- Comprehend the binary number systems, logic gates and digital logic circuits.
- Understand the basic principles of communication systems and their applications.
- Measure the physical parameters using Sensors and Transducers.

UNIT - I
Introduction to Electronics Engineering: Overview, scope and objective of studying Electronics Engineering. Introduction to semiconductor devices: Bond structure of semiconductors, intrinsic and extrinsic semiconductors; Basic principle and operation of semiconductor devices – diode, bipolar junction transistor, field effect transistors; Introduction to VLSI.

UNIT - II
Applications of semiconductor devices: Basic concepts of rectifiers, voltage regulators, amplifiers and oscillators; Basic concepts of operational amplifier and their applications.

UNIT - III
Introduction to digital systems: Binary number system, Boolean algebra, Logic gates, adders, one-bit memory, flip-flops (SR, JK), shift registers, Asynchronous counter.

UNIT - IV
Introduction to Communication Systems: Elements of a communication system – transmitter and receiver; Signal types in communication; FDM and TDM; Processing of signals for transmission – basic concepts of amplitude and frequency modulation; Examples of telecommunication systems – telephone, radio, television, mobile communication and satellite communication.

UNIT - V
Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Textbooks:
1. Millman J, Halkias C.C and Jit S, "Electronic Devices and Circuits", Tata McGraw-Hill, 2nd 2007 Edition.
2. Mano M.M., "Digital Design", Prentice-Hall, 3rd Edition. 2002
3. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", DhanpatRai& Co. 3rd edition Delhi, 2010.
4. Kennedy G. and Davis B., "Electronic Communication Systems", Tata McGraw-Hill, 4th 2008 Edition.

Reference Books:
1. Tomasi W., "Advanced Electronic Communication Systems", Pearson/Prentice-Hall, 6th 2004 Edition.
2. Boylstead R.L. and Nashelsky L., "Electronic Devices and Circuit Theory", Pearson, 10th 2009 Edition.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I CSE

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

INTRODUCTION TO JAVA PROGRAMMING

Course Code:20A50505   **Semester V(R20)**   **L T P C : 3 0 0 3**

Course Objectives:

- To understand object-oriented concepts and problem-solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes:

CO1: Solve real-world problems using OOP techniques.
CO2: Apply code reusability through inheritance, packages and interfaces
CO3: Solve problems using java collection framework and I/O classes.
CO4: Develop applications by using parallel streams for better performance and develop applets for web applications.
CO5: Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

UNIT – I: **Introduction**

Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT – II: **Inheritance, Packages, Interfaces**

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT – III: **Exception handling, Stream based I/O**

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT – IV: **Multithreading, The Collections Framework**

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT – V: **Applet, GUI Programming with Swings, Accessing Databases with JDBC**

Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets

GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirmdialog, show input dialog, show option dialog, jdialog, create a modeless dialog.

Accessing Databases with JDBC:

Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.

2. Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:

1. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
2. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
3. Java Programming for core and advanced learners, Sagayaraj, Dennis, KarthikandGajalakshmi, University Press
4. Introduction to Java programming, Y. Daniel Liang, Pearson Education

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Chemical

Course Code			**L**	**T**	**P**	**C**
20A50805	**ENERGY CONVERSION AND STORAGE DEVICES**		**3**	**0**	**0**	**3**

Pre-requisite

Course Objectives:

1. Understand the fundamentals of fossil energy sources, solar, biomass and electrochemical energy etc
2. Understand the basics of photosynthetic, photocatalytic and photoelectrochemical systems and devices for the efficient energy and fuels production.
3. Learn the principles and operations of electrochemical energy storage devices,

Course Outcomes (CO):

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

CO1   Understand the need of energyconversion and the various methods

of energy storage

CO2   Identify Winds energy as alternateform of energy and to know how itcan be tapped

CO3   Understand the nuclear and bio energy, its mechanism of production

and its applications

CO4   Analyse chemical, electrochemical energy storage devices and interpret the conversion efficiencies

CO5   Explain bio gas generation and itsimpact on environment

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1

CO2

CO3

CO4

CO5

CO6

UNIT - I

Outline of the course. Introduction and scope of energy conversion. World Energy Production and Balance. Motivations for studying future energy systems (e.g. pollution, climate change, energy security).

UNIT - II

Fossil Energy: Overview of fossil fuel resources and energy contents. Cycle analysis (Rankine, Brayton, combined cycles, cogeneration)

Nuclear Energy: nuclear reaction and energy conversion physics (fission and fusion), nuclear power systems

UNIT - III

Solar-thermal energy: solar thermal radiation physics, Active and passive solar-thermal energy collection and conversion systems

Photoelectric energy: Photoelectric physics. Solar photovoltaic cell materials and technology

Wind Energy: Wind interaction with objects fluid dynamics. Wind harvesting devices and systems

UNIT - IV

Biomass and Waste to Energy: Potential and resources of biomass and waste energy. Thermal-chemical and bio-chemical conversion methods

Overview of Climate Control, CO_2 Sequestration and Energy Sustainability

UNIT - V

Basic of Electrochemical energy conversion and storage, Fundamentals of Fuel Cells, Basics of Fusion power, Energy Storage Technologies, Mechanical storage, Chemical storage, Electrical storage

Textbooks:

Energy Systems Engineering, F.M. Vanek, L.D Albright, and LargusAngenent, Second Edition, McGraw-Hill, Inc., 2012,

Reference Books:

- AngèleReinders, Pierre Verlinden, Wilfried van Sark, Alexandre Freundlich, Photovoltaic Solar Energy:From Fundamentals to Applications, JOHN WILEY.
- Alexander P. Kirk, Solar Photovoltaic Cells: Photons to Electricity, ELSEVIER
- Francesco Dalena, Angelo Basile, Claudio Rossi, Bioenergy Systems For The Future: Prospects ForBiofuels And Biohydrogen, 1st Edition, ELSEVIER
- Jean-Marie Tarascon, Patrice Simon, ELECTROCHEMICAL ENERGY STORAGE,
- Electrochemistry by Carl H. Hamann, Andrew Hamnett and Wolf Vielstich, Wiley VCH, 1998.
- Modern Electrochemistry 1. Volume 1 and 2, by J. O'M. Bockris and A. K. N. Reddy, Kluwer Academic,2000.
- Electrochemical Methods, by A. J. Bard and L. R. Faulkner, John Willey, 1980
- John Love and John A. Bryant, Biofuels and Bioenergy, John Wiley
- Anju Dahiya, Bioenergy: Biomass to Biofuels, Elsevier

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Mathematics

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Optimization Methods	L	T	P	C
20A55101	B.Tech III Year (Common for all) Open elective course -1	0	3	0	3
Pre-requisite	--	Semester		I	

Course Objectives:

This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.

Course Outcomes (CO): Student will be able to

- formulate a linear programming problem and solve it by various methods.
- give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
- identify strategies in a game for optimal profit.
- implement project planning.

UNIT - I		8 Hrs

Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.

UNIT - II		8 Hrs

Transportation problems- assignment problems-Game theory.

UNIT - III		9 Hrs

CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.

UNIT - IV		8 Hrs

Sequencing Problems-Replacement problems-Capital equipment- Discounting costs-Group replacement .

UNIT - V		9 Hrs

Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.

Textbooks:

1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, HardikSoni, PHI publishers

Reference Books:

1. Problems on Operations Research, Er. Premkumargupta, Dr.D.S. Hira, Chand publishers
2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumaryadav
Online Learning Resources:
https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf   https://slideplayer.com/slide/7790901/   https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Physics

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
20A55201	**MATERIALS CHARACTERIZATION TECHNIQUES**	3		-	3

COURSE OBJECTIVES	
1	To provide an exposure to different characterization techniques.
2	To explain the basic principles and analysis of different spectroscopic techniques.
3	To elucidate the basic principle of Scanning electron microscope along with its limitations and applications.
4	To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
5	To educate the uses of advanced electric and magnetic instruments for characterization.

COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To explain the structural analysis by X-ray diffraction.
CO2	To understand the morphology of different materials using SEM and TEM.
CO3	To recognize basic principles of various spectroscopic techniques.
CO4	To apprehend the electric and magnetic properties of the materials.
CO5	To make out which technique has to be used to analyse a material

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credit: 3   **Hours of teaching: - 45 H**

UNIT-I   **9H**

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of

polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT-II **9H**

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (SecondaryElectron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT-III **9H**

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT-IV **9H**

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy(ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT-V **9H**

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method,Vibrating sample Magnetometer (VSM) and SQUID.

TEXT BOOKS:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang

Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008

2. Hand book of Materials Characterization -by **Sharma** S. K. - S**pringer**

REFERENCES:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M.

McCash, Tata McGraw-Hill, 2008.

2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, PrenticeHall, 2001 – Science

3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-Yang

Leng- John Wiley & Sons

4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley(Bp)

5. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan,John Wiley & Sons Ltd., 2008.

NPTEL courses

https://nptel.ac.in/courses/115/103/115103030/

https://nptel.ac.in/content/syllabus_pdf/113106034.pdf

https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I H & SS

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	**E-Business**	**L**	**T**	**P**	**C**
20A55401		**3**	**0**	**0**	**3**
Pre-requisite					

Course Objectives:

1.	To provide knowledge on emerging concept on E-Business related aspect.
2.	To understand various electronic markets models which are trending in India
3.	To give detailed information about electronic payment systems net banking.
4.	To exact awareness on internet advertising, market research strategies and supply chain management.
5.	To understand about various internet protocols-security related concept.

