Kongunadu College of Engineering and Technology(Autonomous)

Affiliated to Anna University, Chennai
B.E. Civil Engineering
Regulations:KNCET-UGR2020
Choice Based Credit System
I to VIII Semesters Curricula & Syllabi

Semester I							
S.No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EN101	Technical English -I	HSMC	3	0	0	3
2	20MA101	Mathematics-I	BSC	3	1	0	4
3	20PH101	Engineering Physics	BSC	3	0	0	3
4	20CY101	Engineering Chemistry	BSC	3	0	0	3
5	20GE101	Structured Programming Using C	ESC	3	0	0	3
6	20GE102	Engineering Graphics	ESC	2	0	2	3
Practicals							
7	20BS101L	Physics and Chemistry Laboratory	BSC	0	0	2	1
8	20GE103L	Structured Programming Using C Laboratory	ESC	0	0	2	1
9	20EEC101L	English for Effective Communication	EEC	0	0	2	1
			Total	**17**	**1**	**8**	**22**

Semester II							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EN201	Technical English-II	HSMC	3	0	0	3
2	20MA201	Mathematics-II	BSC	3	1	0	4
3	20PH202	Material Science	BSC	3	0	0	3
4	20BS201	Environmental Science	HSMC	3	0	0	3
5	20BE201	Engineering Mechanics	PCC	3	1	0	4
6	20BE202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3
Practicals							
7	20GE201L	Engineering Practices Laboratory	ESC	0	0	2	1
8	20CE201L	Building Drafting and Modeling Laboratory	PCC	0	0	2	1
9	20EEC201L	Soft Skills	EEC	0	0	2	1
			Total	**18**	**2**	**6**	**23**

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Semester III							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4
2	20CE301	Strength of Materials-I	PCC	3	0	0	3
3	20CE302	Mechanics of Fluids	PCC	3	0	0	3
4	20CE303	Surveying	PCC	3	0	0	3
5	20CE304	Construction Materials	PCC	3	0	2	4
6	20CE305	Engineering Geology	ESC	3	0	0	3
7	20MC003	Constitution of India	HSMC	2	0	0	-
Practicals							
8	20CE306L	Surveying Laboratory	PCC	0	0	2	1
9	20EEC301L	Soft Skills Development	EEC	0	0	2	1
			Total	**20**	**1**	**6**	**22**

Semester IV							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20MA401	Numerical Methods	BSC	4	0	0	4
2	20CE401	Strength of Materials-II	PCC	3	0	0	3
3	20CE402	Applied Hydraulic Engineering	PCC	3	0	0	3
4	20CE403	Construction Techniques, Equipments and Practice	PCC	3	0	0	3
5	20CE404	Soil Mechanics	PCC	3	0	0	3
6	20CE405	Highway Engineering	PCC	3	0	0	3
Practicals							
7	20EEC401L	Life Skills and Personality Development	EEC	0	0	2	1
8	20CE406L	Strength of Materials Laboratory	PCC	0	0	2	1
9	20CE407L	Hydraulic Engineering Laboratory	PCC	0	0	2	1
			Total	**19**	**0**	**6**	**22**

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Semester V							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20CE501	Design of Reinforced Concrete Elements	PCC	3	1	0	4
2	20CE502	Structural Analysis-I	PCC	3	0	0	3
3	20CE503	Railways, Airports and Harbour Engineering	PCC	3	0	0	3
4	20CE504	Foundation Engineering	PCC	3	0	0	3
5	20MC002	Universal Human Values 2: Understanding Harmony	HSMC	2	1	0	3
6		Professional Elective-I	PEC	3	0	0	3
Practicals							
7	20CE505L	Survey Camp (2 weeks - During IV Semester)	PCC	0	0	0	1
8	20CE506L	Geotechnical Engineering Laboratory	PCC	0	0	3	1
9	20CE507L	Highway Engineering Laboratory	PCC	0	0	2	1
10	20EEC501L	Professional Skills Development	EEC	0	0	2	1
			Total	**17**	**2**	**7**	**23**

Semester VI							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20CE601	Design of Steel Structures	PCC	3	0	0	3
2	20CE602	Structural Analysis-II	PCC	3	0	0	3
3	20CE603	Water Supply and Waste Water Engineering	PCC	3	0	0	3
4	20CE604	Estimation Costing and Valuation Engineering	PCC	3	0	0	3
5		Professional Elective-II	PEC	3	0	0	3
6		Open Elective-I	OEC	3	0	0	3
Practicals							
7	20CE605L	Structural Design and Drawing	PCC	0	0	3	1
8	20CE606L	Water Supply and Waste Water Engineering Laboratory	PCC	0	0	3	1
9	20EEC601L	Employability Skills	EEC	0	0	2	1
10	20CE607L	Mini Project-I	EEC	0	0	2	1
			Total	**18**	**0**	**10**	**22**

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Semester VII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20CE701	Concrete Technology	PCC	3	0	0	3
2	20MG501	Principles of Management	HSMC	3	0	0	3
3		Professional Elective-III	PEC	3	0	0	3
4		Professional Elective-IV	PEC	3	0	0	3
5		Open Elective –II	OEC	3	0	0	3
Practicals							
6	20CE702L	Mini Project-II	EEC	0	0	2	1
			Total	**15**	**0**	**2**	**16**

Semester VIII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1		Professional Elective-V	PEC	3	0	0	3
2		Professional Elective-VI	PEC	3	0	0	3
Practicals							
3	20CE801L	Project work	EEC	0	0	20	10
			Total	**6**	**0**	**20**	**16**

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Professional Elective Course (PEC)

Semester- V
Elective I

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE501PE	Industrial Waste Management	PEC	3	0	0	3
2	20CE502PE	Air Pollution and Control Engineering	PEC	3	0	0	3
3	20CE503PE	Non Destructive Testing	PEC	3	0	0	3
4	20CE504PE	Irrigation Engineering	PEC	3	0	0	3
5	20CE505PE	Remote Sensing Essentials	PEC	3	0	0	3
6	20CE506PE	Hydrology	PEC	3	0	0	3

Semester- VI
Elective II

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE601PE	Ground Improvement Techniques	PEC	3	0	0	3
2	20CE602PE	Rock Engineering	PEC	3	0	0	3
3	20CE603PE	Urban Planning and Development	PEC	3	0	0	3
4	20CE604PE	Advanced RC Design	PEC	3	0	0	3
5	20MG802PE	Engineering Economics	PEC	3	0	0	3
6	20CE605PE	Geo-Environmental Engineering	PEC	3	0	0	3
7	20MA601PE	Quantitative and Reasoning Aptitude	PEC	3	0	0	3

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Semester- VII
Elective III

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE701PE	Advanced Steel Design	PEC	3	0	0	3
2	20CE702PE	Prestressed Concrete Structures	PEC	3	0	0	3
3	20CE703PE	Precast Technology in Building	PEC	3	0	0	3
4	20CE704PE	Modern Construction Materials	PEC	3	0	0	3
5	20CE705PE	Basic Structural Dynamics and Earthquake Engineering	PEC	3	0	0	3
6	20CE706PE	Pavement Engineering	PEC	3	0	0	3

Semester- VII
Elective IV

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE707PE	Traffic Engineering and Management	PEC	3	0	0	3
2	20CE708PE	Fire Protection Services And Maintenance Management of Building	PEC	3	0	0	3
3	20CE709PE	Irrigation and Environmental Engineering Design and Drawing	PEC	3	0	0	3
4	20CE710PE	Fundamentals of Nanoscience	PEC	3	0	0	3
5	20CE711PE	Coastal and Offshore Engineering	PEC	3	0	0	3
6	20ME807PE	Project Management	PEC	3	0	0	3

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Semester- VIII
Elective V

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE801PE	Industrial Structures	PEC	3	0	0	3
2	20CE802PE	Water Resources Systems Engineering	PEC	3	0	0	3
3	20CE803PE	Municipal Solid Waste Management	PEC	3	0	0	3
4	20CE804PE	Groundwater Engineering	PEC	3	0	0	3
5	20CE805PE	Prefabricated Structures	PEC	3	0	0	3
6	20GE601	Professional Ethics in Engineering	PEC	3	0	0	3

Semester- VIII
Elective VI

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE806PE	Maintenance and Repair of Concrete Structures	PEC	3	0	0	3
2	20CE807PE	Coastal Engineering	PEC	3	0	0	3
3	20CE808PE	Bridge Engineering	PEC	3	0	0	3
4	20CE809PE	Integrated Water Resources Management	PEC	3	0	0	3
5	20MG701	Total Quality Management	PEC	3	0	0	3
6	20CE810PE	Construction Planning and Scheduling	PEC	3	0	0	3

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Open Elective Course(OEC)

Open Elective I (Semester- VI)

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20ME601OE	Production Technology	OEC	3	0	0	3
2	20ME602OE	Basics of Automotive Components	OEC	3	0	0	3
3	20EC503PE	Internet of Things	OEC	3	0	0	3
4	20EC501OE	Sensors and Transducers	OEC	3	0	0	3
5	20EE501OE	Non-Conventional Energy Resources	OEC	3	0	0	3
6	20EE502OE	Industrial Automation	OEC	3	0	0	3
7	20IT501OE	Fundamentals of Operating Systems	OEC	3	0	0	3
8	20IT502OE	Introduction to Database	OEC	3	0	0	3
9	20CS506OE	Fundamentals of Software Engineering	OEC	3	0	0	3
10	20CS507OE	Introduction to Data Structures and Algorithms	OEC	3	0	0	3
11	20BM501OE	Basics of Biomedical Instrumentation	OEC	3	0	0	3
12	20BM502OE	Introduction to Cell Biology	OEC	3	0	0	3

Open Elective II (Semester- VII)

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20ME701OE	Basics of Hydraulic and Pneumatic Systems	OEC	3	0	0	3
2	20ME702OE	Alternative Energy Fuels	OEC	3	0	0	3
3	20EC701OE	Consumer Electronics	OEC	3	0	0	3
4	20EC702OE	RFID and Flexible Sensors	OEC	3	0	0	3
5	20EE701OE	Energy Storage Systems	OEC	3	0	0	3
6	20EE702OE	Electrical Safety Engineering	OEC	3	0	0	3
7	20IT701OE	Programming in Java	OEC	3	0	0	3
8	20IT702OE	Web Design	OEC	3	0	0	3
9	20CS706OE	E-Commerce	OEC	3	0	0	3
10	20CS708OE	Introduction to Computer Organization	OEC	3	0	0	3
11	20BM701OE	Bioinformatics	OEC	3	0	0	3
12	20BM702OE	Fundamentals of Nutrition	OEC	3	0	0	3

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CIVIL

20EN101 **TECHNICAL ENGLISH-I**

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to,

- Enable learners develop basic communication skills in English.
- Enhance the speaking skills for academic, professional and social purposes.
- Enable learners make use of the electronic media such as internet and other online resources for their language development.
- Inculcate the habit of reading and writing for the purpose of effective communication.
- Develop confidence in learners to communicate in English for all purposes.

UNIT I SHARING INFORMATION **9**

Listening: Intensive and Extensive Listening, Barriers to Effective Listening; Speaking: Descriptions, Reading: Skimming and Scanning, Writing: Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.), Grammar: Parts of speech, Vocabulary: Word formation.

UNIT II INTRODUCTION TO WRITING **9**

Listening: Listening lectures/talks, Speaking: Telephonic interview, Reading: Inferring inferential and contextual meaning from literary texts, Writing: Biographical writing - Writing a paragraph (Cause and Effect/Compare and Contrast/Narrative/Analytical) - Writing a set of recommendations – Writing a set of instructions, Grammar: Prepositions - Active and Passive voice - Present Tense, Vocabulary: Confused Words.

UNIT III IMPROVING SPEAKING **9**

Listening: Listening to talks by eminent personalities - Focused audio tracks, Speaking: Role Play - Simulation - Group Interaction, Reading: Reading magazines, Writing: Business Letter (Order/Acceptance), Grammar: Past tense - Tag Questions - Subject - Verb Agreement, Vocabulary: Learning Words in Situations.

UNIT IV READING SKILLS **9**

Listening: Techniques for Effective Listening, Speaking: Speaking in job Interviews, Reading: Reading for factual and inferential meaning, Writing: Interpreting Visual Materials (Line Graphs, Pie Charts etc.), Grammar: Adverbs - Future Tense, Vocabulary: Single word substitutes.

UNIT V PRONUNCIATION **9**

Listening: Understanding different Accents, Listening to Radio and TV and taking notes, Speaking: Giving impromptu talks- Making presentations, Reading: Practice in speed reading, Writing: Business Letter (enquiry/Rejection), Grammar: Direct and Indirect Speech, Vocabulary: Phrasal Verbs.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the student will be able to,

- Use suitable vocabulary with confidence and express their ideas both in speech and writing.
- Write intelligibly avoiding grammatical errors, using a range of vocabulary, organizing their ideas logically on a topic.
- Speak confidently, with one or many listeners using appropriate communicative strategies.
- Read different genres of texts adopting various reading strategies.
- Understand different spoken discourses/excerpts in different accents.

Text Book:

1. Sanjay Kumar and Pushp Lata, "Communication Skills", Oxford University Press, 2nd edition, 2015.

References:

1. P Kiranmai and Rajeevan Geeta, "Basic Communication Skills", Foundation Books, revised edition, 2013.
2. Redston, Chris & Gillies Cunningham, "Face2Face (Pre-Intermediate Student's Book & Workbook",Cambridge University Press, New Delhi, 2nd edition,2005.
3. Perumal, Lakshmana.N and Sathiseelan S, "Technical English-I", Sri Krishna Hitech Publishing Company Pvt.Ltd, Chennai: 2014.
4. Mohan, Krishna and Banerji Meera, "Developing Communication Skills", Macmillan Publishers India Ltd., Delhi, 2nd edition,2009.
5. Hewings, Martin. "Advanced English Grammar: A self study reference and Practice book for advanced South Asian students" Cambridge University Press, New Delhi, revised edition, 1999.

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20MA101	MATHEMATICS-I (COMMON TO ALL BRANCHES)	L T P C 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Develop the use of matrix algebra technique for practical application
- Apply the properties of arithmetic and geometric in sequences and series
- Familiarize the students with differential calculus
- Familiarize the student with functions of several variables, this is needed in many branches of engineering
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II SEQUENCE AND SERIES **12**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

UNIT III DIFFERENTIAL CALCULUS **12**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules – Maxima and Minima of functions of one variable – Local maximum and minimum – absolute minimum and absolute maximum – increasing and decreasing – Concavity and inflection points – Rolle's theorem and mean value theorem(excluding proofs).

UNIT IV FUNCTIONS OF SEVERAL VARIABLES **12**

Limits and Continuity – Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS **12**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Change of variables in double integrals – Triple integrals – Volume of Solids: Volume as triple integral – Cylindrical coordinates – Spherical coordinates

TOTAL: 60 PERIODS

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OUTCOMES:

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

- Eigen values and eigenvectors, Diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices
- Determining and describing the nth term of arithmetic and geometric sequences
- Apply differential calculus tools in solving various application problems
- Apply differentiation to solve maxima and minima problems
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Narayanan S and Manicavachagom Pillay T K, "Calculus", Volume I and II, S Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

REFERENCES:

1. Dass H K and Er. Rajnish Verma, "Higher Engineering Mathematics", S Chand Private Ltd., 2011.
2. Bali N P and Manish Goyal, "A Text Book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Peter V O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7th Edition, 2012.
4. Veerarajan T, "Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

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20PH101 **ENGINEERING PHYSICS (COMMON TO ALL BRANCHES)** **L T P C 3 0 0 3**

OBJECTIVES:

The student should be made to:

- Describe the basics of crystal structures and their growth techniques
- Explain the elastic properties of materials
- Analyze heat transfer mechanisms and their applications
- Develop an understanding of quantum mechanical concepts and their applications
- Gain fundamental knowledge of laser action, their production and fiber optics

UNIT – I CRYSTAL PHYSICS **9**

Crystalline and Amorphous materials – Crystal systems, Bravais lattices, Miller indices – Interplanar distance – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal growth techniques – solution, Melt (Bridgman and Czochralski methods)

UNIT – II PROPERTIES OF MATTER **9**

Elasticity – Stress–Strain diagram and its uses – Factors affecting elastic modulus – Twisting couple – Torsion pendulum: Theory and Experiment – Bending of beams – Bending moment – Cantilever: Theory and Experiment – Uniform and Non–Uniform bending: Theory and Experiment I–shaped girders and its application.

UNIT – III THERMAL PHYSICS **9**

Modes of heat transfer – Thermal capacity – Newton's law of cooling – Rectilinear heat flow – Thermal conductivity – Forbe's and Lee's disc method: Theory and Experiment – Radial flow of heat – Thermal conductivity of rubber tube – Heat conduction through compound media (Series and Parallel) – Solar power – Advantages – Solar water heater.

UNIT – IV QUANTUM PHYSICS **9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory – de-Broglie wavelength – Properties of Matter waves – Schrodinger's wave equation – Time independent and time dependent wave equations – Physical significance of wave function – Particle in a one dimensional box – Extension to 3D – Degeneracy – Electron Microscope – Scanning Electron Microscope.

UNIT – V LASER AND FIBER OPTICS **9**

Lasers: Principles of laser – Population inversion – Einstein's A and B coefficients–derivation – Modes of vibration in CO_2 molecules – CO_2 Laser – Nd–YAG Laser – Basic principles of a homojunction semiconductor Laser – Industrial and Medical applications of Laser – Fiber optics: principle, numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode) – Fiber optic communication system (Block diagram).

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Identify crystal structure types and describe their growth techniques
- Analyze the elastic properties of materials
- Evaluate the thermal properties of materials
- Explain basic quantum mechanical concepts and their applications
- Elucidate the basic concepts of lasers and their applications

TEXT BOOKS:

1. Pandey B K and Chaturvedi S, "Engineering Physics", Cengage Learning India Pvt. Ltd., Delhi, 2018.
2. Malik H K and Singh AK, "Engineering Physics" TMH, New Delhi, 2010.

REFERENCES:

1. Gaur R K and Gupta S L, "Engineering Physics", DhanpatRai Publications, New Delhi, 2014.
2. Marikani A, "Engineering Physics", PHI learning Pvt. Ltd. New Delhi, Second Edition, 2013.
3. Avadhanulu M N, "Engineering Physics", SChand and Company Ltd, New Delhi, First Edition, 2007.
4. Wahab M A, "Solid State Physics", Narosa Publishing House, New Delhi, 2nd Edition, 2005.

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20CY101 **ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)** **L T P C 3 0 0 3**

OBJECTIVES:

The student should be made to:

- Study the characteristics of water & to know the various treatment methods for effective applications.
- Understand the concept of electrochemistry and corrosion prevention.
- Know the significance and properties of polymers.
- Know the fundamentals of phase rule and its applications and to analyse the principle and generation of energy in batteries and fuel cells.
- Evaluate types of fuels based on calorific values and to know the significance of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY **9**

Sources of water – Hard and soft water – Boiler feed water-requirements – disadvantages of using hard water in boilers (Scale- Sludge- Caustic Embrittlement - Priming - Foaming) – Estimation of hardness of water by EDTA method – Internal conditioning (Phosphate, Calgon, Colloidal and Carbonate conditioning methods) – External conditioning – Zeolite and demineralization process – desalination and reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION **9**

Electrochemistry – Nernst equation and its Applications – Electrochemical series – Corrosion – Types – Dry and Wet corrosion – Galvanic corrosion – Differential aeration corrosion – Pitting corrosion – Corrosion control – sacrificial anodic method and impressed current cathodic protection method – Protective coatings – Paints and its constituents.

UNIT III POLYMERS **9**

Polymers – definition – Classification – addition – condensation polymerization and copolymerization – mechanism of polymerization – (cationic, Anionic and free Radical) – Plastics – classification – preparation, properties and uses of PVC, Teflon, Nylon-6,6 and Epoxy resin – Rubber – vulcanization of rubber – butyl rubber, Styrene Butadiene Rubber.

UNIT IV PHASE RULE AND STORAGE DEVICES **9**

Phase Rule – Terms involved – One Component system (water system) – Two component system (Lead-Silver system) – Thermal analysis – Storage devices – Cell and a battery – Alkaline battery – Lead acid battery – Nickel-Cadmium battery and lithium battery – Fuel cells – Hydrogen – Oxygen fuel cell.