Course Outcomes (CO):

1	They will be able to identify the priority of E-Commerce in the present globalised world.
2	Will be able to understand E-market-Models which are practicing by the organization
3.	Will be able to recognize various E-payment systems & importance of net banking.
4.	By knowing E-advertisement, market research strategies, they can identify the importance of customer role.
5.	By understanding about E-security, they can ensure better access control to secure the information
6	Develop a personal synthesis and approach towards E-Business

UNIT – I   **Electronic Business**

Definition of Electronic Business - Functions of Electronic Commerce (EC) - Advantages of E-Commerce – E-Commerce and E-Business Internet Services Online Shopping-Commerce Opportunities for Industries.

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand the concept of E-Business
- ➢ Contrast and compare E-Commerce E-Business
- ➢ Analyze Advantages of E-Commerce
- ➢ Evaluate opportunities of E-commerce for industry

UNIT - II   **Electronic Markets and Business Models**

E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals - Business Models-Business to Business(B2B)-Business to Customers(B2C)-Business

to Government(B2G)-Auctions-B2B Portals in India

LEARNING OUTCOMES:- After completion of this unit student will

- ➤ Understand the concept of business models
- ➤ Contrast and compare Vertical portal and Horizontal portals
- ➤ Analyze Advantages of portals
- ➤ Explain the B2B,B2C and B2G model

UNIT - III   **III Electronic Payment Systems**

Digital Payment Requirements-Designing E-payment System- Electronic Fund Transfer (EFT)-Electronic Data Interchange (EDT)-Credit Cards-Debit Cards-E-Cash-Electronic Cheques -Smart Cards-Net Banking-Digital Signature.

LEARNING OUTCOMES:- After completion of this unit student will

- ➤ Understand the Electronic payment system
- ➤ Contrast and compare EFT and EDT
- ➤ Analyze debit card and credit card
- ➤ Explain the on Digital signature

UNIT - IV   **E-Security**

Internet Protocols - Security on the Internet –Network and Website Security – Firewalls – Encryption – Access Control – Secure Electronic transactions.

LEARNING OUTCOMES:- After completion of this unit student will

- ➤ Understand E-Security
- ➤ Contrast and compare security and network
- ➤ Analyze Encryption
- ➤ Evaluate electronic transitions

UNIT - V   **E-Marketing**

Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Online Market Research– Data mining and Marketing   Research Marketing Strategy On the Web – E-Customer Relationship Management(e-CRM) –E- Supply Chain Management.(e-SCM) –New Trends in Supply Chain Management.

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand the concept of online marketing
- ➢ Analyze advantages of online marketing
- ➢ Compare the e-CRM and e-SCM
- ➢ Explain the New trends in supply chain management

Textbooks:
1. **E-Commerce by C.S.V Murthy** Himalaya publication house, 2002.

2. **E-Commerce by** P.T.S Joseph, Fourth Edition, Prentice Hall of India 2011

Reference Books:
1. **E-Commerce: by** KamaleshKBajaj,DebjaniNa, Second Edition TataMcGrwHills 2005

2. **E-Commerce E-Management: by Dave Chaffey** –   Second Edition, Pearson, 2012.

3. **E-Commerce Fundamentals and Application; by** Henry Chan, Raymond Lee,Tharm Wiley India 2007

4. **E-Commerce: by** S. Jaiswall Galgotia Publication Pvt Ltd 2003.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF CHEMISTRY

Subject Code	Title of the Subject	L	T	P	C
20A55301	**CHEMISTRY OF ENERGY MATERIALS**	2	1	-	3

COURSE OBJECTIVES	
1	To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2	To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
3	To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
4	Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
5	To understand and apply the basics of calculations related to material and energy flow in the processes.

COURSE OUTCOMES	
CO1	Solve the problems based on electrode potential,Describe the Galvanic Cell Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
CO2	Describe the working Principle of Fuel cell,Explain the efficiency of the fuel cell Discuss about the Basic design of fuel cells,Classify the fuel cell
CO3	Differentiate Chemical and Physical methods of hydrogen storage,Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures Describe the liquification methods
CO4	Apply the photo voltaic technology,Demonstrate about solar energy and prospects Illustrate the Solar cells,Discuss about concentrated solar power
CO5	Differentiate between Photo and Photo electrochemical Conversions,Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photoelectron catalytic conversion

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT-1: Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batterie**s.-**

UNIT-2: Fuel Cells: Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,

UNIT-3: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

UNIT-4:Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells   .

UNIT-5: Hydrogen Storage: Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

References :
1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II Civil
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Disaster Management	L	T	P	C
20A60105		3	0	0	3

Course Objectives:
6. To give knowledge types of disasters and stages in disaster rehabilitation process.
7. To make awareness on change in climates and their impacts on occurrence of environmental disasters.
8. To impart knowledge on Consideration of wind and water effects as per codal provisions to withstand disasters.
9. To familiarize the student with the Causes of earthquake and their effects and remedial methods to be adopted for buildings.
10. To illustrate the methodology in Planning and design considerations of various structures constructing in disaster prone areas.

Course Outcomes (CO):
6. About various types of disasters and stages in disaster rehabilitation process.
7. Impact of change in climates and their impacts on occurrence of environmental disasters.
8. Adopting suitable codal provisions to study the effect of wind and water effects on various structures constructed at disaster prone areas.
9. Causes of earthquake and their effects and remedial methods to be adopted for buildings.
10. Adopt suitable Planning and design considerations of various structures constructing in disaster prone areas.

UNIT - I
Brief introduction to different types of natural disaster, Occurrence of disaster in different climatic and geographical regions, hazard (earthquake and cyclone) map of the world and India, Regulations for disaster risk reduction, Post disaster recovery and rehabilitation (socioeconomic consequences)

UNIT - II
Climate change and its impact on tropical cyclone, Nature of cyclonic wind, velocities and pressure, Cyclone effects, Storm surge, Floods, Landslides. Behavior of structures in past cyclones and wind storms, case studies. Cyclonic retrofitting, strengthening of structures and adaptive sustainable reconstruction. Life–line structures such as temporary cyclone shelter.

UNIT - III

Basic wind engineering, aerodynamics of bluff bodies, vortex shedding and associated unsteadiness along and across wind forces. Lab: Wind tunnel testing, its salient features. Introduction to Computational fluid dynamics. General planning/design considerations under wind storms & cyclones; Wind effects on buildings, towers, glass panels etc, & wind resistant features in design. Codal Provisions, design wind speed, pressure coefficients; Coastal zoning regulation for construction & reconstruction phase in the coastal areas, innovative construction material & techniques, traditional construction techniques in coastal areas.

UNIT - IV

Causes of earthquake, plate tectonics, faults, seismic waves; magnitude, intensity, epicenter, energy release and ground motions. Earthquake effects – On ground, soil rupture, liquefaction, landslides. Performance of ground and building in past earthquakes: Behavior of various types of buildings, structures, and collapse patterns; Behavior of Non-structural elements like services, fixtures, mountings- case studies. Seismic retrofitting- Weakness in existing buildings, aging, concepts in repair, restoration and seismic strengthening.

UNIT - V

General Planning and design consideration; Building forms, horizontal and vertical eccentricities, mass and stiffness distribution, soft storey etc.; Seismic effects related to building configuration. Plan and vertical irregularities, redundancy and setbacks. Various Types and Construction details of: Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under-ground – overhead tanks, staircases and isolation of structures; innovative construction material and techniques; Local practices: traditional regional responses; Computational investigation techniques.

Textbooks:

3. Disaster Management by Rajib Shah, Universities Press, India, 2003
4. Disaster Management by R.B. Singh (Ed) Rawat Publication, New Delhi, 2000

Reference Books:

7. Natural disasters. By Abbott, L. P. (2013) 9th Ed. McGraw-Hill.
8. Earthquake Resistant Design of Structures. By Agarwal, P. and Shrikhande, M. (2009). New Delhi : PHI Learning.
9. Mapping Vulnerability: Disasters, Development and People. byBankoff, G., Frerks, G. and Hilhorst, D. (2004). London :Earthscan.
10. Improving Earthquakes and Cyclone Resistance of Structures:Guidelines for the Indian Subcontinent. TERI
11. Disaster Mitigation, preparedness, recovery and Response. By Sinha, P. C. (2006). New Delhi : SBS Publishers.
12. World Bank. (2009). Handbook for Reconstructingafter Natural Disasters.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II EEE
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	RENEWABLE ENERGY SYSTEMS		L	T	P	C
20A60205	(OE-II)		3	0	0	3
Pre-requisite		Semester	VI			

Course Objectives: To make the students learn about:

- Various sources of Energy and the need of Renewable Energy Systems.
- The concepts of Solar Radiation, Wind energy and its applications.
- Operation of Solar thermal and solar PV systems
- The concept of geo thermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

Course Outcomes (CO): At the end of the course the student will be able to:

CO 1 Understand various alternate sources of energy for different suitable application requirements.
CO 2 Analyze the concepts of solar energy generation strategies and wind energy system
CO 3 Design Solar and Wind energy systems.
CO 4 Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

UNIT - I	SOLAR ENERGY	Lecture Hrs: 10

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT - II	PV ENERGY SYSTEMS	Lecture Hrs: 10

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

UNIT - III	WIND ENERGY	Lecture Hrs: 10

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

UNIT - IV	GEOTHERMAL ENERGY	Lecture Hrs: 8

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT - V	MISCELLANEOUS ENERGY TECHNOLOGIES	Lecture Hrs: 10

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.
Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration
Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Text books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
https://www.slideshare.net/VikramNani/e-commerce-business-models
https://www.slideshare.net/RiteshGoyal/electronic-payment-system
https://www.slideshare.net/WelingkarDLP/electronic-security
https://www.slideshare.net/Ankitha2404/emarketing-ppt

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II Mechanical
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
20A60305	**SOLAR ENERGY SYSTEMS**	3	0	0	3

Course objectives

   Learning the fundamental principles of solar radiation and geographic distribution of solar radiation.