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UNIT V FUELS AND COMBUSTION **9**

Fuels – Introduction – Classification of fuels – coal – Analysis of coal (proximate and ultimate) – Carbonization – Manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – Manufacture of synthetic petrol (Bergius process) – Knocking – Anti knocking – Octane number – Cetane number – Gaseous fuels – LPG, CNG – Combustion: Calorific value – higher and lower calorific values – Theoritical calculation of calorific value – Flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain knowledge on the water quality parameters.
- Identify the solutions to prevent corrosion.
- Analyse the applications of polymers.
- Achieve the knowledge about types of phase diagram and storage devices.
- Evaluate the characteristics of various fuels.

TEXT BOOKS:

1. Jain P C and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing, Company. New Delhi, 2013.
2. Dara S S, "A Text Book of Engineering Chemistry", S Chand & Co Ltd., New Delhi, 2013.

REFERENCES:

1. Shika Agarwal, "Engineering Chemistry", Cambridge University Press., Delhi, 2015.
2. Sivasankar B, "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Palanna O G, "Engineering Chemistry" ,Tata Mc.Graw Hill Education Private Limited, New Delhi, 2011
4. Prasanta Rath, "Engineering Chemistry", Cengage Learning India Pvt. Ltd., Delhi, 2018.

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24/6/24

20GE101	STRUCTURED PROGRAMMING USING C (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Know the fundamentals of Computer and Programming
- Choose appropriate programming constructs in C language
- Construct programs using array and pointer
- Write programs using string and function
- Develop programs using the concept of structure, union and files

UNIT I FUNDAMENTALS OF COMPUTER AND PROGRAMMING **9**

Computer System – CPU – Memory Unit – Data Representation – Number System and Conversion – Programming Fundamentals – Program Development Life Cycle – Algorithm – Control Structures – Flowchart – Pseudocode – Programming Paradigms – Problem Formulation and Problem Solving.

UNIT II BASICS OF C PROGRAMMING **9**

Overview of C – C Character Set – Identifiers and Keywords – Declaration – Data types – Type Qualifiers and Type Modifiers – Variables and Constants – Structure of a C Program – Executing a C Program – Operators and Expressions – Decision-Making and Looping Statements.

UNIT III ARRAYS AND POINTERS **8**

Introduction to Arrays – Single Dimensional Arrays – Multidimensional Array – Pointers – void Pointer – Null Pointer – Relationship between Arrays and Pointers – Arrays of Pointers – Pointer to a Pointer – Pointer to an Array.

UNIT IV STRINGS AND FUNCTIONS **9**

Strings – Character Arrays – Reading String input – String Library Functions – List of Strings – Command Line Arguments – Functions: Types – Declaration – Definition – Function Call – Pass by Value – Pass by Reference – Passing arrays to functions – Recursion – Pointer to function.

UNIT V STRUCTURE, UNION AND FILES **10**

Structures – Pointers to Structures – Array of Structures – Structures within a Structure – Functions and Structures – typedef and Structures – Unions – Practical Applications of Unions – Enumerations – Bit fields – Storage Classes – C Preprocessor – Files: Streams – File type – File operations – Command line arguments.

TOTAL: 45 PERIODS

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BoS(IT)

OUTCOMES:

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

- Understand the fundamentals of Computer and Programming
- Choose appropriate data types, variables and statements for solving simple problems
- Construct programs using arrays and pointers for a given scenario
- Write programs using strings and functions
- Develop programs using structure, union and files for a given scenario

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Pearson India Education Services Pvt. Ltd., 2016.

REFERENCES:

1. Ajay Mital, "Programming in C - A Practical Approach", Pearson Education, 2015.
2. Dromey R G, "How to Solve it by Computer", Pearson Education, Fifteenth Impression, 2014.
3. Herbert Schildt, "C - The Complete Reference", Tata McGraw-Hill, 2013
4. Ashok N Kamthane, "Computer Programming", Pearson Education, Second Edition, 2012.
5. Juneja B L and Anita Seth, "Programming in C", Cengage Learning India Pvt. Ltd., 2011

CHAIRMAN
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20GE102

ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)

L	T	P	C
2	0	2	3

OBJECTIVES:

The Student should be made to:

- Explain the students with various concepts like dimensioning, standards, curves and free hand sketching
- Impart knowledge on projection of points, lines and plane surfaces
- Improve the visualization skills for better understanding of projection of solids
- Develop the imaginative skills of the students required to understand section of solids and development of surfaces
- Make the students to understand the viewing perception of a solid object in Isometric and Perspective projections

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 2

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 9+6

Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, epicycloid – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views – Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 9+6

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true length and true inclination by rotating line method – Projection of planes inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 7+6

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

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UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **9+6**

Sectioning of solids: prisms, pyramids, cylinder, cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: prisms, pyramids, cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **9+6**

Principles of isometric projection – isometric scale – isometric projections of simple solids and truncated solids: Prisms, pyramids, cylinder, cone – Perspective projection of simple solids: Prisms, pyramids and cylinder by visual ray method.

TOTAL: 75 (45+30) PERIODS

COURSE OUTCOMES:

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

- Apply the concepts of dimensioning, standards, curves and free hand sketching objects
- Sketch the projection of points, straight lines and plane surfaces
- Understand the projection of solids in various positions
- Construct projection of solids and development of surfaces
- Draw isometric and perspective sections of simple solids

TEXT BOOKS:

1. Natarajan K V, "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International Pvt. Limited, 2015.

REFERENCES:

1. Bhatt N D and Panchal V M, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K R, "Engineering Drawing", Vol. I and II Combined, Subhas Stores, Bangalore, 2007.

Special points applicable to End Semester Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

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BoS (MECH)

24/6/24

20BS101L	PHYSICS AND CHEMISTRY LABORATORY (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Understand the characteristics of an engineering material
- Know the physical properties of matter
- Estimate types of ions in drinking water
- Analyze the characteristics of acids
- Know the conductivity of a solution

LIST OF THE EXPERIMENTS - PHYSICS - Any six experiments to be conducted

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method.
9. Determination of Coefficient of Viscosity of liquids by Poiseuille's method.

LIST OF THE EXPERIMENTS - CHEMISTRY – Any seven experiments to be conducted

1. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid Vs strong base.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Estimation of iron content of the water sample using spectrophotometer.
10. Determination of rate of corrosion by weight loss method.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Analyze the characteristics of engineering materials.
- Find out the physical properties of matter.
- Assess the water quality parameter.
- Analyze the pH of aqueous solutions.
- Gain knowledge on chemical properties of liquids.

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BoS (S&H)

20GE103L

STRUCTURED PROGRAMMING USING C LABORATORY (COMMON TO ALL BRANCHES)

L	T	P	C
0	0	2	1

OBJECTIVES:

The student should be made to:

- Develop C programs using conditional and looping statements
- Understand the concept of functions, arrays and strings
- Learn to access memory using pointers
- Group different kinds of information related to a single entity
- Understand the manipulation of data in permanent storage

PRACTICAL SYLLABUS:

1. Programs using decision making statements.
2. Programs using looping statements.
3. Programs using user defined functions and recursive functions.
4. Programs using one dimensional and two dimensional arrays.
5. Solving problems using string functions.
6. Programs using pointers and dynamic memory allocation.
7. Programs using structures and unions.
8. Programs using pointers to structures and other data types.
9. Programs using text files.
10. Programs using binary files.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Implement C programs using control statements
- Write C programs using functions, arrays and strings
- Access data in memory using pointers
- Use structures and other user defined data structures to manipulate heterogeneous data
- Manipulate data stored on permanent storage

CHAIRMAN
BoS(IT)

20/6/21

20EEC101L **ENGLISH FOR EFFECTIVE COMMUNICATION (COMMON TO ALL BRANCHES)** **L T P C 0 0 2 1**

OBJECTIVES:

The student should be made to:

- Develop and understand verbal and non-verbal communication
- Acquire grammar for effective communication
- Enable learners express different functions using appropriate language
- Enable learners develop their ability to converse in different situations
- Impart skills in using English at workplace effectively

UNIT I UNDERSTANDING COMMUNICATION **6**

Role and Importance of Communication – Verbal and Non-verbal Communication – Barriers to Communication – Communication Mediums – Effective Communication – Group Communication.

UNIT II VOCABULARY AND GRAMMAR **6**

Aspects of vocabulary learning – Word formation – Sentence formation - Short forms of verbs - Common Grammatical Errors – Connective sentences - usage of Idioms and Phrases.

UNIT III EXPRESSING VARIED FUNCTION **6**

Introducing yourself – Greeting – Conversation between stranger – permission – opinion – information – Refusing – Agree/disagree – Apology – Praising – Requesting.

UNIT IV CONVERSATION LANGUAGE **6**

Understanding conversation – Chunking –Telling a story – Understanding public speech – Recognize Instructions – Persuasive Speech –Introduction to emphatic stress – Intensifying important words – Emphasizing corrections.

UNIT V CORPORATE COMMUNICATION **6**

Listening to Videos – Telephone and Email Etiquette – Extempore – Drafting and Delivering a Speech – Making Presentations – Group Discussion.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Create a group and discuss efficiently in a group communication
- Understand the Sentence formation with proper Vocabulary
- Sort out the language functions to foster a good conversation
- Get the proper pronunciation and usage of language
- Build Communication at workplace in various situations

REFERENCES:

1. Hancock Mark, "English Pronunciation in Use: Intermediate", Cambridge University Press, New Delhi, 2009.
2. Cheepen Christine and James Monaghan, "Spoken English: A Practical Guide", London: Pinter, 1990.
3. Sasikumar V and Dhamija P V, "Spoken English-A Self-Learning Guide to Conversation Practice", TMH, 1995.
4. Singh Ashish, "How to Communicate Effectively", Patridge, New Delhi, 2014.
5. Wilkinson Andrew M, "Spoken English", Edgbaston: University of Birmingham, 1966.

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20EN201

TECHNICAL ENGLISH -II

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The students should be made to

- Improve the reading skills for the purpose of effective communication.
- Make learners acquire listening and speaking skills in both formal and informal contexts.
- Enable learners improve their reading skills from online sources.
- Equip the learners with writing skills needed for academic as well as work place.
- Help the learners improve language skills at their own pace by using the language lab.

UNIT I CONVERSATIONS 9

Listening: Barriers to Effective Listening- Listening to informal conversations, Speaking: Short conversations in varied situations in student life, Reading: Reading Short text and longer passages for comprehension at deeper levels, Writing: Writing reviews (book / film), Grammar: Compound Nouns - Numerical Expression, Vocabulary: Homonyms-Homophones.

UNIT II INFORMAL USE OF LANGUAGE 9

Listening: Listening to Situation based Dialogues, Speaking: Using dictionary for learning pronunciation, stress, and syllable divisions. Reading: Reading a short story for appreciation and understanding, Writing: Informal Letter writing- Dialogue writing Grammar: Definition - Purpose expressions- Relative Pronouns, Vocabulary: Technical Vocabulary - Count/Un count nouns.

UNIT III GENERAL READING 9

Listening: Listening strategies for deeper understanding, Speaking: Asking about Routine actions and giving directions, Reading: an article from Newspaper- Critical reading, Writing: Minutes of meeting - Essay writing, Grammar: Degrees of Comparison, Vocabulary: Collocations.

UNIT IV ENGLISH FOR CAREER 9

Listening: Listening strategies for Effective conversation, Speaking: Group Discussion skills, Reading: pre reading and post reading tasks, Writing: Applying for a Job - Cover Letter -Resume preparation, Grammar: Articles, Vocabulary: Synonyms and Antonyms.

UNIT V REPORT WRITING 9

Listening: Listening and making notes, Speaking: Discussion on problems and solutions, Reading: Reading Journal Articles, Writing: Types of Reports - Feasibility / Accident /Project Report, Grammar: If Clause, Vocabulary: Idioms and their Meanings.

TOTAL: 45 PERIODS

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BoS/S&H

OUTCOMES:

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

- Speak fluently, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
- Read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for method of presentation.
- Make effective presentations using power point and participate successfully in Group Discussions.
- Write efficiently and persuasively and create different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.

Text Book:

1.Bhatnagar, Nitin and Bhatnagar, Mamta, "Communicative English for Engineering and Professionals", Pearson Education India, 2010.

References:

1. Raman, Meenakshi and Sharma, Sangeetha, "Technical Communication Principles and Practice", Oxford University Press: NewDelhi, 2014.
2. Andrea J, Rutherfoord. "Basic Communication Skills for Technology" Pearson Education, Inc., 2001.
3. Rizvi M, Ashraf. "Effective Technical Communication "Tata McGraw Hill Education Pvt.Ltd., NewDelhi,2005.
4. Perumal, Lakshmana.N and Sathiseelan S, "Technical English-II", Sri Krishna Hitech Publishing Company Pvt.Ltd,Chennai, 2014.

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24/6/24

20MA201	MATHEMATICS-II (COMMON TO ALL BRANCHES)	L T P C 3 1 0 4

OBJECTIVES:

The student should be made to:

- Make the student acquire sound knowledge of techniques in solving ordinary differential equations obtained from engineering problems
- Acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines
- Understand the Analytic Functions can be widely used for modelling the various laws of physics
- Familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- Make the student for appreciating the purpose of using transforms to create a new domain in which it is earlier to handle the problem that is being investigated

UNIT I ORDINARY DIFFERENTIAL EQUATIONS **12**

Higher order linear differential equations with constant coefficients $(e^{ax}V, x^nV)$ – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS **12**

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration: line integral – surface integral – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs)

UNIT III ANALYTIC FUNCTIONS **12**

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping $(w = z^2, z + k, 1/z, kz)$ and bilinear transformation.

UNIT IV COMPLEX INTEGRATION **12**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

UNIT V LAPLACE TRANSFORM **12**

Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Transform of periodic functions – Inverse transforms – Convolution theorem – Solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

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BoS (S&H)

OUTCOMES:

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

- Apply various methods of solving differential equation which arise in many application problems
- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals
- Examine analytic functions and its properties, conformal mapping and its applications
- Evaluate real and complex integrals using the Cauchy's integral formula and residue theorem
- Use knowledge of Laplace transform and its properties, inverse Laplace transform to solve linear differential equations

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Bali N P and Manish Goyal, "A Text Book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.

REFERENCES:

1. Dass H K and Er. Rajnish Verma, "Higher Engineering Mathematics", S Chand Private Ltd., 2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 3rd Edition, 2012.
3. Jain R K and Iyengar S R K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Veerarajan T, "Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

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BoS (S&H)

24/6/22

20PH202

MATERIALS SCIENCE
(COMMON TO CIVIL AND MECHANICAL)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Apply classical and quantum theories to explain properties of conductors and semiconductors
- Study the properties of dielectric materials and their applications
- Explain the magnetic and superconducting properties of materials
- Draw phase diagrams and apply them to different systems
- Describe the behaviour of new engineering materials

UNIT I ELECTRICAL PROPERTIES OF MATERIALS **9**

Classical free electron theory – Expression for electrical conductivity and Thermal conductivity expression of metals – Wiedemann-Franz law – Success and failures of CFT – Quantum free electron theory – Energy bands in solids – conductors-Insulators and semiconductors – Intrinsic semiconductors – Carrier concentration in intrinsic semiconductors – Extrinsic semiconductors – Carrier concentration in *n*–type & *p*–type semiconductors.

UNIT II DIELECTRIC MATERIALS **9**

Dielectric materials – Polarization – Electronic polarization – Ionic polarization – Orientation polarization – Space charge polarization – Langevin-Debye equation – Temperature and Frequency effects on polarization – Internal field – Clausius Mosotti relation – Dielectric breakdown – Dielectric loss – Ferroelectric materials – Uses of dielectric materials.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS **9**

Origin of Magnetic moment – Bohr Magneton – Classification of magnetic materials – Ferromagnetism – Domain theory – Hysteresis – Hard and Soft magnetic materials and its applications – Superconducting materials and their properties – Type-I and Type-II superconductors – BCS theory of superconductors – Applications of superconductors – High temperature superconductor (Qualitative).

UNIT IV PHASE DIAGRAMS **9**

Solid solutions – Hume Rothery's rules – the phase rule – One–component system of iron – Binary phase diagrams – Isomorphous systems – the tie–line rule – the lever rule – application to isomorphous system – Iron-Carbon equilibrium diagram – Phase transformations – T-T-T diagram – Pearlitic, Baintic and Martensitic transformations.

UNIT V NEW MATERIALS **9**

Ceramics-types and applications – Composites: Classification, role of matrix and reinforcement, processing of fiber reinforced plastics – Metallic glasses – Melt spinning process – Applications – Shape Memory Alloys: phases, Shape Memory Effect, Pseudoelastic effect – Applications – Synthesis of nanomaterials – Top down approaches (Ball Milling) and Bottom up approaches (CVD).

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H)

OUTCOMES:

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

- Explain the electrical properties of materials
- Describe the properties of dielectric materials and their applications
- Apply the knowledge on magnetic and superconducting properties to engineering applications
- Analyze various phase diagrams and their applications
- Gain knowledge on ceramics, composites and various engineering materials

TEXT BOOKS:

1. Rajendran V, "Materials Science", TMH, New Delhi, 2011.
2. Marikani A, "Engineering Physics", PHI Learning Pvt. Ltd. New Delhi, 2nd Edition, 2013.
3. Uapadhyaya G S and Anish Uapadhyaya, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 2006.

REFERENCES:

1. Balasubramanian R and Callister's, "Materials Science and Engineering", Wiley India Pvt. Ltd., 2014.
2. Raghavan V, "Materials Science and Engineering, A First Course", PHI Learning, 2015.
3. Wahab M A, "Solid State Physics", Narosa Publishing House, New Delhi, 2nd Edition, 2005.
4. Salivahanan S, Rajalakshmi A, Karthie S and Rajesh N P, "Physics for Electronics Engineering and Information Science ", McGraw Hill Education, 2018.

CHAIRMAN
BoS (S&H)

20/6/24

20BS201	ENVIRONMENTAL SCIENCE (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the interrelationship between living organism and environment
- Understand and tackle the impacts of pollution.
- Attain sustainable development by conserving natural resources.
- Find and implement scientific, technological, economic and political solutions to environmental problems
- Analyze the problems faced by the over population.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY **9**

Definition, scope and importance of environment – concept of an ecosystem – structure and function of an ecosystem – Ecological succession – food chain – food web – structure and function of the (a) forest ecosystem (b) desert ecosystem (c) aquatic ecosystem – (pond and ocean) – Biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Endangered, Extinct and Endemic species – conservation of biodiversity: In-situ and ex-situ methods.

UNIT II ENVIRONMENTAL POLLUTION **9**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Thermal pollution (f) Nuclear hazards- solid waste Management – role of an individual in prevention of pollution – disaster management: floods, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES **9**

Forest resources: deforestation – mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water – dams-benefits and problems – Mineral resources: environmental effects of extracting and using mineral resources – Food resources: World food problems – Effects of modern agriculture – fertilizer-pesticide problems, water logging, salinity – Energy resources: renewable and non-renewable energy sources (Solar, wind, Coal, Petrol, Nuclear) Land resource: land degradation, Soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **9**

Sustainable development – Water conservation – rain water harvesting – resettlement and rehabilitation of people; its problems and concerns – environmental ethics – global warming – acid rain , ozone layer depletion – wasteland reclamation – consumerism – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Role of NGO's in environmental protection.

CHAIRMAN
BoS (S&H)

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Acquire knowledge on public awareness & about the environment & ecosystem.
- Able to identify the impacts of pollution.
- Frame solutions to achieve sustainable development.
- Able to analyze about the social issues in the environment.
- Apply the acquired knowledge to tackle the problems of over population.

TEXT BOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.

REFERENCES:

1. Tyler Miller G and Scott Spoolman, "Introduction to Environmental Science", Cengage Learning India Pvt., Ltd., 2009.
2. Dharmendra S Sengar, "Environmental Law", Prentice hall of India Pvt Ltd, New Delhi, 2007.