    Study of various solar energy technologies with different types of concentrating collectors.

   Comparative study of different solar cells with respect to properties and applications of solar cells in nano technology.

   Understanding the basics of economics involves in the solar system.

   Learning the concepts and designing aspects in thermal power. 6. Study of solar pond and solar stills and their applications.

UNIT – I
SOLAR RADIATION:
Sources of radiation –sun earth relationship, Solar Time and angles, day length, angle of incidence on tilted surface; Sun path diagram, Solar Radiation: Extraterrestrial Radiation; Effect of earth atmosphere; Estimation of solar radiation on horizontal and tilted surfaces. Geographic Distribution of solar radiation, Phyrellio, pyranometer, equation of time-estimation of average radiation falling on tilled.

UNIT-II
SOLAR ENERGY TECHNOLOGIES:
 Performance analysis of a liquid Flat-plate collector, Total loss coefficient and heat losses: Top loss coefficient, Bottom loss coefficient, Side loss coefficient. Solar concentrating collectors, types of concentrating collectors, Parabolic Dish System, The central power

tower system, The Parabolic Trough System, Tracking CPC and Solar Swing, Performance analysis of cylindrical parabolic collector, Compound parabolic concentrator (CPC).

UNIT-III
SOLAR CELLS:
Solar cell fundamentals, solar cell classification, solar cell, module, panel array construction, maximum power pint trackers(MPPT), solar PV applications, The Recent developments in Solar cells, Role of Nano-Technology in Solar cells.

UNIT – IV
ECONOMICS:
Discounted Cash Flow-light cycle, coasting of solar system, production function and optimization

UNIT – V
THERMAL POWER:
The power concepts- design aspects, thermo-chemical reactor.
SOLAR POND AND SOLAR STILLS:
Working Principle-Construction-operating difficulties and remedies, Agriculture and Domestic applications: Still, timber drying, crop drying, cooker.
Course Outcomes :
    Illustrate the fundamental principles of solar radiation and geographic distribution of solar radiation.
    Obtaining the performance analysis of liquid flat plate collector and cylindrical parabolic collector.
    Developing solar cells in the field of nano technology.
    Calculating the cash flow and costs involves in the solar energy systems.
    Designing and developing of thermo chemical reactor with respect to thermal power.
Reference Books:
    Solar Energy Thermal Process Diffice and Beckman
    Solar Heating and Cooling by Kreith and Kreider
    Solar Energy Utilization by G.D.Rai
    Solar Energy Utilization by G.D.Rai , Khanna Publishers.
    Renewable Energy Sources and Emerging Technologies- By D.P. Kothari, PHI Pub.,
    Applied Solar Energy by Meinel and Meinel
    Non-Conventional Energy Resources by B.H . Khan, Tata McGraw Hill
Energy Resources Utilization and Technologies ByAnjaneyulu, BS Pub.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II ECE
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BASICS OF INTEGRATED CIRCUITS APPLICATIONS	L	T	P	C
20A60405		3	0	0	3

\Pre-requisite
Basics of Electronics and Communication Engineering
Course Objectives:
- To introduce the basic building blocks of linear & digital integrated circuits.
- To learn the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of 555 and PLL.
- To learn the theory of ADC and DAC
- To understand different families of digital integrated circuits and their characteristics.

Course Outcomes (CO): At the end of this course, the students will be able to
- Understand the basic concepts of Op -AMPs, characteristics and specifications.
- Design circuits using operational amplifiers for various applications.
- Develop, apply and analyze circuits for advanced applications using Op-Amps, PLL, VCO and Analog multipliers.
- Understand different families of digital integrated circuits and their characteristics
- Design various and sequential circuits using digital ICs.

UNIT - I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II
Op-Amp, IC-555 & IC 565 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, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT - III
Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV
Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL
Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V
Sequential Logic ICs and Memories: Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:
1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.
2. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2005.

Reference Books:
1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
2. James M. Fiore, "Op Amps and Linear Integrated Circuits-Concepts and Applications", Cengage Learning/ Jaico, 2009.
3. K.Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 2009.

4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson, Third Edition, 2005.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II CSE
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Introduction to Linux Programming

Course Code:20A60505   **L T P C : 3 0 0 3**

Course Objectives:

- To study the commands according to user requirements.
- To utilize Shell scripts to perform the given task.
- To enable writing own programs in UNIX.
- To know AWK programs.

Course Outcomes:

CO1: Develop text data processing applications using Unix commands and filters.

CO2: Design and develop text based user interface components

CO3: Understand user management, network management and backup utilities

CO4: Use the system calls for file management

CO5: Understands the Concept of Process Threads and File Structure.

UNIT-I: Introduction,Unix File System,Unix Commands

Operating System, History of UNIX, Overview and Features of Unix System,Structure of Unix System, Unix Environment. **Unix File System**: Introduction of Files, Organization of File Systems, Accessing File Systems, Structure of File Systems. **Unix Commands**: Basic Commands, Advanced Unix Commands: File Access Permissions, Pipe Operator, cut, paste, wc, sort, head, tail, diff, cmp, uniq, comm, time, Conversions between DOS and Unix, man.

UNIT-II: File management and Compression Techniques,Manipulating Processes and Signals
Managing and Compressing Files, Computer Devices, Disk related Commands, Compression and Uncompressing Files, Important Unix System Files, Shell Variables, Export of Local and Global Shell Variables.
Manipulating Processes and Signals: Process Basics, Processes States and Transitions, Zombie Process, Context switching, Threads, ps-status of Process.
UNIT-III: System calls
Introduction, File-related System calls (open, create, read, write, lseek), File-related System calls (close, mknod, link and unlink, access, and chown, chmod), Directory Handling System calls (mkdir, rmdir, chdir, opendir, readdir, telldir, closedir), Process related System calls (exec, fork, wait,exit).
Editors in Unix: introduction, Stream editor, Emacs Editor.

UNIT-IV: AWK Script,Burne Shell

AWK Command, print, printf, Displaying Content of Specified Patterns, Comparison Operators, Compound Expressions, Arithmetic Operators, Begin and end Sections, User-defined Variables, if else Statement, Built-in Variables, Changing Input Filed Separator, Functions, Loops, Getting Input from User, Search and Substitute Functions, Copying results into Another file.

Bourne Shell: Introduction, beginning Bourne Shell Scripting, Writing Shell Scripts, Command Line Parameters, read, for Loop, While Loop, if Statement, Bourne Shell Commands.

UNIT-V: InterprocessCommunicaation, Unix System Administration and Networking

Interprocess Communication, Synchronization, Filters.

Unix System Administration and Networking: Unix Booting Procedure,Mounting Unix File System, Unmounting Unix File System, Managing User Accounts, Networking Tools, mail Command, Distributed File System, Firewalls, Backup and Restore.

TEXT BOOKS

1. "UNIX and SHELL Programming", B.M. HARWANI, OXFORD UNIVERSITY PRESS.

REFERENCES

1. "UNIX and Linux System Administration Handbook", Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley, PHI

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II Chemical

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	OE2. GREEN TECHNOLOGY	L	T	P	C
20A60805		3	0	0	3

Pre-requisite

Course Objectives:

Course Outcomes (CO):

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

CO1   Understand the basic knowledge of environmental issues and estimate the risk

CO2   Evaluate the exposures

CO3   To discuss the type of wastes and emissions that drive the environmental impacts

CO4   Estimation of the environmental properties, persistence, ecosystem risk,

CO5   To present approaches and methodologies for evaluating and improving the environmental performance of chemical processes and chemical products.

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT - I

An introduction to environmental issues: Role of chemical processes and chemical products, Global environmental issues, Air and water quality issues, Ecology.

Risk concept: Description of risk, Risk assessment concept, Dose-response, Exposure assessment.

UNIT - II

Evaluating exposures: Occupational exposures: recognition, evaluation, control, Exposure assessment for chemicals in the ambient environment, Designing safer chemicals.

Green chemistry:Green chemistry methodologies, Optimization based frameworks for the design of green chemical synthesis pathway.

UNIT - III

Evaluating environmental fate: Chemical and physical property estimation, estimating environmental persistence, estimating ecosystem risk, classifying environmental risk based on chemical structure.

UNIT - IV

Life-cycle concepts: Life-cycle assessment, Life-cycle impact assessment

UNIT - V

Material flows in chemical manufacturing, Assessing opportunities for waste exchanges and by-product synergies.

Textbooks:

SHONNARD, DALLEN, D. Green Engineering: Environmentally Conscious Design of Chemical Processes.

Reference Books:

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Mathematical Modelling & Simulation	L	T	P	C
20A65101	(Common for CIVIL,MECH&CHEM)	0	3	0	3
Pre-requisite		Semester	II		
Course Objectives:					
This course focuses on what is needed to build simulation software environments, and not just building simulations using preexisting packages.					
Course Outcomes (CO): Student will be able to					
• understand basic Model Forms. • understand basic Simulation Approaches. • evaluate handling Stepped and Event-based Time in Simulations. • distinguish Discrete versus Continuous Modeling.					

	• apply Numerical Techniques. • calculate Sources and Propagation of Error.	
UNIT - I		8 Hrs
Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modelling-Numerical Techniques-Sources and Propagation of Error		
UNIT - II		9 Hrs
Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations		
UNIT - III		8 Hrs
Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms-Handling Inter-partition Dependencies		
UNIT - IV		8 Hrs
Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise-Random Variates Generation-Sensitivity Analysis		
UNIT - V		9 Hrs
Simulations Results Analysis and Viewing Tools-Display Forms: Tables, Graphs, and Multidimensional Visualization-Terminals, X and MS Windows, and Web Interfaces-Validation of Model Results.		
Textbooks:		
1. Mathematical modeling, JN Kapur, Newage publishers 2. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers by Kai Velten, Wiley Publishers		
Reference Books:		
1. Introduction to Mathematical Modeling and Computer Simulations By Vladimir Mityushev,WojciechNawalaniecNataliaRylko Published by Chapman and Hall/CRC.		
Online Learning Resources:		
http://www.cse.chalmers.se/~dag/docs/matmodReport6.pdf https://www.slideshare.net/arupparia/introduction-to-mathematical-modelling-42588379 https://www.slideshare.net/mailrenuka/simulation-for-queuing-problems-using-random-numbers		

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Wavelet transforms and its Applications		L	T	P	C
20A65102	**(Common for EEE&ECE)**		0	3	0	3
Pre-requisite	Fourier Series	**Semester**	**II**			
Course Objectives:						
This course provides the students to understand Wavelet transforms and its applications.						
Course Outcomes (CO): Student will be able to						
- understand wavelets and wavelet expansion systems. - illustrate the multi resolution analysis ad scaling functions. - form fine scale to coarse scale analysis. - find the lattices and lifting. - perform numerical complexity of discrete wavelet transforms.						

- find the frames and tight frames using Fourier series.

UNIT - I	Wavelets	9 Hrs

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems - Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform The Discrete-Time and Continuous Wavelet Transforms.

UNIT - II	A Multiresolution Formulation of Wavelet Systems	8 Hrs

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT - III	Filter Banks and the Discrete Wavelet Transform	9 Hrs

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT - IV	Time-Frequency and Complexity	9 Hrs

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT - V	Bases and Matrix Examples	8 Hrs

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Textbooks:
1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms",Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999).

Reference Books:
1. Raghuveer Rao, "Wavelet Transforms", Pearson Education, Asia.

Online Learning Resources:
https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Statistical Methods for Data Science		L	T	P	C
20A65103	CSE (Data Science)			3		3
Pre-requisite		Semester	II			

Course Objectives:

This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples.

Course Outcomes (CO): Student will be able to

- Understand the basic concepts of Statistics
- Analyze data and draw conclusion about collection of data under study using Point estimation
- Analyze data and draw conclusion about collection of data under study using Interval estimation
- Analyzing the tests and types of errors for large samples

- Apply testing of hypothesis for small samples.

UNIT - I	Basic Concepts	9 Hrs

Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency – Factorization Theorem – Minimal sufficiency; Efficiency – Most efficient estimator, likelihood equivalence, Uniformly minimum variance unbiased estimator,applications of Lehmann-Scheffe's Theorem, Rao - Blackwell Theorem and applications

UNIT - II	Point Estimation	8 Hrs

Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator(without proof)- applications , Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications.

UNIT - III	Interval Estimation	8 Hrs

Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.

UNIT - IV	Testing of hypotheses	9 Hrs

Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.

UNIT - V	Small sample tests	9 Hrs

Student's t-test, test for a population mean, equality of two population means, paired t-test, F-test for equality of two population variances,CRD,RBD,LSD; Chi-square test for goodness of fit and test for independence of attributes, χ^2 test for testing variance of a normal distribution

Sign test, Signed rank test, Median test, Mann-Whitney test, Run test and One sample Kolmogorov –Smirnov test ,Kruskal – Wallis H test(Description, properties and applications only).

Textbooks:

1. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of
   Hypotheses, Prentice Hall of India, 2014.
2. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9th edition,Pearson publishers,2013.

Reference Books:

1. S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons.
2. Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition.
Online Learning Resources:
1. https://www.statstutor.ac.uk/resources/uploaded/1introduction3.pdf
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996198/

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

PHYSICS OFELECTRONICMATERIALS ANDDEVICES

COURSE OBJECTIVES

1 To impart the fundamental knowledge on various materials, their properties and

Applications.

2 To provide insight into various semiconducting materials and their properties.

3 To elucidate the characteristic behavior of various semiconductor devices.

4 To provide the basics of dielectric and piezoelectric materials and their properties.

5 To explain different categories of magnetic materials, mechanism and their

advanced applications.

COURSE OUTCOMES

At the end of the course the student will be able

CO1 To understand the fundamentals of various materials.

CO2 To exploit the physics of semiconducting materials

CO3 To familiarize with the working principles of semiconductor-based devices.

CO4 To understand the behavior of dielectric and piezoelectric materials.

CO5 To make use of the magnetic materials for advanced applications.

Mapping between Course Outcomes and Programme Outcomes

PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12

CO1

CO2

CO3

CO4

CO5

SYLLABUSCredit: 3 Hours of teaching: - 45 H

UNIT-1   Fundamentals of Materials Science: 9H

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of

crystal growth. Basic idea of point, line and planar defects.Concept of thin films, preparation of

thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT-2:   Semiconductors: 9H

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT-3: Physics of Semiconductor Devices: 9H

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium.and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT-4: Dielectric Materials and their Applications: 9H

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties- Ferroelectricity-Applications.

UNIT-5: Magnetic Materials and their Applications: 9H

Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

Text Books

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,3rd edition, 2007.

2. Electronic Components and Materials- Grover and Jamwal, DhanpatRai and Co.

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition

2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005

3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel

Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011

4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.

5. The Science and Engineering of materials- Donald R.Askeland,Chapman& Hall Pub.

6. Electrical Engineering Materials-by A.J. Dekker, PHI Pub

NPTEL courses links

https://nptel.ac.in/courses/113/106/113106062/

https://onlinecourses.nptel.ac.in/noc20_mm02/preview

https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II H& SS

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Academic Writing and Public Speaking		L	T	P	C
20A65501			3	0	0	3
Pre-requisite						
Course Objectives:						
➢ To encourage all round development of the students by focusing on writing skills ➢ To make the students aware of non-verbal skills ➢ To develop analytical skills ➢ To deliver effective public speeches						
Course Outcomes (CO):						
By the end of the program students will be able to • Define various elements of Academic Writing • Understand how to paraphrase sources and avoid plagiarism • Demonstrate the knowledge in writing a Research paper • Analyse different types of essays						

- Assess the speeches of others and know the positive strengths of speakers

- Build confidence in giving an impactful presentation to the audience

UNIT - I	Introduction to Academic Writing	Lecture Hrs
Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing		

UNIT - II	**Academic Journal Article**	Lecture Hrs
Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism		

UNIT - III	**Essay & Writing Reviews**	Lecture Hrs
Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review-		

UNIT - IV	Public Speaking	Lecture Hrs
Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events		

UNIT - V	Public Speaking and Non-Verbal Delivery	Lecture Hrs
Body Language – Kinesics – Oculesics – Proxemics – Haptics – Paralanguage		

Textbooks:

3. **Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)**

4. **A Course In Academic Writing Paperback – 1 January 2017Publisher : The Orient Blackswan; Second edition (1 January 2017)**

Reference Books:
1. **A Handbook For Academic Writing and Composition Paperback – 1 January 2014** by Nzanmongi Jasmine PattonPublisher : Pinnacle Learning; 1st edition (1 January 2014)
2. Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010Publisher : Pearson Education; First edition (1 January 2010) by Marilyn Anderson (Author)
3. Effective Academic Writing Second Edition: 1: Student Book: The Paragraph Paperback – Student Edition, 9 June 2014 by Alice Savage (Author), MasoudShafiei (Author)Publisher : Oxford University Press; Student, Workbook edition (9 June 2014)
4. A Course In Academic Writing Paperback – 1 January 2017 by Renu Gupta (Author)

Publisher : The Orient Blackswan; Second edition (1 January 2017)
Online Learning Resources:

1. https://youtu.be/NNhTIT81nH8

2. phttps://www.youtube.com/watch?v=478ccrWKY-A

3. https://www.youtube.com/watch?v=nzGo5ZC1gMw

4. https://www.youtube.com/watch?v=Qve0ZBmJMh4

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF CHEMISTRY

Subject Code	Title of the Subject	L	T	P	C
	CHEMISTRY OF POLYMERS AND ITS APPLICATIONS	2	1	-	3

COURSE OBJECTIVES	
1	To understand the basic principles of polymers
2	To synthesize the different polymeric materials and their characterization by various instrumental methods.
3	To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
4	To enumerate the applications of polymers in engineering