CHAIRMAN
BoS (S&H)

24/6/24

20BE201 **ENGINEERING MECHANICS (COMMON TO CIVIL AND MECHANICAL)** **L T P C 3 1 0 4**

OBJECTIVES:

The students should be made to:

- Understand the basic concepts of forces and moments
- Gain knowledge to predict the forces involved in various rigid bodies
- Impart analytical skills to solve problems related to first and second moment of area
- Develop capacity to analyze the various frictional forces
- Analyze different types of motion in particles

UNIT I EQUILIBRIUM OF PARTICLES **12**

Introduction – Units and dimensions – Laws of mechanics –Lami's theorem, Parallelogram and triangular law of forces –Vectorial representation of forces and moments – Coplanar forces – Resolution and composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES **12**

Free body diagram – Types of supports and their reactions – Moments and couples – Moment of a force about a point and about an axis –Vectorial representation of moments and couples – Scalar components of a moment –Varignon's theorem – Equilibrium of rigid bodies in two dimensions.

UNIT III PROPERTIES OF SURFACES **12**

Centroid – First moment of area and second moments of plane area of sections – Rectangle, circle, triangle from integration – T section and I section – Parallel axis theorem and perpendicular axis theorem.

UNIT IV FRICTION **12**

Frictional force – Laws of coulomb friction – Simple contact friction – Rolling resistance – Belt friction and ladder friction.

UNIT V DYNAMICS OF PARTICLES **12**

Displacements, velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work energy equation of particles – Impulse and momentum – Translation and rotation of rigid Bodies – General plane motion of simple rigid bodies such as cylinder and sphere.

TOTAL: 60 PERIODS

CHAIRMAN
BoS(CIVIL)

OUTCOMES:

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

- Illustrate vector representation of forces and moments
- Evaluate rigid bodies in equilibrium
- Analyze various properties of surfaces
- Determine various frictional forces applying laws of friction
- Solve dynamic forces and its effects

TEXT BOOKS:

1. Hibbeller R C, "Engineering Mechanics and Dynamics", Vol 1 Statics, Vol 2 Dynamics, Pearson Education Asia Pvt. Ltd., 14th Edition, 2016.
2. Ferdinand P Beer, Russell Johnston E, DevaidMazurek, Phillip J Cornwell, Brain Self and SanjeevSanghi, "Vector Mechanics for Engineers Statics and Dynamics", McGrawHill International,12th Edition, 2019.

REFERENCE BOOKS:

1. Parthasarathi NS and Vela Murali, "Engineering Mechanics", Oxford University Press, 2016.
2. Palanichamy M S, Nagan S, "Engineering Mechanics - Statics and Dynamics", Tata McGraw Hill, 3rd Edition, 2006.
3. Irving H Shames and Krishna MohanaRao G, "Engineering Mechanics - Statics and Dynamics", Pearson Education, 4th Edition, 2006.
4. Meriam JL, Kraige L G and Bolton J N, "Engineering Mechanics: Statics",John Wiley and Sons, 9th Edition, 2018.
5. Meriam J L, Kraige L G and Bolton J N, "Engineering Mechanics: Dynamics", Vol. 2 John Wiley and Sons, 9th Edition, 2018.

CHAIRMAN
BoS(CIVIL)

20BE202

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (COMMON TO AGE AND CIVIL)

L T P C
3 0 0 3

OBJECTIVES:

The students should be made to:

- Explain the basic knowledge about laws used in electrical circuits
- Understand the modeling and operation of electrical machines
- Learn the principles and operation of measuring instruments and transducers
- Introduce the basic concepts of semiconductor devices
- Impart knowledge of various communication systems

UNIT I FUNDAMENTALS OF ELECTRICITY AND DC CIRCUITS 9

Introduction – Definition, symbol and unit of quantities – Ohm's law – Network terminology – Kirchhoff's law – Resistance in series and voltage division technique – Resistance in parallel and current division technique – Loop analysis – Nodal analysis – Star to delta and delta to star transformation.

UNIT II ELECTRICAL MACHINES 9

DC Machines: Principle, construction, EMF equation, types – Characteristics of DC motor.
AC Machines: Construction and working principle of transformer – Construction, working of three phase induction motor – Construction and types of single phase induction motors.

UNIT III ELECTRICAL MEASUREMENTS 9

Classification of instruments – Basic principle of indicating instruments – Moving iron instruments – Moving coil instruments – Energy meter – Watt meter – Classification of transducer, Capacitive and inductive transducer – LVDT – Hall effect – Piezoelectric transducer.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Introduction to semiconductors – PN junction diode, Zener diode and its characteristics – Half wave and full wave rectifiers. Bipolar Junction Transistor – CB, CE, CC configurations and characteristics. Power conditioning equipments: Linear mode power supply, SMPS and UPS. Display devices: LED and LCD.

UNIT V COMMUNICATION SYSTEMS 9

Introduction – Communication systems – Analog and digital signals. Basic principles of modulation: Amplitude Modulation, Frequency Modulation. Communication systems: Microwave Communication – Satellite Communication – Optical fibre communication – ISDN(Block diagram approach only).

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Understand the fundamentals of electric circuits
- Explain the basic operation and performance of electrical machines
- Illustrate the working of measuring equipment and transducers
- Develop an electronic circuits using semiconductor devices
- Analyze the various communication systems

TEXT BOOK:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical Electronics and Computer Science Engineering", 3rd reprint, The McGraw Hill, 2009.

REFERENCES:

1. Theraja B L, "Fundamentals of Electrical Engineering and Electronics". Chand & Co, 2008.
2. Sukhija M S and Nagsarkar T K, "Basic Electrical and Electronic Engineering", 3rd Edition, Oxford, 2017.
3. Mehta V K, "Principles of Electronics", 7th Edition, S.Chand & Company Ltd, 2014.

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24/6/21

20GE201L	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Access the areas of knowledge in application criteria's for plumbing, carpentry through practical manner
- Develop the engineering basis work in welding, machining and sheet metal works
- Make the specified skills in foundry, smithy and fitting operations
- Study the various basic domestic wiring circuits and measure the electrical parameters
- Impart the knowledge of basic electronic components and assemble simple electronic circuits in printed circuit boards

GROUP A (CIVIL AND MECHANICAL)

I. CIVIL ENGINEERING PRACTICE 5

1. Buildings
   (a) Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.
2. Plumbing Works
   (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
   (b) Study of pipe connections requirements for pumps and turbines.
   (c) Preparation of plumbing line sketches for water supply and sewage works.
   (d) Hands-on-exercise:
      (i) Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components.
      (ii) Demonstration of plumbing requirements of high-rise buildings.
3. Carpentry using Power Tools only
   (a) Study of the joints in roofs, doors, windows and furniture.
   (b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

II. MECHANICAL ENGINEERING PRACTICE 10

1. Welding:
   (a) Arc Welding
      (i) Butt joints.
      (ii) Lap joints.
      (iii) T-joints.
   (b) Gas welding practice.
2. Basic Machining
   (a) Simple Turning, Facing.
   (b) Drilling Practice.
3. Sheet Metal Work
   (a) Model making-Cylinder, Funnel and Tray.
   (b) Different type of joints.

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4. Machine assembly practice:
   (a) Study of Centrifugal pump
   (b) Study of Air conditioner
5. Demonstration on:
   (a) Smithy operations, upsetting, swaging, setting down and bending.
   Example: Exercise – Production of hexagonal headed bolt.
   (b) Foundry operations like mould preparation for gear and step cone pulley.
   (c) Fitting – Exercises – Preparation of square fitting and V-fitting models.

GROUP B (ELECTRICAL AND ELECTRONICS)

III. ELECTRICAL ENGINEERING PRACTICE **10**

1. a) Residential house wiring using switches, fuse, indicator, lamp and Energy meter.
   b) Study of different type of electrical wiring joints systems.
   c) Stair case wiring.
2. Industrial wiring using switches, fuse, indicator and Energy meter.
3. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Measurement of earth resistance using Megger.
6. Assembling of ceiling fan.

IV. ELECTRONICS ENGINEERING PRACTICE **5**

1. Study of Electronic components and equipments – Resistor colour coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, NOT, NAND and NOR.
3. Soldering practice - Components Devices and Circuits - Using general purpose PCB.
4. Design of HWR and FWR.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Apply the tasks of work in plumbing and carpentry in application areas regard to pipeline joints, household fittings, water supply and sewage works, joints in roofs, doors, windows and furniture
- Analyze the engineering knowledge through welding, sheet metal forming, bending and basic machining operations
- Understand the assembly works on study of pump, Air conditioner and demonstration works on Smithy, foundry and fitting operation
- Understand the basic domestic wiring circuits and measure the various electrical parameters
- Analyse the basic concept of digital circuits and assemble electronic circuits

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20CE201L BUILDING DRAFTING AND MODELING LABORATORY (FOR CIVIL BRANCH ONLY) **L T P C 0 0 2 1**

OBJECTIVES:

The students should be made to:

- Understand software knowledge required for drafting and modeling of various buildings
- Explain drafting plan, elevation and sectional views of buildings
- Analyze drafting of roofed structures and load bearing wall structures
- Evaluate plan, elevation and sectional views of industrial buildings
- Create various joinery details of residential buildings using AutoCAD commands

LIST OF THE EXPERIMENTS

1. Symbols and sign conventions related to buildings and architecture - Structure types - Components of a typical residential building - Developing plan, section and elevation of buildings.
2. Principles of planning, orientation and complete joinery details (Paneled and Glazed doors and windows) buildings with sloping roof.
3. R.C.C. framed structures.
4. Industrial buildings - North light roof structures.
5. Single storied residential building.
6. Buildings with load bearing walls.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Develop 2D and 3D views of buildings
- Model different views of components of residential buildings
- Assess various roof structures using suitable commands
- Construct all views of industrial buildings
- Analyze plan, section and elevation of buildings with sloped roof structures

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24/6/24

20EEC201L	SOFT SKILLS (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Develop in learners a deep sense of self- esteem
- Enhance learners' self-motivation
- Impart leadership skills
- Help learners enhance critical, creative and analytical skills
- Felicitate learners acquire problem solving skills

UNIT I IDENTITY CONSTRUCTION **6**

Identity formation – Theories of moral Development(Kohlberg) – Cultural heritage – Physical appearance – Problem of Identity Correspondence –Self acceptance– Knowing oneself – Self-confidence –Positive thinking – Self-development – Perception, attitude and Behavioural change, Personality development – Self-esteem.

UNIT II MOTIVATION AND MORALE **6**

Definition – types (Intrinsic and Extrinsic) – Theories (Maslow's hierarchical needs) – Factors that affect motivation – Motivational strategies – Motivational plan – Interruption and Distractions – Motivation in the Business World.

UNIT III PROFESSIONAL THEORIES **6**

Communication – Functions of leadership – Work pressure handling – Creative and critical thinking – Career planning and management – Emotional intelligence – Time management – Negotiation – Conflict management

UNIT IV APPLICATION SKILLS **6**

Visionary thinking – formulating strategies – shaping strategies – building organizations relationships – change management – Project Management Skills – Independent working skills - Writing skills – Public Speaking –Analytical skills – Neo Research and Development.

UNIT V PROBLEM SOLVING SKILLS **6**

Problem solving approaches and its components – Teamwork – Innovative and creative thinking– Tools and Techniques – Application of SMART analysis – Adaptability and flexibility– Decision making.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Know the detail information of individuals
- Increase the self-confidence and develop the moral identity
- Accumulate the learner's career building skills
- Improve professional and life skills
- Engage the imagination to explore new possibilities, Formulate and articulate ideas.

REFERENCES:

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Thomas A Harris, "I am Ok, You Are Ok", Harper and Row,New York, 1972.
3. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.

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Civil

20MA302 **TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

(Common to AG, BME, CIVIL, ECE, EEE & MECH) **L T P C**

3 1 0 4

OBJECTIVES:

The student should be made to,

- Introduce the basic concepts of PDE for solving standard partial differential equations.
- Introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- Acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- Acquaint the student with Fourier transform techniques used in wide variety of situations.
- Introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **12**

Formation of partial differential equations –Singular integrals -Solutions of standard types of first order partial differential equations -Lagrange's linear equation -Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES **12**

Dirichlet's conditions –General Fourier series –Odd and even functions –Half range sine series –Half range cosine series –Complex form of Fourier series –Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12**

Classification of PDE –Method of separation of variables -Fourier Series Solutions of one dimensional wave equation –One dimensional equation of heat conduction –Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS **12**

Statement of Fourier integral theorem –Fourier transform pair –Fourier sine and cosine transforms –Properties –Transforms of simple functions –Convolution theorem –Parseval's identity.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS **12**

Z-transforms -Elementary properties –Inverse Z-transform (using partial fraction and residues) –Initial and final value theorems -Convolution theorem -Formation of difference equations–Solution of difference equations using Z-transform.

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the student will be able to,

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

Text Books:

1. Grewal B.S.,"Higher Engineering Mathematics",Khanna Publishers, New Delhi, 43rd edition, 2014.
2. Narayanan S.,Manicavachagom Pillay,T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", S.Viswanathan Publishers Pvt. Ltd, Chennai, Vol. II & III. 1998.

References:

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt. Ltd, 9th edition, 2014.
2. Erwin Kreyszig, "Advanced Engineering Mathematics ",John Wiley, India, 10th edition, 2016.
3. James. G., "Advanced Modern Engineering Mathematics", Pearson Education, 3rd edition, 2007.
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 11th edition, 2015.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, New Delhi, 6th edition, 2012.

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20CE301	STRENGTH OF MATERIALS-I	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand state of stresses and strains in structural components as aresult of different loading conditions
- Provide knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type and its loadings
- Determine the concepts of internal stress in beams of various cross sections
- Analyze elements under complex state of stress by means of analytical and graphical methods
- Develop knowledge on behavior of members subjected to pure torsion and shear

UNIT I TENSION, COMPRESSION AND SHEAR **9**

Introduction – Normal stress and strain – Hooke's law – Poisson's ratio – Shear stress and strain – Deformation of axially loaded member– Elastic constants– Thermal stresses and composite bars.

UNIT II SHEAR FORCE AND BENDING MOMENT **9**

Introduction –Types of beams, loads and reactions – Shear force and bending moment for statically determinate beams –Relationships between load, shear force and bending moment – Shear force and bending moment diagrams.

UNIT III STRESSES IN BEAMS **9**

Introduction – Pure bending and non-uniform bending – Longitudinal strains in beams – Normal stresses in beams – Stress distribution due to bending moment – Shear stresses in beams of rectangular, circular, T and I section.

UNIT IV PRINCIPAL STRESS AND STRAIN **9**

Principal stresses and principal planes – Maximum shear stress –Plane strain – State of stress in two dimensions – Stresses on inclined planes –Maximum shear stress – Mohr's circle method.

UNIT V TORSION OF SHAFTS AND SPRING **9**

Theory of torsion –Stresses and deformations in solid and hollow circular shafts –Combined bending moment and torsion of shafts – Power transmitted to shaft – Shaft in series and parallel – Closed and open coiled helical springs – Springs in series and parallel.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Realize the state of stresses and strains in structural components under tension,compression and shear
- Plot the shear force and bending moment diagrams for all statically determinatebeams
- Analyze the internal stresses induced in beams
- Evaluate the elements subjected to complex state of stress by means of analytical andgraphical methods
- Comprehend the behavior of members under pure torsion and shear

TEXT BOOKS:

1. Rajput R K, "Strength of Materials", S Chand and Co, New Delhi, 2018.
2. Bansal RK, "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi,2019.

REFERENCE BOOKS:

1. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "SMTS - I Strength of Materials",LaxmiPublications, New Delhi,2015.
2. Singh DK, "Strength of Materials", Ane Books Pvt. Ltd., New Delhi. 2016..

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24/6/21

20CE302 **MECHANICS OF FLUIDS** **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the basic properties and characteristics of fluids
- Develop knowledge on fluid kinematics and fluid dynamics
- Determine the complexities involved in solving the fluid flow problems
- Illustrate the basic concepts of flow through pipes
- Analyze the boundary layer problems

UNIT I FLUID PROPERTIES AND STATICS **9**

Fluid – Definition, fluid statics concept of fluid static pressure, absolute and gauge pressures – Properties of fluids – Density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension – Pressure measurements by manometers–Forces on planes – Centre of pressure –Hydrostatic forces on submerged bodies, buoyancy, flotation and stability.

UNIT II FLUID KINEMATICS AND DYNAMICS **9**

Fluid Kinematics – Classification and types of flow – Velocity field and acceleration –Continuity equation, derivation and applications to one dimensional flow (one and three dimensional differential forms)– Velocity potential function – Flow net – Fluid dynamics – Equations of motion derivation of Euler's equation and Bernoulli's energy equation, examples illustrating the use of energy equations –Venturi meter, orifice meter and pitot tube– Linear momentum equation and its application to pipe bend– Differential momentum equation, impact of jets–Force on fixed and moving vanes, flat and curved.

UNIT III FLOW THROUGH PIPES **9**

Reynold's experiment – Laminar flow through circular pipe (Hagen poiseulle's)– Laminar flow between parallel plates –Hydraulic and energy gradient –Flow through pipes – Darcy – Weisbach's equation – Pipe roughness –Friction factor– Moody's diagram– Major and minor losses of flow in pipes – Pipes in series and in parallel.

UNIT IV DIMENSIONAL ANALYSIS AND MODEL STUDIES **9**

Fundamental dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi-theorem– Reynolds, froude and mach number and their applications in model testing– dimensionless parameters –Similitudes and model studies – Distorted models.

UNIT V BOUNDARY LAYER **9**

Boundary layer –Definition–Boundary layer on a flat plate –Laminar and turbulent boundary layer displacement, energy and momentum thickness – Momentum integral equation–Boundary layer separation and control – Drag on flat plate.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Develop basic knowledge of fluids in statics, kinematics and dynamic equilibrium conditions
- Understand and solve problems related to equations of motion
- Illustrate various types and losses of flow in pipes
- Analyze dimensional and model analysis
- Evaluate and solve the boundary layer problems

TEXT BOOKS:

1. Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2019.

REFERENCES:

1. Munson B R, Young D F and Oklishi T H, "Fundamentals of Fluid Mechanics", JohnWiley and Sons., Singapore, 2006.
2. Subramanya K, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
3. JainA K, "Fluid Mechanics Including Hydraulic Machines", Khanna Publishers, 12th Edition, 2016.
4. Rajput R K, "Fluid Mechanics", S Chand and Co, New Delhi, 2000.

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Ahr

20CE303 **SURVEYING**
(COMMON TO CIVIL AND AGE)

L	T	P	C
3	0	0	3

OBJECTIVES:

The students should be made to:

- Evaluate linear and angular measurements using chain and compass.
- Understand the applications of theodolite survey in angular measurements.
- Gain knowledge on various concepts of control surveying and its adjustments.
- Demonstrate the basic concepts of astronomical surveying.
- Develop skills to operate different types of advanced surveying techniques by learning its working principles.

UNIT I INTRODUCTION OF SURVEYING 9

Definition - Principles - Classification - Scales - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Prismatic compass - Bearing - Systems and conversions - Local attraction - True and magnetic meridians - Magnetic declination - Dip - Traversing - Level line - Horizontal line - Spirit level - Temporary and permanent adjustments - Fly and check leveling.

UNIT II THEODOLITE AND TACHEOMETRIC SURVEYING 9

Theodolite - Description and uses - Temporary and permanent adjustments - Horizontal - Vertical angles - Heights and distances - Traversing - Closing error and distribution - Gale's table - Tacheometry - Principle - Systems - Tangential - Stadia methods - Horizontal and inclined sights - Staff - Vertical and normal - Fixed and movable hairs - Stadia constants - Analytic lens - Contour.

UNIT III CONTROL SURVEYING AND ADJUSTMENTS 9

Triangulation - Classification - Signals and towers - Baseline measurement - Instruments and accessories - Tape corrections - Extension of baseline - Satellite stations - Reduction to centre - Trigonometrical leveling - Classification - True and most probable values - Laws of weights - Weighted observations - Principle of least squares - Normal equation and method of correlates.

UNIT IV ASTRONOMICAL SURVEYING 9

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Spherical trigonometry - Latitude and longitude of a place - Field observations and calculations for azimuth - Nautical almanac.