COURSE OUTCOMES	
CO1	Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of

		polymer
CO2		Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers, Characterize the properties of polymers by IR, NMR, XRD etc.
CO3		Describe the properties and applications of polymers, Interpret the properties of cellulose, lignin, starch, rosin, latex etc., Discuss the special plastics of PES, PAES, PEEK etc., Explain modified cellulosics
CO4		Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery, Demonstrate the advanced drug delivery systems and controlled release
CO5		Demonstrate electrical phenomena at interfaces including electrokinetics, miselles, reverse micelles etc., Explain photoelectron spectroscopy, Discuss ESCA and Auger spectroscopy to the study of surfaces, Differentiate micelles and reverse micelles

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit – I: Polymers-Basics and Characterization :-

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, co polymerization and coordination. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit – II: Synthetic Polymers

Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol – formaldehyde. Melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD

Unit – III : Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Unit-IV: Hydrogels of Polymer networks and Drug delivery

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Unit – V: Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

References :
1. A Text book of Polymer science, Billmayer
2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall

3. Advanced Organic Chemistry, B.Miller, Prentice Hall

4. Polymer Chemistry – G.S.Mishra

5. Polymer Chemistry – Gowarikar

6. Physical Chemistry –Galston

7. Drug Delivery- Ashim K. Misra

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III CIVIL

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Building Technology for Engineers	L	T	P	C
20A70104		3	0	0	3

Course Objectives :
6. To make the student familiar with varioustypes of Buildings and its components
7. To teach the students about general requirements of building regarding safety and transportation
8. To impart knowledge on various special requirements of buildings regarding ventilation, insulation acoustics, etc,.
9. To make the student familiar with the concepts of various Prefabrication systems.
10. To Teach the students about various construction equipments used in building.

Course Outcomes:
By the end of this course the student will be able to

6. Classify various types of buildings and its components.
7. Understand the general requirements of building regarding safety and transportation.
8. Understand the Special requirements of buildings regarding ventilation, insulation acoustics, etc,.
9. Familiarize with the concepts of various Prefabrication systems.

10. Understand various construction equipments used in building.

UNIT-1

Building planning: Types of Buildings — components, definitions, economy and design, Principles and aspects of building planning, Definitions and importance of Grouping and circulation; Lighting and ventilation; Sustainability and Green Buildings.

UNIT-II

General requirements: Requirements for safety against fire, termite, damping, earthquakes, Vertical transportation in building — planning of vertical transportation, Stairs, different forms of stairs, Other modes of vertical transportation.

UNIT-III

Special Requirements: Air conditioning — process and classification of air conditioning, Dehumidification. Systems of air-conditioning, ventilation, functional requirements of ventilation. Thermal insulation. Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation.

UNIT-IV
Prefabrication systems: Prefabricated walls, openings, cupboards, shelves etc., planning and modules and sizes of components in prefabrication. Plumbing services — water supply system, maintenance of building pipe line, Sanitary fittings, Design of building drainage.

UNIT-V
Construction Equipment: Introduction and Planning for construction Equipment, Earthmoving and Excavating equipment, Pile driving equipment, Lifting and Concreting Equipment.

Learning Resources:

Text Books:
3. Building Construction, Punmia B. C., Jain A.J., and Jain A.J., Laxmi Publication, 2016, Eleventh Edition.
4. The Text book for Building Construction, Arora S. P., and Bindra S. P., Dhanpat Rai Pubications, 2010.

Reference Books:
3. Building Construction, Varghese P.C., PHI Learning Pvt. Ltd., 2017, 2nd Edition.
4. Construction Planning, Equipment and Methods, Robert P., Clifford J. S., and Aviad S., McGrawHiII Education, 2010

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III EEE

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BATTERY MANAGEMENT SYSTEMS	L	T	P	C
20A70204	(OE-III)	3	1	0	4
Pre-requisite	Basic Electrical Engineering	Semester		VI	

Course Objectives: To make the students learn about:

- Understand the role of battery management system and the requirements of BMS.
- Interpret the concept associated with battery charging / discharging process
- Analyze various parameters of battery and battery pack
- Design the model of battery pack

Course Outcomes (CO): After completion of this course, student will be able to

CO1: Understand and remember the basic concepts and terminologies of Cells and Batteries, charging, discharging methods, concept of cell balancing.

CO2: Analyze BMS functionality, various sensors used, control techniques, Sate of Charge estimation, cell total energy and cell total power.

CO3: Apply the equivalent circuits, physical models, empirical modelling of BMS.

CO4:	Design of Battery management system considering various parameters and through simulation.	
UNIT - I	**INTRODUCTION**	Lecture Hrs: 14
Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging		
UNIT - II	**BATTERY MANAGEMENT SYSTEM**	Lecture Hrs: 14
Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of charge estimation, Cell total energy and cell total power		
UNIT - III	**BATTERY STATE OF CHARGE AND STATE OF HEALTH ESTIMATION**	Lecture Hrs: 12
Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing		
UNIT - IV	**MODELLING AND SIMULATION**	Lecture Hrs: 12
Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs		
UNIT - V	**DESIGN OF BATTERY MANAGEMENT SYSTEMS**	Lecture Hrs: 12
Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system		
Textbooks:		
1. Plett, Gregory L. Battery management systems, Volume I: Battery modelling. Artech House, 2015. 2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.		
Reference Books:		
1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002. 2. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech		

House, 2010

3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008.

4. RuiXiong, "Battery management Algorithm for Electric Vehicles", China Machine Press, Springer,2020.

5. Bergveid, Krujit, Notten, " Battery Management Systems: Design by Modelling", Philips Research Book Series, Kluwer Academic Publishers.

Online Learning Resources:

1. https://www.coursera.org/learn/battery-management-systems

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF MECHANICAL ENGINEERING

Subject Code	Title of the Subject	L	T	P	C
20A70304	**MODERN MANUFACTURING METHODS**	3	0	0	3

Course Objectives:

To learn the importance and basics of unconventional machining.
To understand the rapid prototyping processes.

To have the knowledge of different micro machining methods
To understand the working principles of various Non-traditional machining methods.

To learn about Non-traditional forming processes.

UNIT-I

Need for Modern Manufacturing Methods: Non-traditional machining methods and rapid prototyping methods - their relevance for precision and lean manufacturing. Classification of non-traditional processes - their selection for processing of different materials and the range of applications.

Introduction to rapid prototyping - Classification of rapid prototyping methods - sterolithography, fused deposition methods - materials, principle of prototyping and various applications.

UNIT-II

Ultrasonic machining – Elements of the process, mechanics of material removal, process parameters, applications and limitations, Abrasive jet, Water jet and abrasive water jet machining: Basic mechanics of material removal, descriptive of equipment, process variables, applications and limitations.

UNIT-III

Electro –Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, metal removal rate in ECM, Tooling, process variables, applications, economic aspects of ECM.

Chemical Machining: Fundamentals of chemical machining- Principle of material removal- maskants – etchants- process variables, advantages and applications.

UNIT-IV

Thermal Metal Removal Processes: Basic principle of spark erosion (EDM), Wire cut EDM, and Electric Discharge Grinding processes - Mechanics of machining, process parameters, selection of tool electrode and dielectric fluids, choice of parameters for improved surface finish and machining accuracy - Applications of different processes and their limitations.

Plasma Machining: Principle of material removal, description of process and equipment, process variables, scope of applications and the process limitations.

UNIT-V

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - process mechanics, parameters, applications and limitations.

Laser Beam Machining: Process description, Mechanism of material removal, process parameters, capabilities and limitations, features of machining, applications and limitations.

Course Outcomes:

At the end of this course the student should be able to understand

Technical aspects of precision machining.
Applications of rapid prototyping technologies.
Tool selection for non traditional processes.
Knowledge of economic aspects of Non-traditional processes.

Fabrication of microelectronic devices.

TEXT BOOKS:

Manufacturing processes for engineering materials by SeropeKalpakjian and Steven R Schmid, 5edn, Pearson Pub.
Advanced machining processes, VK Jain, Allied publishers.

REFERENCE:

New Technology , Bhattacharya A, The Institution of Engineers, India 1984
Manufacturing Technology, Kalpakzian, Pearson
Modern Machining Process, Pandey P.C. and Shah H.S., TMH.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Electronic & Communication Engineering

Course Code	DIGITAL ELECTRONICS		L	T	P	C
20A70404			3	0	0	3
Pre-requisite		Semester	VII			

Basics of Electronics and Communication Engineering

Course Objectives:
- To learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- To understand and design various combinational logic circuits like adders and code converters.
- To know the design of various combinational circuits useful to implement logic functions.
- To study the design of sequential logic circuits in synchronous and asynchronous modes.
- To introduce programmable logic devices.

Course Outcomes (CO): At the end of this course, the students will be able to
- Learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- Understand and design various combinational logic circuits like adders and code converters.
- Know the design of various combinational circuits useful to implement logic functions.

- Gain knowledge on the design of sequential logic circuits in synchronous and asynchronous modes.
- Understand the operation and uses of programmable logic devices.

UNIT - I
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine – McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT - II
Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT - III
Combinational Logic Design 2: Decoders (3 to 8, octal to decimal), Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT - IV
Sequential Logic Design: Latches, Flipflops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, set up and hold times, Ripple and Synchronous counters, Shift registers.

UNIT - V
Programmable Logic Devices:ROM, Programmable Logic Devices (PLDs), Introduction to logic families and their comparisons.

Textbooks:
1. Digital Design, M. Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:
1. Fundamentals of Logic Design, Charles H Roth, Jr., 5th Edition, Brooks/coleCengage Learning, 2004.
2. Digital & State Machine Design, Comer, 3rd Edition, OXFORD.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Compute Science & Engineering

Cyber Security
Course Code:20A70504   **L T P C : 3 0 0 3**

Course Objectives:

- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes:

CO1: Recognize the Java programming environment.
CO2: Select appropriate programming constructs to solve a problem.
CO3: Develop efficient programs using multithreading.
CO4: Design reliable programs using Java exception handling features.
CO5: Extend the programming functionality supported by Java.

UNIT-I: Cybercrime

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-II: Cyber Offenses

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-III: Cybercrime in Mobile and Wireless Devices

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, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

UNIT-VI: Tools and Methods Used in Cybercrime

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks

UNIT-V: Cyber Forensics, Cybercrime in Real-World

Forensics of Computer and Handheld Devices: Cyber forensics, Cyber forensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices – Smartphone forensics, EnCase, Device Seizure, MOBIL edit.

Cybercrime examples, mini-cases, online scams: Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime; Online scams - Cheque cashing scam, Charity scams.

References:

1. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
2. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

Course Code	INDUSTRIAL POLLUTION CONTROL ENGINEERING	L	T	P	C
20A70804		3	0	0	3

Pre-requisite

Course Objectives:

Course Outcomes (CO):

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

CO1	Understand the different types of wastes generated in an industry, their effects on living and non-living things & environmental regulatory legislations and standards and climate changes.
CO2	Quantify, analyse and treat wastewater
CO3	Apply the different unit operations and unit processes involved in conversion of highly polluted water to potable standards
CO4	Apply the operating principles, design calculations of particulate control devices.
CO5	Estimate the different waste generated from the industries

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

UNIT - I

Types of emissions from chemical industries and effects of environment, environment legislation, Type of pollution, sources of wastewater, Effluent guidelines and standards. Characterization of effluent streams, oxygen demands and their determination (BOD, COD, and TOC), Oxygen sag curve, BOD curve mathematical, controlling of BOD curve, self purification of running streams, sources and characteristics of pollutants in fertilizer, paper and pulp industry, petroleum and petroleum industry.

UNIT - II

General methods of control and removal of sulfur dioxide, oxides of nitrogen and organic vapors from gaseous effluent, treatment of liquid and gaseous effluent in fertilizer industry. Air pollution sampling and measurement: Types of pollutant and sampling and measurement,ambient air sampling: collection of gaseous air pollutants, collection of particulate air pollutants. Stack sampling: sampling system, particulate sampling, and gaseous sampling. Analysis of air pollutants: Sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and ozones, hydrocarbons, particulate matter

UNIT - III

Air pollution control methods and equipments: Source collection methods: raw material changes, process changes, and equipment modification. Cleaning of gaseous equipments particulate emission control: collection efficiency, control equipment like gravitational settling chambers, Cyclone separators, fabric filters, ESP and their constructional details and design aspects. Scrubbers: wet scrubbers, spray towers, centrifugal scrubbers, packed beds and plate columns, venturi scrubbers, their design aspects. Control of gaseous emissions: absorption by liquids, absorption equipments, adsorption by solids, equipment and the design aspects

UNIT - IV

Introduction to waste water treatment, biological treatment of wastewater, bacterial and bacterial growth curve, aerobic processes, suspended growth processes, activated aerated lagoons and stabilization ponds, attached growth processes, trickling filters, rotary drum filters, anaerobic processes.

UNIT - V

Methods of primary treatments: screening, sedimentation, flotation, neutralization, and methods of tertiary treatment. A brief study of carbon absorption, ion exchange, reverse osmosis, ultra-filtration, chlorination, ozonation, treatment and disposal. Hazardous waste management: nuclear wastes: health and environment effects, sources and disposal methods. Chemical wastes: health and environmental effects, treatment and disposal: treatment and disposal by industry, off site treatment and disposal, treatment practices in various countries. Biomedical wastes: types of wastes and their control.

Textbooks:

1. Environmental Pollution and Control Engineering, C. S. Rao – Wiley Eastern Limited, India, New Delhi, 1993.

2. Pollution Control in Process Industries, S.P. Mahajan, Tata McGraw-Hill, New Delhi, 1985.

Reference Books:

1. Wastewater Treatment, M. Narayana Rao and A.K.Datta, Oxford and IHB publ. New Delhi.

Online Learning Resources:

DEPARTMENT OF MATHEMATICS

Course Code	Numerical Methods for Engineers		L	T	P	C
20A75101	(Common for all Branches)		0	3	0	3
Pre-requisite	---					
Course Objectives:						
This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.						
Course Outcomes (CO): Student will be able to						
- apply numerical methods to solve algebraic and transcendental equations. - understand fitting of several kinds of curves. - derive interpolating polynomials using interpolation formulae. - Solve differential and integral equations numerically.						
UNIT - I	**Solution of Algebraic & Transcendental Equations:**	8 Hrs				
Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.						
UNIT - II	**Curve Fitting**	8 Hrs				
Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.						
UNIT - III	**Interpolation**	9 Hrs				
Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula						
UNIT - IV	**Numerical Integration**	8 Hrs				
Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule						
UNIT - V	**Solution of Initial value problems to Ordinary**	9 Hrs				

	differential equations	

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Textbooks:

4. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
5. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
6. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

https://slideplayer.com/slide/8588078/

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Physics

Subject Code	Title of the Subject	L	T	P	C
20A75201	**SMART MATERIALS AND DEVICES**	3		-	3

COURSE OBJECTIVES	
1	To provide exposure to smart materials and their engineering applications.
2	To impart knowledge on the basics and phenomenon behind the working of smart materials
3	To explain theproperties exhibited by smart materials
4	To educate various techniques used to synthesize and characterize smart materials
5	To identify the required smart material for distinct applications/devices
COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To recognize the need of smart materials
CO2	To understand the working principles of smart materials
CO3	To know different techniques used to synthesize and characterize smart materials
CO4	To exploit the properties of smart materials
CO5	To make use of smart materials for different applications

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credit: 3   **Hours of teaching: - 45 H**

UNITI : Introduction to Smart Materials: 9H
Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II: Properties of Smart Materials: 9H
Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT III: Synthesis of Smart materials: 9H
Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method,Co-precipitaiton.Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT IV: Characterization Techniques: 9H

X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V:Smart Materials and Devices: 9H

Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials.

Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Text Books:

1.Encyclopaediaof Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002

2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and

   Hall, 1992

Texts/References:

1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.

2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.

3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, , 2nd Edn., John Wiley & Sons, 2003.

4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1. Emission Sensors, Materials and Amplifiers,G.Gautschi, Springer, 2002.

5. Optical Metamaterials: Fundamentals and Applications-W. Cai and V. Shalaev, ,springer,2010.

6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

https://nptel.ac.in/courses/112/104/112104173/
https://nptel.ac.in/courses/112/104/112104251/
https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec_1.pdf

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF H &SS

Course Code	Employability Skills		L	T	P	C
20A75501			3	0	0	3
Pre-requisite		Semester-VII				
Course Objectives:						

➢ To encourage all round development of the students by focusing on productive skills
➢ To make the students aware of Goal setting and writing skills
➢ To enable them to know the importance of presentation skills in achieving desired goals.
➢ To help them develop organizational skills through group activities

To function effectively with heterogeneous teams

Course Outcomes (CO):

CO1: Define goals and try to achieve them
CO2: Understand the significance of self-management
CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes
CO4: Analyse various forms of Presentation skills
CO5: Judge the group behaviour
CO6: Develop skills required for employability.

UNIT - I	Goal Setting and Self-Management	Lecture Hrs

Definition, importance, types of Goal Setting – SMART Goal Setting – Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOT Analysis

UNIT - II	Writing Skills	Lecture Hrs

Definition, significance, types of writing skills – Resume writing, E-Mail writing, Cover Letters, - E-Mail Etiquettes

UNIT - III	Technical Presentation Skills	Lecture Hrs

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics – PPT & Poster Presentation

UNIT - IV	Group Presentation Skills	Lecture Hrs

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion

UNIT - V	Job Cracking Skills	Lecture Hrs

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success - Answering Strategies – Mock Interviews

Textbooks:

• 1. Soft Skills & Employability Skills (English, Paperback, SABINA PILLAI, AGNA FERNANDEZ)Publisher: Cambridge

2.Personality Development and Soft Skills (English, Paperback, MitraBarun K.)