UNIT V ADVANCED SURVEYING TECHNIQUES 9

Total Station - Advantages - Fundamental quantities measured - Parts and accessories - Working principle - On board calculations - Field procedure - Errors and good practices in using total station GPS surveying - Different segments - Space, control and user segments - Orbit determination and representation - Anti spoofing and selective availability - Hand held and geodetic receivers - Data processing - Remote sensing application.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Demonstrate various surveying instruments to calculate linear and angular measurements.
- Measure horizontal angles and vertical angles using theodolite and tacheometric instruments.
- Understand different methods of levelling.
- Evaluate astronomical surveying and methods to determine time, longitude, latitude and azimuth.
- Develop knowledge on concepts and principles of modern surveying.

TEXT BOOKS:

1. Punmia B C, Ashok K Jain and Arun K Jain, "Surveying Vol. I & II", Lakshmi Publications Pvt. Ltd., 16th Edition, New Delhi, 2011.
2. Kanetkar T P and Kulkarni S V, "Surveying and Levelling", Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.

REFERENCE BOOKS:

1. Arora K R., "Surveying Vol I & II", Standard Book house, 17th Edition, 2019.
2. Satheesh Gopi, Sathishkumar R and Madhu N, "Advanced Surveying, Total Station GPS and Remote sensing", Pearson Education, 2007.

V. Gopi

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24/6/22

20CE304	CONSTRUCTION MATERIALS	L	T	P	C
		3	0	2	4

OBJECTIVES:

The students should be made to:

- Provide knowledge on properties of stones, bricks, aggregates and other construction materials through theory classes and laboratory experiments
- Understand the properties of lime, cement and ceramic materials used in construction
- Explain various types of commercially available damp proofing and waterproofing materials
- Develop knowledge on different forms of timber and roofing materials
- Evaluate properties of fresh and hardened concrete

UNIT I STONES, BRICKSAND AGGREGATES 9

Stones – Classification – Quarrying and dressing – Selection – Composition and mineral constituents – Common building stones and their uses – Characteristics of good stone – Physical tests – Deterioration and preservation of stones – Stone veneering – Artificial stones – Brick earth – Composition and harmful constituents – Bricks –Manufacturing process, classification, types, dimensions, sampling and testing as per IS Codal provisions – Qualities of good brick – Brick substitutes– Aggregates – Properties and test.

UNIT II LIME, CEMENT AND CERAMIC MATERIALS 9

Lime – Manufacturing process, cementing action, classification as per IS 712 -1973, tests and comparison with cement– Cement properties – Manufacturing process of cement – Ceramic materials – Components, raw materials, classification and ceramic coating – Floor tiles – Selection and applications – Ceramic sanitary appliances – Roof tiles – Acid resistant materials– Mineral binders – Air setting and binding materials – Hydraulic binding materials.

UNIT III DAMP PROOFING AND WATER PROOFING MATERIALS 9

Definition – Damp proof course – System of water proofing – Paints, varnishes, distempers and adhesives –Sealants –Joint materials and asphalts – Organic binders – Bitumen, tars, emulsions and mastics – Polymers and plastics – Polymer based building materials for walls, pipes and sanitary ware – Glues and mastics.

UNIT IV TIMBER AND ROOFING MATERIALS 9

Timber – Market forms, industrial products, moisture content as per IS 287-1993, popular species used in building construction, physical properties, seasoning of wood and preservative treatment – Plywood – Pressed wood – Particle board – Hard board –Fibre board – Lamina board – Bamboo and its products – Roofing materials – Asbestos sheets and GI sheets – Tubes and light weight roofing materials – Assembling and fixing methods.

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UNIT V CONCRETE **9**

Ingredients – Manufacturing process – Ready mix concrete – Principle of concrete mix design – IS method – Fresh concrete – Workability – Hardened concrete – Strength – Segregation and bleeding – Chemical and mineral admixtures – Special concrete – Ferro cement.

THEORY: 45 PERIODS

CONSTRUCTION MATERIALS LABORATORY

I. TEST ON CEMENT

1. Consistency of cement.
2. Initial and final setting time of cement.
3. Fineness of cement.

II. TEST ON FINE AGGREGATES

1. Grading of fine aggregates.
2. Test for specific gravity.
3. Compacted and loose bulk density of fine aggregates.

III. TEST ON COARSE AGGREGATE

1. Determination of impact value of coarse aggregates.
2. Determination of elongation index.
3. Determination of flakiness index.
4. Determination of aggregate crushing value of coarse aggregates.

IV. TEST ON CONCRETE

1. Test for slump.
2. Test for compaction factor.
3. Test for compressive strength
4. Test for split tensile strength.
5. Test for flexural strength.

V. TEST ON BRICKS AND BLOCKS

1. Test for compressive strength of bricks and blocks.
2. Test for water absorption of bricks and blocks.
3. Determination of efflorescence of bricks.

PRACTICALS: 30 PERIODS

TOTAL: 75 PERIODS

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24/6/21

OUTCOMES:

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

- Analyze different types of stones, bricks, aggregates and other construction materials for various construction works with the exposure of both theory and practical knowledge.
- Understand various lime, cement and ceramic materials with their specifications
- Acquire sufficient knowledge to use damp proofing and water proofing materials
- Determine suitable timber and roofing materials for structural and non-structural applications
- Gain knowledge about concrete and its properties

TEXT BOOKS:

1. Varghese PC, "Building Materials", PHI Learning Pvt. Ltd., New Delhi, 2015.
2. Rajput R K, "Engineering Materials", S Chand and Company Ltd., 2008.

REFERENCES(THEORY):

1. Jagadish K S, "Alternative Building Materials Technology", New Age International,2017.
2. Gambhir ML and Neha Jamwal, "Building Materials, Products, Properties and Systems", Tata McGraw Hill Educations Pvt. Ltd., New Delhi,2014.
3. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.

REFERENCES(PRACTICALS):

1. "Construction Materials Laboratory Manual", Anna University, Chennai-600 025.
2. IS 4031 (Part 1), "Indian Standard Method for Determination of Fineness by Dry Sieving", 1996.
3. IS 2386 (Part 1 to Part 6), "Indian Standard Methods for Test for Aggregate for Concrete", 1963.
4. IS 383, "Indian Standard Specification for Coarse and Fine Aggregates from Natural Sources for Concrete", 1970.

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BoS(CIVIL)

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20CE305 **ENGINEERING GEOLOGY** L T P C
3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the importance of geology and relate the structure and dynamic properties of earth caused by earthquakes, ground water exploration and sea water intrusion
- Provide knowledge on various properties of minerals with their engineering significance
- Classify various types of rocks with its properties
- Demonstrate the geodynamics and rock mechanics in structures
- Elaborate geological site investigation for dams, tunnels etc., through aerial and geophysical survey

UNIT I INTRODUCTION TO GEOMORPHOLOGY AND HYDROGEOLOGY 9

Geology in civil engineering – Branches of geology – Earth structures and composition – Continental drift and plate technologies –Weathering – Types– Landforms of rivers, wind and sea. hydrological cycle – Properties of water bearing geological formation – Aquifers and their types – Ground water exploration – Sea water intrusion and remedial measures importance in civil engineering.

UNIT II MINERALOGY 9

Crystallographic systems –Physical properties of minerals – Rock forming minerals – Quartz and feldspar family, augite, hornblende, biotite, muscovite, calcite, garnet – Properties, behavior and engineering significance of clay minerals – Coal and petroleum – Origin and occurrence in India.

UNIT III PETROLOGY 9

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Description, occurrence, engineering properties – Igneous rocks –Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt – Sedimentary rocks – Sandstone, limestone, shale, conglomerate and breccias– Metamorphic rocks –Quartizite, marble, slate, phyllite, gniess and schist.

UNIT IV GEODYNAMICS AND ROCK MECHANICS 9

Forces caused for uncertainty of structures – Earthquake – Types - Earthquake belts in India – Volcano –Types – Landslides, causes, effects and remedial measures – Stress, strain and deformational effects on different rocks – Attitude of beds – Outcrops – Study of structures – Fold, fault and joint – Influence in civil engineering – Seismic and electrical methods for civil engineering investigations.

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UNIT V GEOLOGICAL INVESTIGATIONS FOR CIVIL ENGINEERING STRUCTURES **9**

Site selection for civil engineering projects – Study of topo sheets and geological maps –Litho logical and structural features studies for construction of dams, reservoirs, tunnels, bridges and highways through seismic and electrical methods of geophysical investigations.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain earth structure with its composition and various properties of water bearing geological formation
- Demonstrate various crystallographic systems and physical properties of various minerals
- Identify different types of rocks with its various engineering properties
- Analyze the forces caused due to uncertainty of structures
- Interpret air photos and satellite imageries using sub surface geological survey

TEXT BOOKS:

1. Parbin Singh, "Engineering and General Geology", Katson Publication House, New Delhi, 2010.

REFERENCE BOOKS:

1. Venkat Reddy D, "Engineering Geology", Vikas Publishing House Pvt. Ltd, 2010.
2. Varghese P C, "Engineering Geology for Civil Engineering", Prentice Hall of India Learning Private Limited, New Delhi, 2012.
3. Mukerjee P K, "Text Book of Geology", World Press Pvt. Ltd., Kolkatta, 2001.

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24/6/24

20MC003 **CONSTITUTION OF INDIA**

L	T	P	C
2	0	0	0

OBJECTIVES:

The student should be made to:

- To teach history and philosophy of Indian constitution.
- To summarize powers and functions of Indian government.
- To explain structure and functions of local administration.
- To demonstrate the organization and working of the Judiciary.
- To discuss financial power and emergency provisions.

UNIT I INTRODUCTION **6**

Historical background – Government of India act – Indian councils act – Making of the constitution -Philosophy of the Indian constitution – Preamble.

UNIT II GOVERNMENT OF THE UNION **6**

Powers and Functions of President and Prime Minister - Council of Ministers – President in relation to his council - Legislature structure and functions of Loksabha and Rajyasabha – Speaker.

UNIT III GOVERNMENTS OF THE STATES AND LOCAL GOVERNMENT **6**

The state executive: General structure – Governor – Council of ministers – State legislature. Local government - Panchayat –Municipality– Powers, Authority and Responsibilities of municipalities.

UNIT IV THE JUDICATURE **6**

Organization and Composition of Judiciary – Constitution – Appointment - Qualifications - Powers and functions of the supreme court– High courts – Control over subordinate courts.

UNIT V THE FEDERAL SYSTEM **6**

Distribution of financial powers: Need, principles-Underlaying distribution of tax revenues- Distribution of legislative power – Interstate relation - Emergency provisions.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Understand history and philosophy of Indian constitution
- Realize powers and functions of Indian government
- Acquire awareness on structure and functions of local administration
- Enhance knowledge about organization and composition of judiciary
- Explore the distribution of financial powers and emergency provisions

TEXT BOOKS:

1. Basu D.D,"Introduction to Indian Constitution",Prentice Hall of India,New Delhi,2015.
2. Gupta D.C,"Indian Government and Politics",Vikas Publishing House,New Delhi, 2010.

REFERENCES:

1. Pylee M.V,"Introduction to the Constitution of India",Vikas Publishing House,NewDelhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.
3. The Constitution of India, 1950 (Bare Act), Government Publication.
4. Jain M P, Indian Constitution Law, Seventh Edition, Lexis Nexis, 2014.
5. Busi S N, Ambedkar B R framing of Indian Constitution, First Edition, 2015.

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AGE

20CE306L **SURVEYING LABORATORY (COMMON TO CIVIL AND AGE)**

L	T	P	C
0	0	2	1

OBJECTIVES:

The students should be made to:

- Impart knowledge on measuring area and offset by using chain surveying
- Evaluate concepts of bearing and area measurements using different compass
- Develop training on different methods of plane table surveying
- Acquire knowledge to calculate reduced levels using different methods of levelling
- Determine the elevation between two inaccessible points using total station

LIST OF EXPERIMENTS

1. Study of chains and its accessories, aligning, ranging, chaining and marking perpendicular offset.
2. Setting out works – Foundation marking using tapes single room and double room.
3. Compass traversing – Measuring bearings and arriving included angles.
4. Fly levelling using dumpy level and tilting level.
5. Check levelling.
6. Measurements of horizontal angles by reiteration and repetition and vertical angles.
7. Determination of elevation of an object using single plane method when base is accessible /inaccessible.
8. Determination of tacheometric Constants.
9. Location of points by resection method – Three point problem.
10. Plotting of contours.
11. Traverse using total station and area of traverse.
12. Determination of distance and difference in elevation between two inaccessible points using total station.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Demonstrate conventional surveying instruments such as chain/tape, compass, plane table and theodolite
- Evaluate levelling using various instruments and to plot contour
- Measure horizontal and vertical angles by reiteration and repetition method
- Determine tacheometric constants
- Calculate the distance and elevation between two accessible and inaccessible points

REFERENCES:

1. Punmia BC, Ashok K Jain and Arun K Jain, "Surveying" Vol. I and II, Lakshmi Publications, Pvt Ltd, New Delhi, 2005.
2. Venkatramaiah, "Text Book of Surveying", University Press, New Delhi, 2014.

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V. Gopi

20/6/21

20EEC301L	SOFT SKILLS DEVELOPMENT (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The Student should be made to:

- Enhance the development of students by focusing on soft skills
- Develop skills of the students through individualand group activities
- Shape students attitude and behavior through activities
- Analyze the characteristics of the students for self-development
- Prepare themselves for the recruitment processes

UNIT ISOFT SKILLS ARE IMPORTANT FOR SUCCESS **6**

Importance of Soft Skills – Types – Industrial needs – Development of skills – Employees Expectation – Success of Employees.

UNIT II CORPORATE COMMUNICATION **6**

Needs and Development of Communication – Customers Relationship – Improving Informal Communication – Formation of Presentations – Public Speaking – Telephone and Email Etiquettes.

UNIT III DISCUSSIONS **6**

Introduction to Discussion – Importance and types of Discussion – Spontaneous conversation – Plan for Discussions – Panel Discussions – Visual Aid Discussions – Debate.

UNIT IV SELF ANALYSIS **6**

Who am I –Identifying or searching one's own Strength, Weakness –, opportunities and threats (SWOT Analysis) – Benefits of SWOT Analysis – Importance of Self Confidence, Self Esteem, Self Development and Self Introspection.

UNIT V CREATIVITY AND GOAL SETTING **6**

Thinking out of the box – Lateral Thinking – Positive Thinking – Results of Smart Work – Application of Creativities – Short Term and Long term Goals – Life Time Goals.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Learners will recognize the importance of Soft skills in Professional life
- Improve oral and Listening Skills
- Enhance students' ability in GDs, Presentations and interviews
- Develop one's strength in setting of goals and developing creative
- Become a good team worker in the society

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES :

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Carnegie Dale, "How to Win Friends and Influence People", New York: Simon and Schuster, 1998.
3. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 2011.

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24/5/24

20MA401	NUMERICAL METHODS (COMMON TO CIVIL, EEE AND MECH)	L T P C 3 1 0 4

OBJECTIVES:

The student should be made to:

- Introduce the basic concepts of solving algebraic and transcendental equations
- Introduce the numerical techniques of interpolation in various intervals in real life situations
- Understanding the numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines
- Acquaint the knowledge of various techniques and methods of solving ordinary differential equations
- Understand the knowledge of various techniques and methods of solving various types of partial differential equations

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Matrix Inversion by Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single Step methods – Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's and Adams-Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

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OUTCOMES:

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

- Understand the basic concepts and techniques of solving algebraic and transcendental equations
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations
- Apply the numerical techniques of differentiation and integration for engineering problems
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications

TEXTBOOKS:

1. Grewal B S and Grewal J S, "Numerical Methods in Engineering and Science", Khann Publishers, 9th Edition, New Delhi, 2007.
2. Gerald C F and Wheatley P O, "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.

REFERENCES:

1. Chapra S C and Canale R P, "Numerical Methods for Engineers", Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
3. Sankara Rao K, "Numerical Methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

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BoS (S&H)

24/6/24

20CE401 **STRENGTH OF MATERIALS-II** **L T P C**
3 0 0 3

OBJECTIVES:
The students should be made to:

- Analyze plane and space trusses using different methods
- Illustrate thin and thick cylinders subjected to fluidpressure and various failure theories
- Evaluatebehavior of short and long columns under axial and eccentric loads
- Calculatedeflection in beams using different methods
- Determine bending stresses and shear centre in symmetrical and unsymmetrical sections

UNIT I ANALYSIS OF TRUSSES **9**

Perfect, deficient and redundant trusses – Degree of redundancy – Internal and external redundancy –Methods of analysis – Method of joints – Method of section– Method of tension coefficient– Analysis of space truss.

UNIT II THIN AND THICK CYLINDERS AND THEORIES OF ELASTIC FAILURE **9**

Thin cylinders – Circumferential stress – Longitudinal stress – Volumetric strain – Stresses in thick cylindrical shell – Stresses in compound cylinders – Failure theories – Maximum principal stress theory– Maximum shear stress theory– Maximum principal strain theory – Strain energy theory– Maximum shear strain energy theory.

UNIT III COLUMNS AND STRUTS **9**

Short and slender columns– Axial and bending stress – Buckling and stability – Columns with pinned ends columns with other support conditions – Columns with eccentric loads – Euler's theory and Rankine's formula.

UNIT IV DEFLECTION OF BEAMS **9**

Deflection of trusses–Deflection of beams – Double integration method – Macaulay's method – moment–Area method – Conjugate beam method for determinate beams.

UNIT V UNSYMMETRICAL BENDING **9**

Unsymmetrical bending– Symmetrical and unsymmetrical sections – Bending stresses in beams – Shear centre – Shear centre for thin walled beam of mono– Symmetric and unsymmetrical open sections.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Calculate member forces acting on plane and space trusses by using different methods
- Analyze the problems related to thin and thick cylinders subjected to fluid pressure
- Understand the behavior of short and long columnsunder axial and eccentric loads with different support conditions
- Determine slope and deflection in determinate beams using various methods
- Acquire knowledge on stresses acting on unsymmetrical bending sections

TEXT BOOKS:

1. Rajput R K, "Strength of Materials (Mechanics of Solids)", SChand and company Ltd., New Delhi, 2018.
2. Bansal RK, "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi,2019.

REFERENCE BOOKS:

1. Singh D K, "Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016.
2. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", SMTS, Vol.II, Laxmi Publishing Pvt. Ltd., New Delhi, 2017.

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24/6/24

20CE402 **APPLIED HYDRAULIC ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the different properties of fluids on uniform flow in open channels
- Realize the concepts of gradually varied flow and its computational methods
- Acquire knowledge on applications of rapidly varying flow and hydraulic jump with surges
- Distinguish the importance of turbines and jets classified based on characteristics
- Explore and demonstrate the classification of pumps with its work efficiency

UNIT I UNIFORM FLOW **9**

Definition and differences between pipe flow and open channel flow – Types of flow – Properties of open channel – Velocity distribution in open channel – Steady uniform flow (Chezy's equation, Manning equation) – Best hydraulic sections for uniform flow – Wide open channel – Specific energy and specific force – Critical flow.

UNIT II GRADUALLY VARIED FLOW **9**

Dynamic equations of gradually varied flows – Types of flow profiles – Classifications – Computation by direct step method –Standard step method – Control section.

UNIT III RAPIDLY VARIED FLOW **9**

Application of the momentum equation for RVF – Hydraulic jumps – Types – Energy dissipation – Rapidly varied unsteady flows (positive and negative surges).

UNIT IV TURBINES **9**

Impact of jet on flat curved plates, stationary and moving – Classification of turbines –Pelton wheel – Modern Francis turbine – Kaplan turbine – Specific speed – Characteristic curves of turbines – Draft tube and cavitations.

UNIT V PUMPS **9**

Classification of pumps – Centrifugal pumps – Work done – Minimum speed to start the pump – NPSH – Multistage pumps –Characteristics curve – Reciprocating pumps – Negative slip – Indicator diagrams and its variations – Air vessels –Submersible pumps–Deep well pumps.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Apply their knowledge of fluid mechanics in addressing problems in open channels
- Solve dynamic equations of gradually varied flows
- Analyze problems in rapidly varied flows in steady and unsteady state conditions
- Understand the basic concepts and working methodology of turbines and elucidate problems
- Determine work done and efficiency of different pumps

TEXT BOOKS:

1. Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2019.
2. Subramanya K, "Flow in Open Channels", Tata McGraw Hill, New Delhi, 2019.

REFERENCES:

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry M, "Open Channel Flow", Springer, 2nd Edition, 2007.
3. Jain AK, "Fluid Mechanics (Including Hydraulic Machines)", Khanna Publishers, 12th Edition, 2016.