Reference Books:

1. Learning How To Fly - Life Lessons for the Youth (English, Paperback, Kalam Abdul A. P. J.), Rupa& Co

2. Personality Development and Soft Skills - Preparing for Tomorrow 1

Edition (English, Paperback, Shikha Kapoor)Publisher: Dreamtech Press 3. Skills for Employability - Skills for Employability with 0 Disc (English, Paperback, Dr. M. Sen Gupta)Publisher: Innovative Publication

Online Learning Resources:
7. https://youtu.be/gkLsn4ddmTs 8. https://youtu.be/2bf9K2rRWwo 9. https://youtu.be/FchfE3c2jzc 10. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Chemistry

Subject Code	Title of the Subject	L	T	P	C
20A75301	**GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT**	2	1	-	3

COURSE OBJECTIVES	
1	Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
2	Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

COURSE OUTCOMES	
CO1	Apply the Green chemistry Principles for day to day life as well as synthesis, Describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
CO2	Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
CO3	Demonstrate Organic solvents and importance of solvent free systems, Discuss Super critical carbondioxide, Explain Super critical water and water as a reaction solvent, Interpret Ionic Liquids as Catalyst and Solvent
CO4	Describe importance of Biomass and Solar Power, Illustrate Sonochemistry and Green Chemistry, Apply Green Chemistry for Sustainable Development , Discuss the importance of Renewable resources
CO5	Discuss green Chemistry Principles for practicing Green nano synthesis, Illustrate Microwave Assisted Synthesis, Differentiate Hydrothermal and Reflux synthesis, Demonstrate Green Chemistry applications of Inorganic nanomaterials

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												

CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT 1: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT 2: CATALYSIS AND GREEN CHEMISTRY

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogeneous and Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples,

UNIT 3: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalyst and solvent.

UNIT 4: EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable Feedstocks, Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions)

UNIT 5:ALTERNATIVE ENERGY SOURCES

Photo redox catalysis, single electron transfer reactions (SET), Advantages and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis.

Text Books :

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition,

Oxford University Press, USA

References :

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.

2. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:

   Green Nanoscience, wiley-VCH, 2013.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Civil Engineering

		L	T	P	C
20A70105	**Environmental Impact Assessment**	3	0	0	3

Course Objectives:
1. To impart knowledge on different concepts of Environmental Impact Assessment.
2. To teach procedures of risk assessment.
3. To teach the EIA methodologies and the criterion for selection of EIA methods.
4. To teach the procedures for environmental clearances and audit.
5. To know the impact quantification of various projects on the environment.

Course Outcomes (CO):
1. To prepare EMP, EIS, and EIA report.
2. To identify the risks and impacts of a project.
3. To choose an appropriate EIA methodology.
4. To evaluation the EIA report.
5. To Estimate the cost benefit ratio of a project.

UNIT - I

Concepts and methodologies of EIA :Initial environmental Examination, Elements of EIA, - Factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters- Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT - II

Impact of Developmental Activities and Land Use :Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT - III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment :Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-Advantages of Environmental Risk Assessment

UNIT - IV   Environmental audit

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT - V   Environmental Acts and Notifications

The Environmental protection Act, The water preservation Act, The Air (Prevention &Control of pollution Act), Wild life Act - Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- Evaluation of EIA report. Environmental legislation objectives, evaluation of Audit

data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Textbooks:
1. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011

Reference Books:
1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers
3. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi.

Online Learning Resources:
https://nptel.ac.in/courses/124107160

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Electrical & Electronic & Engineering

Course Code	IoT APPLICATIONS IN ELECTRICAL ENGINEERING (OE-IV)	L	T	P	C
20A70205		3	0	0	3
Pre-requisite					

Course Objectives: To make the students learn about:

- Basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process.
- The concept of motion less and motion detectors in IoT applications.
- Applications of IoT in smart grid.
- The concept of Internet of Energy for various applications.

Course Outcomes (CO): After completing the course, the student should be able to do the following:

CO 1 Understand the concept of IoT in Electrical Engineering.
CO 2 Analyze various types of motionless sensors and various types of motion detectors
CO 3 Apply various applications of IoT in smart grid.
CO 4 Design future working environment with Energy internet.

UNIT - I	SENSORS	Lecture Hrs: 10

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

UNIT - II	OCCUPANCY AND MOTION DETECTORS	Lecture Hrs: 10

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

UNIT - III	MEMS	Lecture Hrs: 10

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

UNIT - IV	IoT FOR SMART GRID	Lecture Hrs: 8

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

UNIT - V	INTERNET of ENERGY (IoE)	Lecture Hrs: 10

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid .

Textbooks:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. ErsanKabalci and YasinKabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir VahidDastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD SundaramShriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs96/preview
2. https://nptel.ac.in/courses/108108123
3. https://nptel.ac.in/courses/108108179

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Mechanical Engineering

Subject Code	Title of the Subject	L	T	P	C
20A70305	**MATERIAL HANDLING EQUIPMENTS**	3	0	0	3

Course Objectives:

To understand how the knowledge of materials management can be an advantage to logistics and supply chain operations.

To sensitize the students on the materials management functions – Planning, Purchase, Controlling, Storing, Handling, Packaging, Shipping and Distributing, and Standardizing.

To realize the importance of materials both in product and service.

planning/ production and plant layouts, studying about strategies of material handling and equipments, and selection of site locations.

It also aims to explore the layout planning by computer applications following different algorithms.

UNIT-I

Overview of Material Handling: Principles of Material Handling, Principal groups of Material Handling equipment – General Characteristics and application of Material Handling Equipment, Modern trends in material handling.

UNIT-II

Lifting Equipments: Hoist- Components of Hoist – Load Handling attachments hooks, grabs and clamps – Grabbing attachments for bulk material – Wire ropes and chains.

UNIT-II

Lifting tackle pulleys for gain of force and speed: Tension in drop parts – Drums, Shears and sprockets – Arresting gear and brakes – Block brakes, Band brakes, thrust brakes – Safety and

hand cranks. Principle operation of EOT, Gantry and jib cranes Hoisting Mechanisms, Travelling mechanisms, lifting mechanisms – Slewing Mechanisms – Elevators and lifts.

UNIT-IV

CONVEYORS: Types - description -applications of Belt conveyors, apron conveyors and escalators Pneumatic conveyors, Screw conveyors and vibratory conveyors

UNIT-V

ELEVATORS: Bucket elevators: Loading and bucket arrangements - Cage elevators - shaft way, guides, counter weights, hoisting machine, safety devices - Design of fork lift trucks.

Course Outcomes :

The students will be able to select appropriate location for establishing industrial plants by applying the concepts of location selection.

The students will be able to plan and design plant and production layouts through basic strategies and with computer applications.

The students will be able to identify and analyse the problems in the existing layout/ material handling system and shall be able to the optimize the layout/ material handling system

The students will be able to develop algorithms for new planning layouts for typical applications in the industries and Suggesting appropriate material handling strategies in the industries.

The students will be able to design of fork lift trucks.

REFERENCES

Rudenko, N., Materials handling equipment, ELnvee Publishers, 1970.

Spivakovsy, A.O. and Dyachkov, V.K., Conveying Machines, Volumes I and II, MIR Publishers, 1985.

Alexandrov, M., Materials Handling Equipments, MIR Publishers, 1981.

Boltzharol, A., Materials Handling Handbook, The Ronald Press Company, 1958.

P.S.G. Tech., "Design Data Book", KalaikathirAchchagam, Coimbatore, 2003.

Lingaiah. K. and Narayana Iyengar, "Machine Design Data Hand Book", Vol. 1 & 2, Suma Publishers,

Bangalore, 1983

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV

Course Code	PRINCIPLES OF DIGITAL SIGNAL PROCESSING	L	T	P	C
20A70405		3	0	0	3

Pre-requisite
Basics of Electronics and Communication Engineering

Course Objectives:
- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete Fourier series and Fourier transforms.
- To design &analyzeIIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

Course Outcomes (CO): At the end of this course, the students will be able to
- Articulate the frequency domain analysis of discrete time signals.
- Understand the properties of discrete Fourier series and Fourier transforms.
- Design &analyzeIIR digital filters from analog filters.
- Design various structures used in implementation of FIR digital filters.
- Summarize the importance and applications of Multirate Digital signal processing.

UNIT - I
Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations, frequency domain representation of discrete time signals and systems. Review of Z-transforms.

UNIT - II
Discrete Fourier Series and Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT - III
Design of IIR Digital Filters and Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT - IV
Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling techniques, comparison of IIR & FIR filters, basic structures of FIR systems.
UNIT - V
DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters:

Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using block diagram representation study only.

Textbooks:

1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithmsand Applications", Pearson Education, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI.

Reference Books:

1. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006
2. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling and Sandra L. Harris, "Fundamentals of Digital Signal Processing using MATLAB", Thomson, 2007.
4. B. Venkataramani and M. Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", TATA McGraw Hill, 2002.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Computer Science & Engineering

Introduction to Database Management Systems

Course Code:20A70505   **L T P C : 3 0 0 3**
Course Objectives:

- To introduce the concept of Internet of Things.

- To Practice programs and build real time applications.

- Students will be explored to the interconnection and integration of the physical world.

- Students will gain practical experience in the development of Cloud-based IoT systems.

- To get knowledge on cloud platforms

Course Outcomes (CO):

CO1: Design reliable real time applications using microcontrollers and microprocessors .
CO2: Extend the programming functionality and design new modules.
CO3: Able to design & develop IOT Devices.

UNIT-I: Introduction

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMS

system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMS

system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMSsystem architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMS

system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence,DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence, DBMSsystem architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems, Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence, DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

UNIT-II: E/R Model

Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship

types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples

Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship

types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples

Conceptual Data Modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples.

UNIT-III: Relational Data Model

Concepts of relations, schema-instance distinction, keys, referential integrity & foreign keys, converting the database specification in ER notation to the relational schema, Relational algebra operators: selection, projection, cross product, various types of joins, division, set operations, example queries, tuple relational calculus, domain relational calculus, Fundamentals of SQL.