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24/6/22

20CE403	CONSTRUCTION TECHNIQUES, EQUIPMENTS AND PRACTICE	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand various practices involved in the construction field
- Apply the appropriate techniques used for sub –structure constructions
- Analyze various innovative technologies involved in super structure constructions
- Develop awareness among the learners about industrial structures and their utilities
- Study the characteristics and suitability of equipments employed in different works

UNIT I CONSTRUCTION PRACTICES **9**

Site selection and site plan – Foundations and basements – Masonry – Bonds – Brick masonry – Stone masonry – Concrete hollow block masonry – Precast paver blocks – Flooring – Construction joints – Movement and expansion joints – Contraction joints – Form works – Centering and shuttering – Slip forms – Scaffoldings, shoring and underpinning – Fabrication and erection of trusses – Acoustics – Sound insulation – Fire protection.

UNIT II SUB STRUCTURE CONSTRUCTION **9**

Box jacking – Pipe jacking – Arch jacking – Tunneling techniques – Underground and underwater diaphragm walls – Piling techniques – Coffer dams – Well foundation and caisson – Sinking operations – Cable anchoring and grouting – Sheet piling – Shoring for deep cutting – Dewatering techniques and pumping equipment.

UNIT III SUPER STRUCTURE CONSTRUCTION **9**

Launching girders – Bridge decks – Off shore platforms –Special forms of shells and domes – Techniques for heavy decks – In –situ pre –stressing in high rise structures – Material handling and erecting light weight components on tall structures – Articulated structures – Braced domes – Space decks.

UNIT IV INDUSTRIAL STRUCTURES **9**

Chimneys – Cooling towers – Silos – Bunkers – High tension transmission and telecommunication towers – Support structures for heavy equipment and conveyors – Escalators – Vertical conveyors.

UNIT V CONSTRUCTION EQUIPMENT **9**

Earth work – Selection of equipment for earth work – Earth moving operations – Types of earthwork equipment – Tractors, motor graders, scrapers, front end waders and earth movers – Equipment for compaction, batching, mixing and concreting – Equipment for material handling and erection of structures – Equipment for trenching, tunneling and dredging.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Apply various practices exercised in the construction field
- Acquire knowledge on various techniques used for underground and under water structures
- Illustrate various construction techniques involved in super structure
- Develop knowledge about various industrial structures and their utilities
- Adopt suitable equipments in construction towards speedy completion of projects

TEXT BOOKS:

1. Arora SP and Bindra S P, "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.
2. Varghese PC, "Building Construction", Prentice Hall of India Pvt. Ltd., New Delhi, 2007.

REFERENCE BOOKS:

1. Deodhar SV, "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
2. Shetty M S, "Concrete Technology –Theory and Practice", S Chand and Co. Pvt. Ltd.,New Delhi, 2009.
3. Peurifoy RL, Ledbetter W B and Schexnayder C, "Construction Planning, Equipment and Methods", McGraw Hill, Singapore, 5th Edition, 1995.

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20/6/22

20CE404	SOIL MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the various properties and classification of soil
- Develop knowledge on permeability of soil and stress distribution in soil medium
- Determine various methods of compaction and consolidation of soil
- Analyze shear strength behavior of cohesive and non –cohesive soil
- Evaluate shear strength behavior of soil using stability analysis of slopes

UNIT I SOIL CLASSIFICATION AND COMPACTION **9**

Nature of soil – Phase relationships – Soil description and classification for engineering purposes – Significance – Index properties of soils – BIS classification system – Soil compaction – Theory–Comparison of laboratory and field compaction methods – Compaction – Proctor's test – Moisture – Density relations –Factors influencing compaction behavior of soils.

UNIT II EFFECTIVE STRESS PRINCIPLE AND PERMEABILITY **9**

Soil water – Static pressure in water – Effective stress concepts in soils – Capillary stress – Permeability measurement in the laboratory and field pumping in and pumping out tests – Factors influencing permeability of soils – Seepage – Introduction to flow nets – Simple problems.

UNIT III STRESS DISTRIBUTION CONCEPT AND SETTLEMENT **9**

Stress distribution – Soil media – Boussines theory – Use of new marks influence chart – Settlement – Components of settlement –Immediate and consolidation settlement – Methods of minimising settlement –Terzaghi's one dimensional consolidation theory – Computation of rate of settlement – Square root t and log t methods – e–log p relationship – Factors influencing compression behaviour of soils.

UNIT IV SHEAR STRENGTH BEHAVIOUR **9**

Shear strength of cohesive and cohesionless soils –Mohr –Coulomb's failure theory – Relationship between principal stresses at failure – Measurement of shear strength–Direct shear test – Triaxial compression test – Unconfined compression test and vane shear test – Pore pressure parameters – Cyclic mobility – Liquefaction.

UNIT V STABILITY OF SLOPES **9**

Slope failure mechanisms – Types – Infinite slopes – Finite slopes –Total stress analysis for saturated clay –Fellenius method –Friction circle method –Factor of safety – Use of stability number–Slope protection measures.

TOTAL: 45 PERIODS

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BoS(CIVIL)

OUTCOMES:

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

- Impart the fundamental concepts of soil mechanics and identify the soil properties
- Understand the importance of engineering properties such as consolidation and compaction of soils
- Evaluate the stress developed in the soil medium
- Estimate the shear strength of various types of soil
- Analyze the stability of slopes using different methods

TEXT BOOKS:

1. Punmia B C, Ashok K Jain and Arun K Jain, "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, 17th Edition, 2018.
2. Murthy V N S, "Text Book of Soil Mechanics and Foundation Engineering", CBS Publisher and Distributors, New Delhi, 2018.

REFERENCE BOOKS:

1. GopalRanjan and Rao A S R, "Basic and Applied Soil Mechanics" New Age International, New Delhi, 3rd Edition, 2018.
2. Dr Arora K R, "Soil Mechanics and Foundations Engineering", Standard Publishers Distributors, 7th Edition, 2019.

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BoS(CIVIL)

20CE405 **HIGHWAY ENGINEERING** L T P C
3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the basics and objectives of planning and alignment in highway
- Impart knowledge on geometric design of highways
- Design flexible and rigid pavements as per design principles
- Acquire knowledge on traffic engineering
- Analyze pavement evaluation and techniques needed for strengthening of pavements

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Objectives of highway planning – History of road development in India – Highway planning in India – Factors controlling alignment – Engineering surveys for alignment, objectives, conventional and modern methods – Classification of highways – Typical cross section of urban and rural roads.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9

Cross sectional elements – Sight distances – Horizontal curves, super elevation, transition curves, widening at curves – Vertical curves – Gradients, special consideration for hill roads – Hairpin bends.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Pavement components and their role – Design principles – Design practice for flexible and rigid pavements (IRC method only) – Embankments – Problems in flexible pavement design.

UNIT IV TRAFFIC ENGINEERING 9

Scope of traffic engineering – Traffic characteristics – Traffic flow and roadway capacity – Traffic regulations – Traffic control devices – Design of road intersections – Design of parking facility – Pedestrian facilities – Highway lighting – Traffic planning and management.

UNITV HIGHWAY CONSTRUCTION MATERIALS, EVALUATION AND MAINTENANCE OF PAVEMENTS 9

Highway construction materials, properties and testing methods – CBR test for soil subgrade – Test on aggregate and bitumen – Highway drainage – Pavement distress in flexible and rigid pavements – Pavement management systems – Structural evaluation – Strengthening of pavements–Highway project formulation.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Demonstrate planning, alignment and cross sections of urban and rural roads
- Develop knowledge on basic principles involved in geometric design of highways
- Design flexible and rigid pavements as per IRC
- Realize the importance of traffic planning and management
- Recognize pavement construction and techniques needed for strengthening of pavements

TEXT BOOKS:

1. Khanna S K, Justo CEG and Veeraragavan A, "Highway Engineering", Nemchand Publishers, 2018.

REFERENCES:

1. Kadiyali L R. "Principles and Practices of Highway Engineering", Khanna Technical Publications, Delhi, 2017.
2. IRC Standards, IRC 37 – 2018 and IRC 58 – 2015.

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BoS(CIVIL)

20EEC401L	LIFE SKILLS AND PERSONALITY DEVELOPMENT (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Create self- confident among the students by the training
- Develop good personality for mature outlook in different circumstances
- Encourage effective presentation skills
- Dramatize role play by assigning the best role
- Enhance team building and time management skills

UNIT I CAREER PLANNING **6**

Introduction – Benefits of Career Planning – Expectation and Development – Guidelines for choosing a Career – Future Planning – Evaluation of planning

UNIT II ATTITUDE **6**

Introduction – Rightness of Attitude and behavior – Formation of attitudes – Evolving Behavior of a person – Creating right attitudes – Approaches of Challenges – Lessons from Attitude.

UNIT III ROLE PLAYING **6**

Introduction – settings of role plays – Principles and Purpose – importance of communication in role plays – Arrangement of points and character – Extempore Talk – Debates – Emotional Intelligence.

UNIT IV TEAM BUILDING **6**

Purpose of Creating Team – Exploring Team roles and Processes – Importance of Building and Developing Strong Team – Leadership Qualities – Success of Team Building.

UNIT V TIME MANAGEMENT **6**

Value of time – Concept and applications of time management – Causes for Wasting of Time – Methods of Time Management – Diagnosing Time Management – Planning for presentation – To-do-list – Prioritizing work.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Improve the leadership skills by identifying the strengths of a team
- Learn to lead a team on a project in an organization
- Helps students to perform on a distinct role and learn to face the challenges
- Build a strong team to achieve their goals with the right choice of people
- Develop the time management skills to achieve success

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES :

1. Thomas A Harris, "I Am Ok, You Are Ok", Harper and Row, New York, 1972.
2. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.
3. NiraKonar, "Communication Skills for Professionals", Eastern Economy Edition, 2010.
4. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.

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BoS (S&H)

20CE406L	STRENGTH OF MATERIALS LABORATORY (COMMON TO CIVIL AND AGE)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The students should be made to:

- Understand the stress strain behavior of mild steel rod
- Obtain the hardness value of various metals
- Analyze the deflection acting on springs by applying tensile and compressive load
- Determine impact strength of mild steel
- Evaluate the properties of wood by conducting compression test

LIST OF EXPERIMENTS:

1. Tension test on mild steel rod.
2. Torsion test on mild steel rod.
3. Compression test on wood.
4. Tests on open coiled helical springs.
5. Tests on close coiled helical springs.
6. Izod and charpy impact tests.
7. Determination of rockwell and brinell hardness number.
8. Static bending test on metal beam.
9. Yield strength, ultimate strength, percentage of elongation and young's modulus for the mild steel rod and HYSD bars using UTM.
10. Maximum shear strength of the mild steel and aluminium bar using double shear test.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Illustrate the behaviour of mild steel under the action of tensile and compressive load
- Calculate the hardness value of the various metal specimens
- Determine the torsional and impact strength of mild steel
- Understand the properties of wood when the load is acting parallel to grain
- Evaluate the stiffness and deflection of open coiled, close coiled springs

REFERENCES:

1. "Strength of Materials Laboratory Manual", Anna University, Chennai-600 025.
2. IS1786-2008, "High Strength Deformed Bars and Wires for Concrete Reinforcement – Specification", 2008.

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24/6/24

20CE407L	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

The students should be made to:

- Demonstrate the working principle, components, functions of orifice meter and venturimeter
- Determine the major and minor losses in pipes
- Analyze the flow through orifices, mouthpieces and notches
- Understand the performance of centrifugal, reciprocating, submersible and gear pumps
- Evaluate the characteristics of pelton wheel and francis turbines

I. FLOW MEASUREMENT

1. Calibration of Rotameter.
2. Calibration of Venturimeter / Orifice meter.
3. Bernoulli`s experiment.

II.LOSSES IN PIPES

1. Determination of friction factor in pipes.
2. Determination of min or losses.

III. PUMPS

1. Characteristics of Centrifugal pumps.
2. Characteristics of Gear pump.
3. Characteristics of Submersible pump.
4. Characteristics of Reciprocating pump.

IV. TURBINES

1. Characteristics of Pelton wheel turbine.
2. Characteristics of Francis turbine/ Kaplan turbine.

V. DETERMINATION OF METACENTRIC HEIGHT

1. Determination of Metacentric height of floating bodies.

TOTAL: 30 PERIODS

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BoS(CIVIL)

OUTCOMES:

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

- Evaluate the discharge in orifice meter and venturimeter
- Measure frictional losses in pipes
- Determine the flow rate in orifice and mouthpiece
- Illustrate characteristics of various pumps
- Understand discharge abilities of various turbines

REFERENCES:

1. Sarbjit Singh, "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi PN and Seth S M, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
4. Subramanya K, "Flow in Open Channels", Tata McGraw Hill Publishing Company, 2001.

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20CE501 DESIGN OF REINFORCED CONCRETE ELEMENTS

L	T	P	C
3	1	0	4

OBJECTIVES:

The student should be made to:

- Understand basic concepts in the behavior and design of reinforced concrete elements using working stress method
- Analyze design principles of RC beams subjected to shear, bond, and torsion
- Gain knowledge related to design of slabs and staircase in accordance with limit state method
- Learn concepts of RC Column design using limit state method
- Impart knowledge on design of various RC footings

UNIT I INTRODUCTION **12**

Materials and properties – Grades of concrete and steel – Stress – Strain characteristics of concrete and steel – Fatigue effects. Type of loads and load combinations – Factor of Safety – Concept of elastic method, ultimate load method and limit state method – Advantages of limit state method over other methods – Design codes and specifications – Design of singly and doubly reinforced beams by working stress method.

UNIT II LIMIT STATE DESIGN OF BEAM **12**

Design of singly and doubly reinforced sections and flanged section subjected to flexure, shear and torsion – Flexural and anchorage bonds – Development length – Detailing of reinforcement.

UNIT III LIMIT STATE DESIGN OF SLAB AND STAIRCASE **12**

Introduction – Types of slab – Design of one way slab – Design of two way slabs with various boundary conditions – Design of cantilever slab – Check for shear and deflection – Detailing of reinforcement. Design of doglegged stair case – Detailing of reinforcement.

UNIT IV LIMIT STATE DESIGN OF COLUMN **12**

Estimation of effective length of a column – Code requirements: Slenderness limits – minimum eccentricities and reinforcements – Compression members – Classification of columns – Design of short columns and Long columns – Axial and eccentric loading using interaction curve – Detailing of reinforcement.

UNIT V LIMIT STATE DESIGN OF FOOTING **12**

Introduction – Types of footing – Selection of footing – Soil pressures under isolated footings – General design considerations and Code requirements – Design of Isolated square and rectangular footing – Combined rectangular footing – Strap footing – Mat footing – Detailing of reinforcement.

TOTAL: 60 PERIODS

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OUTCOMES:

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

- Understand various design methodologies in design of RC elements
- Evaluate design of beams by limit state method
- Design various types of slabs and staircase by limit state method
- Determine columns subjected to axial and eccentric loadings
- Execute design of footings by limit state method

TEXT BOOKS:

1. Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors, New Delhi, 2013.

REFERENCE BOOKS:

1. Varghese P C, "Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt. Ltd, New Delhi, 2010.
2. Gambhir M L, "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Pvt. td, New Delhi, 2006.
3. Unnikrishna Pillai S and Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2015.

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20CE502	STRUCTURAL ANALYSIS-I	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge on deflection of trusses, beams and frames using energy methods
- Draw influence lines for statically determinate and indeterminate structures
- Analyze various arch structures
- Calculate slope and deflection of indeterminate structures
- Understand concepts of distribution of moments and internal forces in indeterminate structures

UNIT I ENERGY METHODS AND INDETERMINATE FRAMES **9**

Principle of virtual work – Deflections of trusses, beams and frames – Strain energy theorem – Analysis of beams, frames indeterminate trusses by strain energy method and consistent deformation method (up to two degrees of redundancy).

UNIT II MOVING LOADS AND INFLUENCE LINES **9**

Influence lines for reactions in statically determinate structures – Influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads – EUDL – Muller Breslau's principle – Indirect model analysis for influence lines of indeterminate structures – Begg's deformeter.

UNIT III ARCHES **9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

UNIT IV SLOPE DEFLECTION METHOD **9**

Slope deflection method – Equilibrium conditions – Analysis of statically indeterminate beams with and without support settlement, Analysis of portal frames with and without sway.

UNIT V MOMENT DISTRIBUTION METHOD **9**

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Kanis method.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Calculate deflections of beams, frames and trusses
- Draw influence lines for statically determinate and indeterminate structures
- Solve shear and bending moment subjected to arches at various loadings
- Determine slope and deflection in indeterminate beams and portal frames
- Evaluate distribution of moments in indeterminate structures by iterative procedure

TEXT BOOKS:

1. Vaidyanathan R and Perumal P, "Comprehensive Structural Analysis – Vol. I and II", Laxmi Publications, New Delhi, 2007.
2. Bhavikatti S S, "Structural Analysis – Vol. 1 and Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCES:

1. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 2017
2. Gambhir M L, "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2014.
3. Ghali A, Nebille and Brown T G, "Structural Analysis-A Unified Classical and Matrix Approach", Sixth Edition, Spon Press, New York, 2009.

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20CE503 RAILWAYS, AIRPORT AND HARBOUR ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Study planning and alignment of railways
- Impart knowledge on geometric designs, stations, yards, laying and maintenance of tracks
- Analyze the planning and design of airports
- Learn about air traffic control facilities and navigation aids
- Acquire knowledge of various harbors, ports and docks

UNIT I RAILWAY PLANNING AND DESIGN 9

Role of Indian railways in national development – Railways for urban transportation – LRT and MRTS – engineering surveys for track alignment – obligatory points – Conventional and modern methods – Remote Sensing, GIS & GPS, EDM and other equipment – Permanent way – components and their functions – Rails – types, fastenings, gauge, coning of wheels, creeps and kinks – Sleepers – functions, materials, density – Ballast – functions, materials – ballast less tracks.

UNIT II GEOMETRIC DESIGN OF RAILWAY TRACKS 9

Gradients and grade compensation, super elevation, widening of gauges in curves, transition curves, horizontal and vertical curves – Points and crossings – Turnouts – design, working principle – Track circuiting, signaling, interlocking – construction – maintenance – conventional, modern methods and materials – Track drainage – Track modernization – Automated maintenance and upgrading, relaying of track – Lay outs of railway stations and yards – rolling stock, tractive power, track resistance – Level crossings.

UNIT III AIRPORT PLANNING AND DESIGN 9

Role of air transport – Components of airports – Airport planning – Air traffic potential, site selection, design of components – Cost estimates, evaluation and institutional arrangements – Runway – design, orientation, cross wind component, wind rose diagram – Geometric design and corrections for gradients – drainage – taxiway – geometric design elements, minimum separation distances, design speed – airport drainage.

UNIT IV AIRPORT VISUAL AIDS AND AIR TRAFFIC CONTROL 9

Airport zoning – Clear zone, approach zone, buffer zone, turning zone, clearance over highways and railways – Airport layouts – Apron, terminal building, hangers, motor vehicle parking area and circulation pattern – Case studies of airport layouts – Airport buildings – Primary functions, planning concept, passenger facilities – Visual aids – Runway and taxiway markings, wind direction indicators, runway and taxiway lightings – Air traffic control – Basic actions and network – Helipads – Service equipment.

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UNIT V HARBOURS **9**

Introduction – Harbours, ports and docks – Components, factors influencing the site selection, wind, wave characteristics – Breakwater – Components and types – Tetrapods and other special blocks – Erosion – Tides – Types of tides –Docks – Types of docks – Warehouses – Transit sheds, fenders – Quays and jetties – Dolphins – Containerization – Mooring, types of mooring – Goods transport – Container movement.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design different railway components
- Understand geometric design of railway tracks
- Recognize design concepts of various components of airport
- Know about the air traffic control facilities and visual aids
- Learn various harbour elements in harbour planning

TEXT BOOKS:

1. Saxena S C, Arora S P, "A Text Book of Railway Engineering", Dhanpat Rai Publications, 2016.
2. Khanna S K, Arora M G and Jain S S, "Airport Planning and Designing", Nemchand and Bros, 2012.

REFERENCE BOOKS:

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.
4. Dr Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai Publications, 2013.

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20CE504 **FOUNDATION ENGINEERING** L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Get basic knowledge of geotechnical site investigation
- Understand various types of foundation and design principles
- Learn design concepts of different types of footings
- Discuss different types of pile foundation with its carrying capacity
- Study various earth pressure theories

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and Objectives – Methods of exploration – Depth and spacing of bore holes – Sampling of soil – Methods of sampling – Penetration tests (SPT, SCPT and DCPT) – Interpretation – Bore log report – Requirements of good foundation – Factors governing location and depth of foundation – Types and Selection of foundation.

UNIT II SHALLOW FOUNDATION 9

Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Bearing Capacity from insitu tests (SPT, SCPT and Plate load) – Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements (As per IS Codal provisions) – Methods of minimising total and differential settlement.

UNIT III FOOTINGS AND RAFT 9

Contact pressure distribution below footings – Isolated, combined footings and Mat foundation – Types, uses and proportioning – Allowable bearing pressure for raft foundation as per IS Codal provisions

UNIT IV PILE FOUNDATIONS 9

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hiley's) – Capacity from insitu tests (SPT, SCPT and Pile load test) – Negative skin friction – Group capacity by different methods (Feld's rule and block failure criterion) – Settlement of pile groups

UNIT V EARTH PRESSURE 9

Active and passive earth pressure – Rankine's theory – Coloumb's wedge theory – Earth pressure on retaining walls including the effect of surcharge for C and C-φ soil under dry and saturated conditions.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Acquire knowledge on soil investigation report including the lab and field investigation test results
- Evaluate bearing capacity of soil and design of shallow foundation
- Design various types of footings as per IS Codal provisions
- Determine load carrying capacity of piles and design of pile foundations
- Perform lateral earth pressure analysis by various earth pressure theories

TEXT BOOKS:

1. Punmia B C and Jain A K, "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, 2015.
2. Dr Arora K R, "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, 2008.

REFERENCES:

1. Gopal Ranjan Rao, "Basic and Applied Soil Mechanics", New Age International, New Delhi, 2018.
2. Murthy V N S, "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2018.

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20/6/24

20MC002	UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

Objectives

The students should be made to:

- Understand the need of value education and human aspiration
- Know the difference between self and body
- Recognize the harmony in the family and society
- Understand harmony in nature
- Identify the human values and ethics

UNIT I INTRODUCTION TO VALUE EDUCATION 9

Value Education – need and process, Self-Exploration – process, Basic Human Aspirations - Continuous Happiness and Prosperity, Basic requirement for fulfillment of Human Aspirants, Understanding Happiness and Prosperity – Continuity of Happiness from Physical Facility.

UNIT II HARMONY IN THE HUMAN BEING 9

Human being as a co-existence of the self and the Body - The needs of Self and Body, Body as an Instrument - The Self as the Seer- Doer-Enjoyer, Harmony in the self, Harmony of the Self with the Body –Programme for Self – regulation and health.

UNIT III HARMONY IN THE FAMILY AND SOCIETY 9

Family as the basic unit of human interaction , Understanding Relationship, Trust as the foundational value, Respect as the Right Evaluation, Harmony in the society – Understanding Human Goal, Harmony from Family Order to World Family Order – Universal Human Order - Scope.

UNIT IV HARMONY IN THE NATURE AND EXISTENCE 9

Nature - as Collections of Units, Classification of Units into Four Orders, Interconnectedness, and mutual fulfillment among the four orders of nature, self-regulation in Nature, Understanding Existence as Units in Space, Existence as Co-existence.

UNIT V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS 9

Natural Acceptance of Human Values - Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Constitution, Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production System and Management Models – Typical case, Strategies for Transition towards value based life and profession.

TOTAL: 45 PERIODS

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Outcome:

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

- Understand the significance of value education and distinguish between values and skills.
- Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
- Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings.
- Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
- Distinguish between ethical and unethical practices and understand the human values.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2nd Revised Edition, 2019.

References:

1. Tripathi A N, "Human Values", New Age Intl. Publishers, New Delhi, 2009.
2. Govindarajan M, Natrajan S and Senthilkumar V S, "Engineering Ethics (Including Human Values)" Eastern Economy, PHI, 12th Edition, 2011.
3. Govindarajan M and Natrajan S, "Professional Ethics and Human Values", PHI, 2011.
4. Banerjee B P, "Foundation of Ethics and Management", Excel Publication, 2005.
5. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co, Lucknow, Reprinted 2008.
6. Seebauer and Robert L Berry, "Fundamentals of Ethics for Scientist and Engineers", Oxford University Press, 2000.

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20CE505L	SURVEY CAMP (2 WEEKS - DURING IV SEMESTER)	L T P C 0 0 0 1

OBJECTIVES:

The Students should be made to:

- Acquire knowledge to get practical training on traversing
- Understand radial tachometric contouring, block level and L.S and C.S
- Develop skills on alignment of roads and canals
- Calculate latitude, longitude and azimuth using GPS
- Plot offset of buildings and setting of curves

The objective of the survey camp is to enable the students to get practical training in thefield work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse – using Total station
2. Contouring
   (i). Radial tachometric contouring – Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line.
   (ii). Block Level/ by squares of size at least 100 meter x 100 meter at least 20 meter interval
   (iii). L.S and C.S – Road and canal alignment for a Length of not less than 1 Kilo Meter at least L.S at Every 30 m and C.S at every 90 m
3. Offset of Buildings and Plotting the Location
4. Sun observation to determine azimuth (guidelines to be given to the students)
5. Use of GPS to determine latitude and longitude and locate the survey camp location
6. Traversing using GPS
7. Curve setting by deflection angle

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.

OUTCOMES:

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

- Evaluate traversing using GPS and total station
- Plot contour and map area using radial tachometric contouring
- Determine road and canal alignment by L.S and C.S
- Measure azimuth readings from sun observations
- Execute offset of buildings to plot the location and setting of curves from field observations

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20CE506L	GEOTECHNICAL ENGINEERING LABORATORY (COMMON TO CIVIL AND AGE)	L	T	P	C
		0	0	3	1

OBJECTIVES:

The student should be made to:

- Develop skills to test the soils for their index and engineering properties
- Characterize the soil based on their properties
- Determine insitu density and compaction characteristics
- Understand permeability characteristics of soil
- Learn consolidation and shear properties of soil

I. DETERMINATION OF INDEX PROPERTIES

1. Specific gravity of soil solids
2. Grain size distribution – Sieve analysis
3. Grain size distribution – Hydrometer analysis
4. Liquid limit and Plastic limit tests
5. Shrinkage limit and Differential free swell tests

II. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

1. Field density Test (Sand replacement method and core cutter method)
2. Determination of moisture – density relationship using standard proctor compaction test.
3. Determination of relative density.

III. DETERMINATION OF ENGINEERING PROPERTIES

1. Permeability determination (Constant head and falling head methods)
2. One dimensional consolidation test (Determination of Co-efficient of consolidation only)
3. Direct shear test in cohesionless soil.
4. Unconfined compression test in cohesive soil.
5. Laboratory vane shear test in cohesive soil.
6. Tri-axial compression test in cohesionless soil (Demonstration only).
7. California Bearing Ratio test.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Calculate index properties of soil
- Perform grain size distribution using both sieve analysis and hydrometer analysis
- Execute compaction and field density test
- Determine permeability of soil using both constant and falling head method
- Enumerate consolidation and shear test in soil

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REFERENCES:

1. "Soil Engineering Laboratory Instruction Manual" Published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
2. Lambe T W, "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008.
3. Saibaba Reddy E, Rama Sastri K, "Measurement of Engineering Properties of Soils", New Age International Pvt. Limited Publishers, New Delhi, 2002.
4. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.

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20CE507L	HIGHWAY ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Understand basic properties of coarse aggregates
- Learn abrasion property of coarse aggregates
- Study specific gravity of bitumen
- Determine viscosity, penetration and softening test on bitumen
- Perform marshall stability test on bitumen mixes

I. TEST ON AGGREGATES

1. Specific gravity of aggregates
2. Fineness modulus of aggregates – Sieve analysis
3. Los angeles abrasion test
4. Water absorption of aggregates

II. TEST ON BITUMEN

1. Specific gravity of bitumen
2. Penetration test
3. Viscosity test
4. Softening test

III. TESTS ON BITUMINOUS MIXES

1. Stripping test
2. Determination of binder content
3. Marshall stability and flow values

TOTAL: 30 PERIODS

OUTCOMES:

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

- Characterize various pavement materials through relevant tests
- Determine various properties of coarse aggregates
- Calculate basic properties test on bitumen
- Enumerate penetration, viscosity values of bitumen
- Evaluate tests on bitumen mixes

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REFERENCES:

1. "Highway Materials and Pavement Testing", New Chand and Bros., Roorkee, Revised Fifth Edition, 2009.
2. IS 1201–1978 to IS 1220–1978, "Methods for Testing Tar and Bituminous Materials", Bureau of Indian Standards.
3. IS 2386 – 1978, "Methods of Test for Aggregates", Bureau of Indian Standards.
4. "Mix Design Methods Asphalt Institute Manual Series No.2", Lexington, USA. 6th Edition,1997,

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20EEC501L	PROFESSIONAL SKILLS DEVELOPMENT (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Sharpen problem solving skills and to improve thinking ability of the students
- Drive the students to use language with great commitment and cooperation
- Expertise the creative thinking and presentation skills to meet company needs
- Develop and foster the soft skills through individual and group activities
- Expose students to right attitudinal and behavioral thoughts

UNIT I INTRODUCTION TO BASIC ARITHMETIC AND PERSONALITY TRAIT **6**

Aptitude – Numbers, Average, Percentage, Profit and loss, Picture pattern; Soft skills – Personality development, Professional ethics, Perception insights, attitude and behavioral changes.

UNIT II CONCEPT OF PROPORTIONALITY AND INTERPERSONAL SKILLS **6**

Aptitude – Time and work, Pipes and cisterns, Series completion, Critical reasoning; Soft skills – Developing self esteem, Significance of interpersonal behavior and interpersonal relationships.

UNIT III AN APPROACH TO COGNITIVE APTITUDE AND LEADERSHIP SKILLS **6**

Aptitude – Time, speed and distance, Boats and streams, Races and games, Syllogism; Soft skills – Leadership – Characteristics and importance of leadership, Roles and responsibilities of a good Leader.

UNIT IV CONTEMPORARY APTITUDE AND SITUATIONAL RESPONSES **6**

Aptitude – Crypt arithmetic, Ranking, Logarithms, Cubes, Analogy; Soft skills – Decision making – Process and challenges, Creative and Critical thinking.

UNIT V NON-VERBAL REASONONG AND INFLUENCING OTHERS **6**

Aptitude – Clocks, Non – verbal reasoning, Permutation, Classifications; Soft skills – Presentation skills – Make use of visual aids with modern tools, Insights on persistence and perseverance.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Ability to solve both analytical and logical problems in an effective manner
- Practice to organize and convey the information in such an optimistic way
- Deliver a professional and constructive presentation
- Recognize explicit assumptions and their consequences
- Access the needed information effectively and efficiently

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2017.
2. Murty G R K, "Soft Skills for Success", DGM Icfai Books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; Sixth edition, 2016.
2. Aggarwal R S, "A Modern Approach to Verbal and Non-Verbal Reasoning", S Chand Publishing, New Delhi, 2018.
3. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; Eighth Edition, 2018.
4. Covey Sean, "Seven Habits of Highly Effective Teens", Fireside Publishers, New York, 1998.
5. Carnegie Dale, "How to Win Friends and Influence People", Simon and Schuster, New York, 1998.

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20CE601 DESIGN OF STEEL STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand concepts of limit state and working stress method of design of structural steel members and various types of connections.
- Determine net area and effective sections in tension members, tension splices, lug angles and gussets.
- Execute design of compression members as per IS Codal practice.
- Analyze concepts of design of flexural members.
- Design structural systems such as roof trusses, gantry girders as per provisions of IS 800 – 2007 of practice for limit state method.

UNIT I INTRODUCTION **9**

Introduction to steel structures – Comparison of Working stress and Limit state method of design – Properties of steel – Structural steel sections – Types of connections – Design of bolted and welded connections for axial load – Efficiency of joint.

UNIT II TENSION MEMBERS **9**

Introduction to types of tension members – Calculation of net area – Net effective sections for angles and Tee in tension – Design of tension members – Design of tension splices, Lug Angles and Gussets.

UNIT III COMPRESSION MEMBERS **9**

Introduction to types of compression members – Loads on compression member – Influence of effective length and slenderness ratio on the strength of column – Codal provisions for compression members – Design of compression members – Design of lacing – Design of Battening.

UNIT IV DESIGN OF BEAMS **9**

Introduction to design of flexural members – Design of laterally supported and unsupported beams – Design of plate girders – Intermediate and bearing stiffeners.

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UNIT V MISCELLANEOUS TOPICS **9**

Roof trusses – Roof and side coverings – Design of purlin and elements of truss, end bearing – Design procedure of gantry girder.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze different types of bolted and welded connections.
- Develop skills to design tension members, splices, lug angles and gussets.
- Elaborate IS Code design practice of various compression members.
- Design laterally supported and unsupported beams, built-up beams, plate girders and stiffeners.
- Acquire knowledge about components of industrial structures, Gantry girders and roof trusses.

TEXT BOOKS:

1. Bhavikatti S S, "Design of Steel Structures", By Limit State Method as per IS: 800 – 2007, IK International Publishing House Pvt. Ltd., 2019.
2. Subramanian N, "Design of Steel Structures", Oxford University Press 2011.

REFERENCE BOOKS:

1. Duggal S K, "Limit State Design of Steel Structures", Tata, McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
2. Shiyekar M R, "Limit State Design in Structural Steel", PHI Learning Private Limited, New Delhi, 2nd Edition, 2013.
3. IS: 800 – 2007, IS: 800 – 1984, "General Construction in Steel – Code of Practice", BIS, New Delhi, 3rd Edition, 2017.

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24/6/24

20CE602 STRUCTURAL ANALYSIS-II

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Analyze statically indeterminate structures by flexibility matrix method.
- Evaluate structure stiffness matrix to solve indeterminate structures by stiffness method.
- Understand the basic concepts of finite element method and its applications in structural analysis.
- Acquire knowledge on plastic analysis of indeterminate beams and frames.
- Determine analysis of space and cable structures.

UNIT I FLEXIBILITY METHOD **9**

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT II STIFFNESS METHOD **9**

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two).

UNIT III FINITE ELEMENT METHOD **9**

Introduction – Discretization of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain – Triangular elements.

UNIT IV PLASTIC ANALYSIS OF STRUCTURES **9**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

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UNIT V SPACE AND CABLE STRUCTURES **9**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan – Suspension cables – suspension bridges with two and three hinged stiffening girders.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze pin-jointed and rigid plane frames, continuous beams by flexibility matrix method.
- Solve statically indeterminate structures using stiffness matrix method.
- Apply finite element method in structural analysis.
- Calculate collapse loads for beams and frames by plastic analysis.
- Determine the member forces acting on suspension bridges and space truss.

TEXT BOOKS:

1. Vaidyanathan R and Perumal P, "Comprehensive Structural Analysis – Vol. I and II", Laxmi Publications, New Delhi, 4th Edition, 2019.
2. Bhavikatti S S, "Structural Analysis – Vol. 1 and Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCE BOOKS:

1. Punmia B C, Ashok Kumar Jain and Arunkumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 2017.
2. Ghali A, Neville A M and Brown T G, "Structural Analysis a Unified Classical and Matrix Approach", 6th Edition, SPON Press New York, 2009.

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24/6/24

20CE603 WATER SUPPLY AND WASTE WATER ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on basic principles of water supply system, planning and sources of water.
- Understand the various conveyance systems of water from the sources.
- Design various water treatment plant units and distribution system.
- Analyze principles of planning, sources and estimation of wastewater.
- Acquire knowledge on design, construction and operation of primary and secondary treatment of sewage.

UNIT I SOURCES OF WATER SUPPLY 9

Importance and necessity for planned public water supplies – Planning and execution of modern water supply systems – Design period, population forecasting, water demand – Sources of water and their characteristics – Surface and ground water storage reservoir – Development and selection of source – Surface water quality – Characterization significance – Drinking water quality standards (IS – WHO).

UNIT II CONVEYANCE FROM THE SOURCES 9

Intake structures – Factors governing the location of an intake – Types of intakes – Functions – Pipes and conduits for transporting water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – Appurtenances of pipes – Types of pumps – Selection of pumps.

UNIT III WATER TREATMENT 9

Unit operation and process – Design of water treatment plant units, aerators flash mixers, sedimentation, coagulation, and flocculation – Clariflocculator and sand filters principles of disinfection – Residue management – Construction, operation and maintenance of treatment plants.

UNIT IV SEWERAGE SYSTEMS PLANNING AND SOURCES 9

Sources of wastewater generation – Sewerage – Planning – Steps involved – Objectives – Design period – Effects – Population forecasting methods – Estimation of sanitary sewage flow – Estimation of storm runoff – Characteristics and composition of sewage – Significance

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UNIT V TREATMENT OF SEWAGE 9

Objectives – Unit operation and processes – Primary treatment – Principles, functions, design and drawing of screen, grit chambers and primary sedimentation tanks – Onsite sanitation – Septic tank – Secondary treatment – Objectives – Selection of treatment methods – Principles, functions, design and drawing of units – Activated sludge process and trickling filter – Oxidation ditches, UASB and waste stabilization ponds – Recent advances in sewage treatment – Sewage treatment plants – Construction, operation and maintenance.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze the various characteristics and sources of water supply.
- Classify the intake structures, pipes and pumps.
- Design water treatment plant and other unit operations.
- Plan and design the collection system of wastewater from its sources.
- Apply suitable method for the treatment of waste water.

TEXT BOOKS:

1. Garg S K, "Environmental Engineering Vol I. Water Supply Engineering", Khanna Publishers, New Delhi, 2019.
2. Garg S K, "Environmental Engineering Vol II. Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi, 2016.

REFERENCE BOOKS:

1. Punmia B C, Ashok K Jain and Arun K Jain, "Water Supply Engineering", Lakshmi Publications (P) Ltd., New Delhi, 2016.
2. Modi P N, "Water Supply Engineering – I", Standard Book House, New Delhi, 2018.
3. Punmia B C, Ashok K Jain and Arun K Jain, "Waste Water Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2016.
4. Metcalf and Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill, New Delhi, 2017.
5. Patwardhan A D, "Industrial Waste Water Treatment", PHI Learning Pvt. Ltd., New Delhi, 2013.

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24/6/24

20CE604 ESTIMATION COSTING AND VALUATION ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Impart knowledge on basic concepts of estimation.
- Analyze the rate of each work item according to the specifications.
- Identify various items of works in building and calculate their quantities using appropriate methods.
- Understand different methods of estimation of various civil engineering structures.
- Acquire skills to calculate valuation of buildings.

UNIT I INTRODUCTION TO ESTIMATION AND SPECIFICATION **9**

General introduction to estimation – Purpose of estimates – Types of estimates – Units of measurements for works and materials – Degree of accuracy in measurements – Purpose and basic principles of general and detailed Specifications – Detailed specifications for various items of work – Report accompanying the estimate.

UNIT II RATE ANALYSIS, TENDERS & CONTRACTS **9**

Data – Lead statement – Schedule of rates – Standard data book – Lump sum provision – Task out turn of work – Rate analysis for various work items – Tender and process of tendering – Contracts – Types of contracts – Arbitration and legal requirements.

UNIT III BUILDING ESTIMATE **9**

Taking out quantity – Measurement, abstract sheets and recording of measurements – Centre line method and long wall – Short wall method – Detailed estimate of masonry buildings and R.C.C works – Preparation of bar bending schedule – Various types of arches – Calculation of brick work and RCC works in arches – Deductions for openings – Preparation of bills of quantities Approximate estimates – Case studies.

UNIT IV ESTIMATE OF OTHER STRUCTURES **9**

Industrial sheds – Steel trusses – Water supply and sanitary works – Septic tank, soak pit, manhole – Roads – Earth work, pitching of slopes, hill roads – Estimation of R.C.C. slab culvert, pipe culvert – Irrigation works – Canals, aqueducts.