UNIT-VI: Relational Database Design

Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms

for FD's, closure of a set of FD's, minimal covers, Normalization, Normal Forms - INF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, multi valued dependencies and 4NF, join dependencies and 5NF, Concept of Denormalization.

UNIT-V: Transaction Processing,Data Storage & Indexing

Transaction processing and Error recovery-Concepts of transaction processing, ACID properties, concurrency control, Serializability, locking based protocols, Timestamp based protocols, recovery and logging methods.

Data Storage and Indexes - File organizations, primary, secondary index structures, various index structures - hasb based, dynamic hashing techniques, multi-level indexes, B and B-trees.

References:

3. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
4. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Chemical Engineering

Course Code	SOLID WASTE MANAGEMENT	L	T	P	C
20A70805		3	0	0	3

Pre-requisite

Course Objectives:

- Material flow in society and generation of solid waste source
- Clarification of solid waste on characterization of the same
- Understand the sense of onsite handling storage and collection systems including transportation

- Understand processing technologies with mechanical volume reduction and thermal volume reduction corporate land filling, deep well injections.
- Learn to estimate material recovery energy recovery from a given waste data using case standing

Course Outcomes (CO):

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

CO1   Identify sources and relationship between various functional elements of solid waste management and methods of storage and collection and transport of solid wastes.

CO2   Know the importance of transfer station and suggest suitable methods of solid waste disposal based on the composition of solid waste.

CO3   Suggest suitable methods for the management of plastic and E-wastes

CO4   Identify hazardous wastes and suggest suitable management techniques for radioactive wastes and Bio-medical wastes.

CO5   Adopt the suitable management method for a given industry

Course Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT - I

Introduction: Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes.

General aspects Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and environment. Legislations

UNIT - II

Engineered systems: Typical generation rates. Estimation and factors effecting generation rates. On site handling. Storage and processing. Collection systems and devices. Transfer and transport.

UNIT - III

Processing Techniques: Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

UNIT - IV

Material recovery: Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products.
Energy recovery: Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

UNIT - V

Case studies: Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units.

Textbooks:

1. Howard S. Peavy, Environmental Engineering, McGraw Hill International Edition, 1986.
2. Dutta, Industrial Solid Water Management and Land Filling Practice, Narose Publishing House, 1999.

Reference Books:

1. Sastry C.A., Waste Treatment Plants, Narose Publishing House, 1995.
2. Lagrega, Hazardous Waste Management, McGraw Hill, 1994.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Number theory and its Applications		L	T	P	C
20A75102			0	3	0	3
Pre-requisite	-----	Semester	I			
Course Objectives:						
This course enables the students to learn the concepts of number theory and its applications to information security.						
Course Outcomes (CO): Student will be able to						
- understand number theory and its properties. - understand principles on congruences - develop the knowledge to apply various applications						

	• develop various encryption methods and its applications.	
UNIT - I	**Integers, Greatest common divisors and prime Factorization**	8 Hrs

The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT - II	**Congruences**	8 Hrs

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT - III	**Applications of Congruences**	9 Hrs

Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem- Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT - IV	**Finite fields & Primality, factoring**	8 Hrs

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT - V	**Cryptology**	9 Hrs

Basic terminology-complexity theorem-Character ciphers-Block ciphers- Exponentiation ciphers- Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

Textbooks:
1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2. A course in Number theory & Cryptography, Neal Koblitz, Springer.

Reference Books:

1. An Introduction To The Theory Of Numbers, Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, wiley publishers
2. Introduction to Analytic number theory-Tom M Apostol, springer
3. Elementary number theory, VK Krishnan, Universities press

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Physics

Subject Code	Title of the Subject	L	T	P	C
20A75202	**SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS**	3		-	3

COURSE OBJECTIVES	
1	To provide exposure to various kinds of sensors and actuators and their engineering applications.
2	To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
3	To explain the operating principles of various sensors and actuators
4	To educate the fabrication of sensors
5	To explain the required sensor and actuator for interdisciplinary application
COURSE OUTCOMES	

	At the end of the course the student will be able
CO1	To recognize the need of sensors and actuators
CO2	To understand working principles of various sensors and actuators
CO3	To identify different type of sensors and actuators used in real life applications
CO4	To exploit basics in common methods for converting a physical parameter into an electrical quantity
CO5	To make use of sensors and actuators for different applications

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credits: 3   **Hours of teaching:- 45 H**

UNIT – I: Introduction to Sensors and Actuators   **9H**
Sensors: Types of sensors:temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition:ChemicalVapor Deposition, Pattern: photolithography and Etching: Dry and WetEtching.
Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT –II: Temperature and Mechanical Sensors   **9H**
Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors
Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Semiconductor, Piezoresistive, capacitive, Variable Reluctance Sensor (VRP).

UNIT –III: Optical and Acoustic Sensors   **9H**

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors:thermal, Passive Infra Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT –IV: Magnetic, Electromagnetic Sensors and Actuators   9H

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT –V: Chemical and Radiation Sensors   9H

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Muller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Text Books:
1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:
1.Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation By D. Patranabhis

NPTEL courses links
https://onlinecourses.nptel.ac.in/noc21_ee32/preview

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF H & SS

Subject Code	Title of the Subject	L	T	P	C
20A79102	English Literary Spectrum	3		0	3

COURSE OBJECTIVES	
1	To develop aesthetic sense to appreciate the beauty of life
2	To introduce to Elizabethan drama and be able to appreciate the nuances of humour
3	To familiarize with Victorian novel and industrialization
4	To expose to the historical significance of ideas of different periods
5	To give exposure to the vicissitudes of life through short stories

COURSE OUTCOMES	
CO1	Awareness to lead a life of quality than quantity
CO2	Able to understand humour and Elizabethan culture
CO3	Enable to appreciate human relations in this mechanized world
CO4	Tolerant and receptive to different ideas
CO5	Be imaginative and understanding of human aspirations

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT I: Poetry

1. Ode to a Grecian Urn- John Keats
2. To a Skylark- P.B.Shelley
3. Satan's Speech from Paradise Lost Book I- 140-170 lines- John Milton
4. My Last Duchess- Robert Browning

UNIT II: Drama

1. Twelfth Night- William Shakespeare
   a) Elizabethan theatre
   b) Shakespearean tragedy
   c) Shakespearean Comedy
   d) Themes of Shakespearean Dramas

UNIT III: Novel

1. Hard Times- Charles Dickens
   a) Rise of the English Novel
   b) Victorian Novel
   c) Utilitarianism
   d) Humanism

UNIT IV: Prose

1. Of Studies – Francis Bacon
2. On Seeing People Off- A.G.Gardiner
3. Sweetness and Light- Mathew Arnold
4. I too have a Dream- Martin Luther King Junior

UNIT V: Short Stories

1. The Last Leaf- O.Henry
2. Useless Beauty- Guy de Maupassant
3. After the Dance – Leo Tolstoy
4. The Selfish Giant- Oscar Wilde

Text Books:

The Oxford Book of English Verse by Christopher Ricks (Editor)

Twelfth Night (2010 edition): Oxford School Shakespeare (Oxford School Shakespeare Series)

Dickens Charles, Hard Times (Penguin Classics)

The Art of the Personal Essay: An Anthology from the Classical Era to the Present, Anchor Books
Publication

References:
Legois and Cazamian, *A History of English Literature*

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Chemistry

Subject Code	Title of the Subject	L	T	P	C
20A75302	**CHEMISTRY OF NANOMATERIALS AND APPLICATIONS**	2	1	-	3

COURSE OBJECTIVES	
1	To understand synthetic principles of Nanomaterials by various methods
2	And also characterisae the synthetic nanomaterials by various instrumental methods
3	To enumerate the applications of nanomaterials in engineering

COURSE OUTCOMES	
CO1	Classify the nanostructure materials, Describe scope of nano science and technology, Explain different synthetic methods of nano materials, Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material

CO2	Describe the top down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapour deposition method and electrodeposition method, Discuss about high energy ball milling.
CO3	Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis, Apply different spectroscopic techniques for characterization
CO4	Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, Describe liquid crystals
CO5	Illustrate applications of nanaomaterials, Discuss the magnetic applications of nanomaterials, list the applications of non-linear optical materials, Describe the applications fullerenes, carbon nanotubes

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit – I

Basics and Characterization of Nanomaterials : Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Unit – II

Synthesis of nanomaterials : Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling method.

Synthetic Methods**:** Bottom-Up approach**:-** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT-III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterilas, BET method for surface area analysis, dynamic light scattering for particle size determination-

UNIT-IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials and liquid crystals.

UNIT-V

Engineering Applications of Nanomaterials : Applications of Nano Particle, nano rods of nano wires, Fullerenes, carbon nano tubes, Graphines nanoparticles and other applications of nonmaterials and uses.

TEXT BOOKS:

1. **NANO: The Essentials:** T Pradeep, MaGraw-Hill, 2007.
2. **Textbook of Nanoscience and nanotechnology:** B S Murty, P Shankar, Baldev Rai, BB Rath and James Murday, Univ. Press, 2012.

REFERENCE BOOKS:

1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. **Nanostructures & Nanomaterials; Synthesis, Properties & Applications:** Guozhong Cao, Imperial College Press, 2007.
3. **Nanomaterials Chemistry**, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.