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UNIT V VALUATION 9

Purpose of valuation – Types – Book value – Market value – Salvage value – Scrap value – Depreciation – Obsolescence – Sinking fund – Land valuation – Mortgage and lease – Problems on valuation – Annuity – Definition and types only – Fixation of rent – Outgoing – Gross and net income – Years purchase – Capital cost – Standard rent.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Prepare estimation corresponding to the available specification.
- Arrive rates of various work items and get familiarized with tendering and contract process.
- Calculate the quantities of various items of work in a building by entering them in a standard measurement sheet.
- Measure quantities and estimate different civil engineering structures.
- Determine the valuation of properties considering various factors.

TEXT BOOKS:

1. Dutta B N, "Estimating and Costing in Civil Engineering Theory and Practice," UBS Publishers Pvt. Ltd., 2017.
2. Patil B S, "Civil Engineering Contracts and Estimates", Universities Press (India) Pvt. Ltd., 2015.

REFERENCE BOOKS:

1. Birdie G S, "A Text Book on Estimating and Costing", Dhanpat Rai Co. Pvt. Ltd., New Delhi, 2013.
2. Chakraborti M, "Estimating, Costing, Specification and Valuation in Civil Engineering", M Chakraborty Publication, 2006.

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24/6/24

20CE605L STRUCTURAL DESIGN AND DRAWING

L	T	P	C
0	0	3	1

OBJECTIVES:

The student should be made to:

- Acquire knowledge on liquid retaining structures and retaining wall.
- Explain about the detailing of various RC and Steel structures.
- Analyze and design solid slab, flat slab, bridge, culverts and tanks.
- Design earth, gravity dams and diverting structures.
- Determine dimensions of slab base and gusseted base.

LIST OF EXPERIMENTS

1. Design and drawing of Reinforced Concrete cantilever and counterfort retaining walls
2. Design and drawing of Reinforced Concrete rectangular and circular water tank
3. Design of solid slab and RCC T beam bridge deck.
4. Design of box culvert and pipe culvert.
5. Design of flat slab
6. Design of tank surplus weir
7. Design of tank sluice with tower head
8. Design principles of earth dam and gravity dam
9. Design of hemispherical bottomed steel tank
10. Design of slab base
11. Design of gusseted base

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand design and detailing of different types of retaining walls.
- Design and draw reinforced concrete water tanks, dams, culverts.
- Execute the dimensions and draw the detailing of tank surplus weir, tank sluice.
- Calculate the dimensions of flat slab, solid slab, T-beam deck bridge.
- Analyze and design the dimensions of slab base and gusseted base.

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REFERENCES:

1. Krishna Raju N, "Structural Design and Drawing", University Press (India) Pvt. Ltd., New Delhi, 3rd Edition, 2006.
2. Varghese P C, "Advanced Reinforced Concrete Design", Prentice Hall International Edition, 2011.

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24/6/24

20CE606L WATER SUPPLY AND WASTEWATER ENGINEERING LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

The student should be made to:

- Determine pH, turbidity, hardness, chlorides, and other characteristics of water.
- Calculate alkalinity and acidity of water.
- Measure BOD, COD, DO, residual chlorine and optimum coagulant dosage.
- Execute the calculation of suspended, volatile, settle able and fixed solids.
- Analyze SVI of biological sludge.

LIST OF EXPERIMENTS

1. Determination of pH and turbidity.
2. Determination of hardness and chlorides.
3. Determination of alkalinity and acidity.
4. Determination of COD.
5. Determination of BOD.
6. Determination of dissolved oxygen.
7. Determination of phosphates and sulphates.
8. Determination of sodium and potassium.
9. Determination of fluoride.
10. Determination of residual chlorine.
11. Determination of optimum coagulant dosage.
12. Determination of suspended, settleable, volatile and fixed solids.
13. Determination of SVI of biological sludge.
14. Determination of MPN index of given water sample.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Evaluate percentage of fluorides, phosphates, sulphates, sodium, potassium and other permissible standard limits of water.
- Measure BOD, COD and dissolved oxygen of waste water.
- Determine optimum coagulant dosage using jar test.
- Calculate MPN index and different amount of solids present in water.
- Analyze the amount SVI present in biological sludge.

REFERENCES:

1. Garg S K, "Environmental Engineering", Volume – I and II, Khanna Publishers, New Delhi, 28th Edition, 2013.
2. Manual on Water Supply and Treatment, CPHEEO, New Delhi, 3rd Edition, 2010.
3. "Standard Methods for Examination of Water and Wastewater Engineering", American Public Health Association, Washington, 22nd Edition, 2005.
4. http://web.iitd.ac.in/~arunku/files/CVL212_Y15/Lab_CVL212v1.pdf.
5. https://www.slideshare.net/RambabuPalaka/environmental-engineering-lab-manual.

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20EEC601L **EMPLOYABILITY SKILLS** **L T P C**
0 0 2 1

OBJECTIVES:

The student should be made to:

- Learn the application of mathematical and project management to different contexts
- Focus on quantitative ability and employability skills through modern practices
- Enhance job skills and analytical ability of students
- Improve reasoning skills and employability skills
- Practice the skills on logical reasoning and interview techniques

UNIT I INTRODUCTION TO NUMERIC ABILITY AND PROJECT MANAGEMENT **6**

Aptitude – Ratio and Proportion – Partnership – Allegation of Mixtures – Coding and Decoding - Number Sequence.

Soft Skills – Managerial Skills – Project Cost, Risk and Task Management, Conflict Management and Resolution.

UNIT II QUANTITATIVE ANALYSIS AND EMPLOYERS EXPECTATIONS **6**

Aptitude – Number System – Data Interpretation – Chain Rule – Surds and Indices – Direction Sense.

Soft Skills – Employers Needs and Expectations – Mind Mapping – Situation Reaction Test (SRT).

UNIT III ANALYTICAL SKILLS AND JOB READINESS **6**

Aptitude – Combination – Probability – Problems on Ages – Seating Arrangements.

Soft Skills – Job Application – Resume Building – Exploring and Identifying Career Options.

UNIT IV REASONING ABILITY AND INSIGHT ON INTERVIEWS **6**

Aptitude – Mensuration – SI and CI – Cause and Effect – Statement, Assumptions and Conclusions.

Soft Skills – Interview Techniques – Job Description – Roles and Responsibilities – Work Etiquettes.

UNIT V LOGICAL REASONING AND READY RECKONERS FOR INTERVIEWS **6**

Aptitude – Input – Output Tracing – Trains – Calendar – Blood Relations.

Soft Skills – Types of Interview – Interview Process – Analyzing the Interviewer – HR Questions – Mock Interviews.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Develop numerical ability and project management skills
- Achieve quantitative skills and employability skills
- Understand both analytical and job readiness in a productive manner
- Acquire reasoning ability and interview techniques
- Obtain logical skills and interviewers expectations

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TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2017.
2. Murty G R K, "Soft Skills for Success", DGM ICFAI books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education, Sixth Edition, 2016.
2. Carnegie Dale, "How to Win Friends and Influence People", Simon and Schuster New York, 1998.
3. Thomas A Harris, "I'm OK - You're OK", Harper and Row New York, 1972.
4. Rajesh Verma, "Fast Track Objective Arithmetic", Arihant Publications (India) Limited, 2012.
5. Arun Sharma, "How to Prepare for Quantitative Aptitude for CAT", McGraw Hill Education, Eighth Edition, 2018.

Chairman
BoS/S&H

20CE607L MINI PROJECT-I

L	T	P	C
0	0	2	1

OBJECTIVES:

The student should be made to:

- Identify the real time problems.
- Analyze new solutions and techniques to the existing problems.
- Demonstrate the working principles of various models.
- Apply Civil Engineering knowledge to do a mini project.
- Acquire skills in the area of design, fabrication and modeling.

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 30 PERIODS

OUTCOMES:

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

- Understand the problems and develop solutions to it.
- Express ideas and updated technologies in a novel way.
- Implement different technical ideas and methodologies in practical aspects.
- Apply new tools, fabrication, designs, algorithms and techniques that contribute to obtain the solution in an ideal manner.
- Develop skills of team spirit and effective presentation.

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BoS(CIVIL)

20CE701 CONCRETE TECHNOLOGY **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Evaluate various requirements of cement, aggregates and water for making concrete.
- Understand various effects of admixtures on properties of concrete.
- Gain knowledge on different concepts and procedure of mix design as per IS method.
- Determine properties of concrete at fresh and hardened state.
- Execute the importance and application of special concretes.

UNIT I CONCRETE MAKING MATERIALS **9**

Cement – Chemical composition and properties – Tests on cement – IS Specifications – Hydration of cement – Aggregates – Classification, grading and tests as per BIS specification – Alkali aggregate reaction – Thermal properties of aggregates, water – Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES **9**

Accelerators – Retarders – Plasticizers – Super plasticizers – Water proofers – Mineral Admixtures like fly ash, silica fume, ground granulated blast furnace slag and metakaoline – Effects on concrete properties.

UNIT III CONCRETING METHODS AND MIX DESIGN **9**

Concrete – Manufacturing process, methods of transportation, placing, compacting and curing – Admixtures – Their effects on concrete properties – Principles of concrete mix design – Factors influencing mix design – Nominal and design mix – IS method of concrete mix design.

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE **9**

Fresh concrete – Workability – Measurement of workability – Factors affecting workability – Hardened concrete – Strength – Stress strain characteristics – segregation and bleeding – Shrinkage – Creep – Durability of concrete – Water absorption – Permeability – Corrosion test – Acid resistance.

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UNIT V SPECIAL CONCRETES **9**

Properties and applications – Light weight concrete – Ferro-cement – Fiber reinforced concrete – Polymer concrete – Air entrained concrete – High performance concrete – High strength concrete – Self compacting concrete – Vacuum concrete – Ready mix concrete – SIFCON – Geopolymer concrete.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply knowledge on various requirements of concrete making materials.
- Analyze the effect of chemical and mineral admixtures on properties of concrete.
- Understand various concreting methods and mix design procedure as per IS method.
- Recognize various fresh and hardened properties of concrete.
- Enumerate properties and applications of special concrete.

TEXT BOOKS:

1. Shetty M S, "Concrete Technology Theory and Practice", S Chand and Company Ltd, New Delhi, 2019.

REFERENCE BOOKS:

1. Gupta B L and Amit Gupta, "Concrete Technology", Jain Book Agency, 4th Edition, 2010.
2. Santhakumar A R, "Concrete Technology", Oxford University Press India, 2nd Edition, 2018.
3. IS: 10262 – 2009, Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1st Edition, 1998.

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Civil

20MG501	PRINCIPLES OF MANAGEMENT (COMMON TO CIVIL, CSE, ECE, EEE, IT AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Know about the overview of the Management
- Understand various planning tools and techniques
- Learn various structures and designs of organization
- Familiarize with various directing approaches and its impact
- Impart knowledge on the concepts and applications of controlling

UNIT I OVERVIEW OF MANAGEMENT 9

Introduction to Management and Organizations – Management Functions – Types of Managers – Managerial Roles and Skills – Evolution of Management Theory – Managing in a Global Environment – Social Responsibility and Managerial Ethics – Organization's Culture – Source, Types of Organization.

UNIT II PLANNING 9

Foundation of Planning – Purposes of Planning – Types of Plan – Process of Planning – Policies – Planning Tools and Techniques – Importance of Strategic Management – Process – Types of Organizational Strategies – MBO – Decision Making Process – Types of decision.

UNIT III ORGANISING 9

Organization Structure – Organizational Design – Departmentation – Span of Control – Centralization and Decentralization – Human Resource Management – Process – HR Planning – Recruitment – Selection –Training – Performance Management – Career Development– Forces of Managing Change – Types of Change – Innovation.

UNIT IV DIRECTING 9

Foundations of Behavior – Motivation Theories – Leadership – Functions, Style and Theories of Leadership – Team and Team work – Types , Characteristics of Teams – Communication – Process of Communication – Barrier to Effective Communication – Communication and IT.

UNIT V CONTROLLING 9

Foundation of Control – Importance, Process and Tools – Budgetary and Non-Budgetary Control Methods – Types of Budgets – Auditing – MIS – Operation System – Importance of Operations Management – Designing Operations System – Reporting.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply various managerial roles and skills
- Use planning tools and techniques for effective decision making
- Implement the applications of organizational structures
- Execute various directing approaches for effective communications
- Evaluate the applications of controlling in an organization

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BoS (MECH)

TEXT BOOKS:

1. Stephen P Robbins and Mary Coulter, "Management", Prentice Hall of India, 14th Edition, 2019.
2. James A F Stoner, Edward Freeman R and Daniel R Gilbert Jr., "Management", Pearson Education, 6th Edition, 2015.

REFERENCES:

1. Prasad L M, "Principles and Practice of Management", Sultan Chand and Sons, 10th Edition, 2020.
2. Hellriegel, Slocum and Jackson, "Management-A Competency Based Approach", Thomson South Western, 10th Edition, 2007.
3. Harold Koontz, Heinz Weihrich and Mark V Cannice, "Management-A global & Entrepreneurial Perspective", Tata Mcgraw Hill, 12th Edition, 2007.
4. Andrew J Dubrin, "Essentials of Management", Thomson South-western, 7th Edition, 2007.

CHAIRMAN
BoS (MECH)

24/1/22

20CE702L MINI PROJECT-II

L	T	P	C
0	0	2	1

OBJECTIVES:

The student should be made to:

- Execute design calculations in all structures related to the core area of civil engineering.
- Calculate loads and support conditions acting on the structures.
- Analyze specifications and data's required for the design of structures as per standards.
- Elaborate drawings in detail for the executed design.
- Evaluate skills in report preparation and project presentation.

The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than three. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

Evaluation Procedure

The method of evaluation will be as follows:

1. Internal Marks: 20 marks (Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark.
3. Viva voce examination: 50 marks (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal weight age)

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Design structures related to all specialization of civil engineering with its required standards.
- Analyze load calculations, support conditions, materials and stability requirements.
- Understand specifications, calculations and data's required for the design of structures.
- Execute drawings in different views as per design both manually and using software.
- Develop skills in innovation, report preparation, project presentation and team spirit.

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20CE801L PROJECT WORK

L	T	P	C
0	0	20	10

OBJECTIVES:

The student should be made to:

- Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
- Reproduce, improve and refine technical aspects for engineering projects.
- Critically analyze existing systems, thereby select and justify parameters to be improved.
- Achieve precision in uses of the tools related to their experiments/fabrication.
- Validate theoretical and reported data with results obtained from numerical/ experimental/ analytical study.

The objective of this course is to impart and improve the innovation of the student in peer review procedure from the prerequisites of technical knowledge as gained. This course conceives purely understanding of professional, ethical responsibilities, also review, evaluate the literature available related to chosen problem in any one of the disciplines of Civil Engineering, Formulate new expressions, ideas to solve that selected problem to enhance problem solving skill. The problem can be allotted to either an individual student or a group of students comprising of not more than three. At the end of the course the group should submit a complete report on the civil innovation problem.

The method of evaluation will be as follows:

1. Internal Marks: 20 marks (Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark.
3. Viva voce examination: 50 marks (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal weight age)

TOTAL: 300 PERIODS

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OUTCOMES:

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

- Identify thrust area in civil engineering and finalize problem statement.
- Evaluate overall technical knowledge and industry readiness.
- Analyze various applications of civil engineering in real life problem solving.
- Recognize scope of future studies.
- Develop skills in innovation, report preparation, project presentation and team spirit.

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20CE501PE INDUSTRIAL WASTE MANAGEMENT **L T P C**

(Common to AGE, BME, ECE, EEE, CSE, IT, Mech) **3 0 0 3**

OBJECTIVES:

The student should be made to:

- Understand the various characteristics of industrial waste water.
- Learn the process and mechanism of different waste water treatment process.
- Impart awareness on waste that emits from industries.
- Demonstrate biological waste water treatment process.
- Acquire knowledge on treatment of sludge and its disposal methods.

UNIT I INTRODUCTION **9**

Undesirable waste water characteristics – Characteristics of industrial waste waters – Waste water characteristics – Estimating the organic content – Measuring the efficiency toxicity – In plant waste control and waste reuse – Storm water control.

UNIT II WASTE WATER TREATMENT PROCESSES **9**

Pre and primary treatment of waste water – Equalization – Neutralization – Sedimentation – Oil separation-sour water strippers – Floatation – Coagulation, precipitation and metals removal– coagulation – Heavy metals removal – Aeration and mass transfer; mechanism of oxygen transfer – Aeration equipment – Air stripping of volatile organic compounds.

UNIT III POLLUTION FROM MAJOR INDUSTRIES **9**

Sources, Characteristics, waste treatment flow from industries such as Textiles, pulp and paper mill wastes breweries and distilleries waste, Tanneries, Pharmaceuticals, Dairy, Sugar mill wastes, Steel plants, oil Refineries, fertilizer plant waste, petrochemical complex waste, corn starch industry waste – Odour and its removal-removal color from waste waters – Waste minimization and clean technologies.

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UNIT IV BIOLOGICAL WASTE WATER TREATMENT PROCESS 9

Lagoons and stabilization basins – Aerated lagoons-activated sludge processes – Trickling filtration – Rotating biological contactors – Anaerobic decomposition-laboratory evaluation of anaerobic treatment – Adsorption – Theory of activated carbon – Sludge quality considerations – Stripping of volatile organics – Nitrification and denitrification.

UNIT V SLUDGE TREATMENT AND DISPOSAL 9

Characteristics of sludge for disposal – Aerobic digestion – Gravity thickening – Flotation thickening – Rotatary drum screen – Gravity belt thickener – Centrifugation – Vacuum filtration – Pressure filtration – Belt filter press – Sand bed drying-factors affecting dewatering performance – Land disposal of sludges – Incineration.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, learners will be able to,

- Gain knowledge on undesirable waste water characteristics.
- Understand various methods dealt with treatment of waste water.
- Illustrate various sources, types, characteristics and disposal methods of industrial waste water.
- Acquire knowledge on different types of aerobic and anaerobic waste water treatment process.
- Aware with various sludge treatment methods and its disposal.

TEXT BOOKS:

1. Wesley Eckenfelder W, Jr Industrial Water Pollution Control 3rd Edition, Mc–GrawHill Book Company, New Delhi, 2000.
2. Stephenson R L and Blackburn J B, Industrial Wastewater Systems Hand book, Lewis Publisher, New York, 1998.

REFERENCE BOOKS:

1. M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford - IBH Publication, 1995.
2. H.M. Freeman, Industrial Pollution Prevention Hand Book, McGraw-Hill Inc., New Delhi, 1995.

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20CE502PE	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
	(Common to AGE, BME, ECE, EEE, CSE, IT, Mech)	3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on ambient air quality and emission standards.
- Learn effects of meteorology on air pollution.
- Understand various types of particulate contaminants with its sources and control measures.
- Gain awareness on different types of gaseous contaminants and its preventive measures.
- Study various sources, types and control of indoor air pollutants.

UNIT I INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

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UNIT V INDOOR AIR QUALITY MANAGEMENT 9

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control- Sources and Effects of Noise Pollution – Measurement – Standards – Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the nature and characteristics of air pollutants.
- Analyze the fundamentals on effects of meteorology in air pollution.
- Design stacks and particulate air pollution control devices to meet applicable standards.
- Learn control devices of gaseous contaminants with design standards.
- Maintain indoor quality management.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York, 1995.

REFERENCE BOOKS:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C Stern, "Air Pollution (Vol. I – Vol. VIII)", Academic Press, 2006.
3. Wayne T Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc., 2000.
4. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers Pvt. Ltd., India 2002.

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20CE503PE **NON DESTRUCTIVE TESTING**

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Analyse various surface examination Non Destructive methods
- Impart knowledge on volumetric methods
- Demonstrate radiography, tomography and laminography
- Acquire knowledge about principles of condition monitoring methods
- Illustrate the procedures to be followed in special NDT methods

UNIT I SURFACE EXAMINATION METHOD **9**

Visual Inspection – Liquid Penetrant – Magnetic Particle – Eddy Current – Physical Principles, Methodology, Limitations, Applications.

UNIT II VOLUMETRIC EXAMINATION METHOD-PART1 **9**

Ultrasonic Testing – Ultrasonic NDT principles, Different types of wave modes, Physics of wave generation, reception, interactions and propagation. Calibration, data collection, quantification, and interpretation, New methods using guided waves, Resonance and other Low Frequency Methods.

UNIT III VOLUMETRIC EXAMINATION METHOD-PART2 **9**

Radiography Testing – Principles of X-ray NDT, Equipment, Calibration, Image Collection, Quantification, and Interpretation. High power sources and high quality films. Digital Radiography, Introduction to Tomography and Laminography.

UNIT IV CONDITION MONITORING METHOD **9**

Thermography – Principles of thermography and approaches in NDT, Sources and detectors, capabilities and limitations, measurement of diffusivity and wall thickness. Infrared Testing – Vibration Analysis.

UNIT V SPECIAL NDT METHODS **9**

Introduction to special NDT methods – magnetic resonance imaging, vibration monitoring, laser ultrasonic, holography, computed tomography.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Identify the problem in structures by visual inspection without any special instruments
- Examine the quality of structures/materials by ultrasonic test and its principles with help of data from equipment's and methods
- Understand the quality of structures/materials by radiography with principals of X ray and its principles with help of digital radiography, image collection
- Develop the quality of structures/materials by thermography approach with help sources and detectors and more technique
- Exposed to latest techniques/methods in adopted in NDT method

TEXT BOOKS:

1. Shull P J, "Nondestructive Evaluation – Theory, Techniques, and Applications", Marcell Decker Inc., 2016.
2. Bray D E and Stanley R K, "Nondestructive Evaluation - A Tool in Design, Manufacturing and Service", CRC Press, Revised Edition, 1997.

REFERENCES:

1. Breysse D, "Non-Destructive Assessment of Concrete Structures: Reliability and Limits of Single and Combined Techniques", Springer Publishers, 2012.
2. NDT Handbooks, Vol 1 – 17, ASNT Press, OH, USA.

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20CE504PE **IRRIGATION ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand basic types of irrigation, irrigation standards and crop water assessment
- Comprehend different methods of irrigation
- Design of canal structures as per IS Code practice
- Acquire knowledge about diversion and impounding structures
- Understand various issues connected with irrigation water management

UNIT I INTRODUCTION **9**

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop seasons – Consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and development of irrigation projects.

UNIT II IRRIGATION METHODS **9**

Canal irrigation – Lift irrigation – Surface and sub-surface methods of application of water – Sprinkler and drip irrigation methods.

UNIT III CANAL IRRIGATION STRUCTURES **9**

Alignment of canals – classification of canals – Design of canals based on Kennedy's and Lacey's silt theories – canal drops – hydraulic design of drops – cross drainage works – Hydraulic design of cross drainage works – canal head works – canal regulators – River training works.

UNIT IV DIVERSION AND IMPOUNDING STRUCTURES **9**

Weirs – elementary profile of a weir – weirs on pervious foundations – types of impounding structures – percolation – Tanks – sluice and tank surplus weir – Factors affecting location and type of dams – Forces on dam – Gravity dam – Earth dam – Arch dam – Hydraulic design – Spillways – Types of spillways.

UNIT V IRRIGATION WATER MANAGEMENT **9**

Need for canal irrigation management – methods for improving canal irrigation management – inadequacies – water delivery systems – Delivery of water to farms – operation and maintenance – performance evaluation.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Assess different irrigation needs of crops
- Select suitable methods of irrigation
- Design various types of canal irrigation structures
- Select and design suitable type of dam based on the requirement
- Learn canal irrigation water management by understanding its operation and maintenance

TEXT BOOKS:

1. Garg S K, "Irrigation Engineering and Hydraulic structures", Khanna Publishers, New Delhi, 2010.
2. Asawa G L, "Irrigation Engineering", New Age International Publishers, 2010.

REFERENCES:

1. Sharma R K, "Irrigation Engineering", S Chand and Co., Pvt. Ltd., 2007.
2. Dilipkumar Majumdar, "Irrigation Water Management (Principles and Practice)", Prentice Hall of India Pvt., Ltd., 2009.

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20CE505PE **REMOTE SENSING ESSENTIALS** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Analyse the basic concepts of remote sensing
- Understand types of platforms and sensors
- Determine types of data products and image analysis
- Impart knowledge on spatial resolution and satellite applications
- Illustrate images interpretation and its applications

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL **9**

Rudiments of remote sensing and advantages – Historical Perspective of development of remote sensing technology – EM spectrum, solar reflection and thermal emission – Interaction of EM radiation with atmosphere including atmospheric scattering, absorption and emission – Interaction mechanisms of EM radiation with ground, spectral response curves – Laws of Radiation and their relevance in Remote Sensing – Basics of remote sensing image representation – Various Remote Sensing Platforms – Multi-spectral scanners and imaging devices – Significant characteristics of LANDSAT, SPOT, Sentinel sensors.

UNIT II PLATFORMS AND SENSORS **9**

Prominent characteristics of IRS, Cartosat Resource Sat sensors – Unmanned Aerial Vehicle / Drone – Passive Microwave Remote Sensing – Image characteristics and different resolutions in Remote Sensing – Different techniques of Image acquisition – Importance of digital image processing – Digital Image Processing Software – Basic image enhancement techniques – Colour representations and transforms – Image Histograms and statistics.

UNIT III IMAGE ANALYSIS **9**

Atmospheric errors and corrections – Geo referencing Techniques – Digital Image Processing Software – Image enhancement techniques – Digital Image Processing Software – Spatial Filtering Techniques, Band rationing and PCA – Frequency Domain Fourier Transformation, Digital Image Processing Software – Unsupervised image classification and density slicing techniques.

UNIT IV SPATIAL RESOLUTION AND SATELLITE APPLICATION **9**

Supervised image classification techniques and limitations – Digital Image Processing Software – LiDAR Technique and applications – Mosaicking, subsets, sub-sampling techniques and applications – False Topographic Phenomena and correction techniques – High Spatial Resolution Satellite Images and limitations – Basic Image Compression techniques and different image file formats, Hyper spectral Remote Sensing – Digital Image Vs Digital Photograph.

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UNIT V IMAGES INTERPRETATION AND APPLICATIONS 9

NDVI and other indices – Active Microwave Remote Sensing – Radar Images interpretation and applications – SAR Interferometry (InSAR) Technique – Principles of image interpretation – Image interpretation of different geological landforms, rock types and structures – Remote Sensing of Moon and Mars – Google Earth and its Applications.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand basics of EMR and its interaction with atmosphere
- Identify the types of platforms and sensors in remote sensing
- Interpret and enhance the image for analysis
- Develop knowledge with usage of spatial Resolution and satellite application
- Analyze the image interpretation and its applications

TEXT BOOKS:

1. Anji Reddy, "Remote Sensing and Graphical Information Systems" BS Publication, 2008.
2. Dr Kumar S, " Basic of Remote Sensing and GIS", Laxmi Publication, 2017.

REFERENCES:

1. James B Campbell and Randolph H, "Introduction to Remote Sensing", The Guildford Press, New York, 5th Edition, 2012.
2. Lillesand T M, Kiefer R W and Chapman J W, "Remote Sensing and Image Interpretation", John Wiley and Sons, 5th Edition, 2007.
3. Gupta R P, "Remote Sensing Geology", Springer, 2nd Edition, 2003.
4. Drury S A, "Image Interpretation in Geology", Allen and Unwin, 2nd Edition, 1993.
5. Cracknell A P, "Introduction to Remote Sensing", Taylor and Francis, London, 2nd Edition, 1991.

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20CE506PE **HYDROLOGY** L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand different measurement methods of rainfall
- Estimate evaporation and infiltration losses using various methods
- Determine various forms of unit hydrograph with its applications
- Acquire knowledge on flood routing, flood control and mitigation measures
- Educate various types of aquifers and methods of computing yield from well

UNIT I PRECIPITATION 9

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, and frequency relationship – Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION 9

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration Process – Infiltration Capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III HYDROGRAPHS 9

Factors affecting hydrograph – Base flow separation – Unit Hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations – Synthetic unit hydrograph.

UNIT IV FLOODS AND FLOOD ROUTING 9

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's channel routing – Flood control.

UNIT V GROUND WATER HYDROLOGY 9

Types of Aquifers – Darcy's Law – Dupuit's assumptions – Confined aquifer – Unconfined aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only – Methods of computing yield from a well – Well losses – Various methods of well construction.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Understand different forms of precipitation
- Determine the magnitude of infiltration and evaporation and evapotranspiration by various empirical methods
- Estimate means areal precipitation and their significance in design of various hydraulic structures
- Evaluate flood frequency studies and flood routing by various methods
- Calculate yield of groundwater flow by applying different methods

TEXT BOOKS:

1. Subramanya K, "Engineering Hydrology", Tata McGraw Hill Publishing Co., Ltd., 2000.
2. Raghunath H M, "Hydrology", Wiley Eastern Ltd., 2000.

REFERENCES:

1. Chow V T and Maidment, "Hydrology for Engineers", McGraw Hill Inc., Ltd., 2000.
2. Singh V P, "Hydrology", McGraw Hill Inc., Ltd., 2000.

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20CE601PE GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Identify the problems in soil and apply suitable remedial measures to improve their behavior.
- Acquire knowledge on various dewatering techniques.
- Execute various in situ treatment of cohesion less and cohesive soils.
- Demonstrate concept of earth reinforcement and their roles in geotextiles.
- Understand various equipments and working principles of grouting methods.

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 9

Role of ground improvement in foundation engineering -- Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING 9

Dewatering Techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two – Dimensional flow for fully and partially penetrated slots in homogeneous deposits – Simple cases – Design.

UNIT III IN SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

In situ densification of cohesionless soils and consolidation of cohesive soils: Dynamic compaction vibro flotation, sand compaction piles and deep compaction – Consolidation: preloading with sand drains, and fabric drains, stone columns and lime piles – Installation techniques – Simple design – Relative merits of above methods and their limitations.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design – Applications of reinforced earth – Role of geo textiles in filtration, drainage, separation, road works and containment.

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UNIT V GROUTING TECHNIQUES 9

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil –Sheet Piling Techniques.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Evaluate various problems in different types of soil and providing suitable improvement techniques to it.
- Attain knowledge on dewatering techniques and seepage analysis.
- Identify the problems in cohesion less and cohesive soils and apply suitable in situ treatment.
- Acquire knowledge on concepts of earth reinforcement, its types and applications.
- Apply different types of grouting techniques.

TEXT BOOKS:

1. Purushothama Raj P, "Ground Improvement Techniques", Firewall Media, 1st Edition, 2005.
2. Mittal S, "An Introduction to Ground Improvement Engineering", Medtech Publishers, 1st Edition, 2013.

REFERENCE BOOKS:

1. Moseley M P and Kirsch K "Ground Improvement" Spon Press, 2nd Edition, 2004.
2. Das B M, "Principles of Foundation Engineering", Cengage Learning, 7th Edition, 2010.
3. Jones J E P, "Earth Reinforcement and Soil Structure", Thomas Telford Publishing, 3rd Edition, 1996.
4. Coduto, D P, Man - Chu Ronald Yeung William A Kitch "Geotechnical Engineering Principles and Practices", Pearson Publishers, 2nd Edition, 2011.

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20CE602PE ROCK ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand concepts of formation and classification of rocks.
- Evaluate testing of rocks to understand failure mechanism.
- Analyze elastic stress distribution and displacements around circular tunnels.
- Determine strength criteria for isotropic and anisotropic rocks using different criteria.
- Gain knowledge on rock mechanics and various failures in rocks.

UNIT I ROCK FORMATION & ENGINEERING CLASSIFICATION **9**

Introduction – Minerals and rock classes – Mineral identification procedure – Rock Identification procedure – Geologically structures and discontinuities – Shear tests – Engineering classification of Intact rocks, RQD – Concept of rock mass, Factors affecting discontinuities – Classification of rock mass – Rock mass rating(RMR), Rock mass quality (Q – system) – Geological strength Index (GSI).

UNIT II TESTING OF ROCKS **9**

Spherical representation of geological data – Application of Graphical Representation of Geological Data – Laboratory testing of rocks – Sampling – Preparation & UCS – Factors influencing UCS & Modes of failure in compression – Failure mechanism and post failure behavior in compression, indirect method for UCS – Brazilian test, Schnidt rebound hardness Test – Sound velocity test – Shake durability test, swelling pressure and free swell test & void index test.

UNIT III TUNNELING **9**

Tunneling – Ground conditions – Elastic stress distribution around circular tunnels – Elastic analysis of circular tunnels – Displacements – Thick wall cylinder in Biaxial field.

UNIT IV ROCK STABILISATION **9**

Strength criteria for isotropic and anisotropic rock – Mohr failure theory – Mohrs coulomb failure criterion – Coulomb navier failure criterion – Concept of instantaneous C and I – Balmer approach – Empirical failure criteria – Basics of regression analysis – Hoek and brown criterion.

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– Parameter of failure criteria – Failure criteria for rock mass – Tunneling – Underground excavations – Rock slope stability – Circular failure – Toppling failure.

UNIT V ROCK MECHANICS IN ENGINEERING 9

Elasto plastic stress distribution around circular tunnel – Underground excavation failure mechanisms – Structurally controlled failure – Roof failure – Sidewall failures – Rock mass support interaction analysis (1&2) – Plane failure – Wedge failure – Foundation on weak rocks – Ultimate bearing capacity using bella's approach – Bearing capacity from classification approaches and based on UCS – Bearing capacity based on plate load test – Treatment of foundations – Dam foundation problems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze identification of rock, mineral classes and rock mass rating and quality.
- Develop skills on spherical representation of geological data and conduct various direct and indirect tests on rocks.
- Acquire knowledge on tunneling, ground conditions and elastic analysis.
- Evaluate Mohr-coulomb failure criterion, failure criteria of rock masses and underground excavations
- Execute structurally controlled failure, ultimate bearing capacity in rocks.

TEXT BOOKS:

1. Richard E Goodman, "Introduction to Rock Mechanics", John Wiley & Sons, 2nd Edition, 2010.
2. Ramamurthy T, "Engineering in Rocks for Slopes, Foundations and Tunnels", PHI Learning Pvt. Ltd, New Delhi, 2014.

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REFERENCE BOOKS:

1. Hoek, E and Bray J W, "Rock Slope Engineering", The Institution of Mining and Metallurgy, London, 3rd Edition, 1981.
2. Jaeger J G, Cook N G W and Zimmerman R W, "Fundamentals of Rock Mechanics", Blackwell Publishing, 4th Edition, 2007.
3. Bhawani Singh and Goel R K, "Engineering Rock Mass Classification", Oxford, UK, Elsevier Inc, 2011.
4. Ducan C Wyllie and Christopher W Mah, "Rock Slope Engineering, Civil and Mining", CRC Press, 4th Edition, 2004

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20CE603PE URBAN PLANNING AND DEVELOPMENT **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on introduction to urban transportation planning.
- Analyze the different types, methods of module C trip generation.
- Understand the concepts, types and various methods of module D trip distribution.
- Learn the various types and effects of module E modal split.
- Gain knowledge on various trips, directions, network properties and algorithm, curves of module F traffic assignment.

UNIT I INTRODUCTION TO URBAN TRANSPORTATION PLANNING **9**

Urbanization – Urban transportation – Impacts – Behavioral changes – Urban transportation problems and externalities – Congestion – Safety – Emissions – Introduction to transport planning – Transport planning morphology – Problem definition – Solution generation – Solution analysis, evaluation and choice – Implementation – Hierarchical levels of urban transport planning – Conceptual plan – Outline plan – Master plans, statutory or advisory plans – Detailed development plans.

UNIT II MODULE-C: TRIP GENERATION **9**

Introduction – Basic considerations in trip generation – Amount of urban activity – Character of urban activity – Other considerations – Special generators – Trip classification – Factors affecting trip generation – Methods of trip generation – Regression analysis – Trip rate analysis – Cross classification analysis – Multiple linear regression – Regression analysis concept – Multiple linear regression – Trip generation model calibration.

UNIT III MODULE-D: TRIP DISTRIBUTION **9**

Introduction – Basic considerations in trip distribution – P-A matrix to O-D matrix – Factors affecting trip distribution – Properties of transport network, spatial separation between various zones growth factor methods – Uniform factor method, Average factor method, Detroit method, Fratar method – Furness method, Synthetic methods – Introduction to gravity model – Calibration – BPR approach of calibration intervening opportunities model – Concept – Advantages and limitations.

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UNIT IV MODULE-E: MODAL SPLIT **9**

Introduction – Types of modal split models – Trip end type and trip interchange type – Limitations – Aggregate and disaggregate models – Elements of choice decision process – Utility theory – Probabilistic choice theory – Binary choice models – Binary logit model, discriminant analysis and probit analysis – Logit model – Multinomial logit model – Nested logit model, estimation of logit models, two-stage modal split models.

UNIT IV MODULE-F: TRAFFIC ASSIGNMENT **9**

Person trips and vehicle trips – Diurnal patterns of demand – Trip directions – Network properties – Characteristics of link (capacity, free flow speed and travel time), link flows – Zonal flows – Network connectivity, minimum spanning tree and shortest path – Network algorithms – Kruskal, prims Dijkstra and Floyd – Route choice behavior – User equilibrium – System equilibrium – Stochastic equilibrium – Diversion curves – California diversion curves – Detroit diversion curves – Bureau of public roads diversion curves.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the concepts of urban transportation planning.
- Execute the various methods, characters of module C trip generation and calibration.
- Evaluate the different concepts of module D trip distribution.
- Analyze the types, limitations, and elements of module E modal split.
- Attain knowledge on various concepts of module F traffic assignment.

TEXT BOOKS:

1. Kadiyali L R, "Traffic Engineering and Transport Planning", Khanna Publishers, 9th Edition, 2017.

REFERENCE BOOKS:

1. Jotin Khisty C and Kent Lall B, "Transportation Engineering", Pearson Publishers, 3rd Edition, 2017.
2. Papacostas C S and Prevedouros P D, "Transportation Engineering and Planning", Pearson Education India, 3rd Edition, 2015.

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20CE604PE ADVANCED RC DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on limit state design of special structural members such as continuous beams, curved beams, deep beams and corbels.
- Design various types of slabs and grid floor as per IS code of practices.
- Calculate deflection and crack width considering limit state of serviceability.
- Acquire knowledge on design of RC wall, shear wall and ductile detailing.
- Develop skills on ultimate load analysis and inelastic behavior of RC structures.

UNIT I SPECIAL STRUCTURAL MEMBERS **9**

Design of RC beams – Continuous beams, Curved beams and Deep beams – Design of Corbels.

UNIT II DESIGN OF SLABS AND YIELD LINE THEORY **9**

Assumptions – Yield line patterns for various types of slabs with different boundary conditions – Yield line theory of slabs – Virtual work method – Equilibrium methods – Hillerborg method of design – Design of flat slabs – Design of grid floors as per IS: 456.

UNIT III LIMIT STATE OF SERVICEABILITY **9**

Parameters considered in limit state of serviceability – Short term deflection – Long term deflection – Calculation of deflections in beams under working loads – Calculation of crack width in beams.

UNIT IV DESIGN OF RC WALL AND DUCTILE DETAILING **9**

Design of RC walls – Shear walls – Concepts of ductility – Factors influencing ductility – Design principles and codal provisions.

UNIT V ULTIMATE LOAD ANALYSIS AND INELASTIC BEHAVIOUR **9**

Whitney's theory – Ultimate load analysis – Moment redistribution and moment rotation characteristics of a R.C. section – Plastic hinges check for rotation capacity of sections – Concept of moment – Rotation curves.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Design continuous beams, curved beams, deep beams and corbels as per IS practices.
- Analysis of RC slabs using yield line theory and design of flat slab and grid floor.
- Execute calculation of deflection and crack width for serviceability conditions as per code practice.
- Apply concepts of ductile detailing and design RC walls and shear walls.
- Evaluate ultimate load analysis and moment redistribution, moment rotation characteristics of RC sections.

TEXT BOOKS:

1. Unnikrishna Pillai S and Devados Menon, "Reinforced Concrete Design", Tata McGraw Hill Education, 2015.
2. Varghese P C, "Advanced Reinforced Concrete Design", Prentice Hall International Edition, 2nd Edition, 2011.

REFERENCE BOOKS:

1. Krishnaraju N, "Advanced Reinforced Concrete Design", CBS Publishers and Distributors, 2017.
2. Park P and Paulay T, "Reinforced Concrete Structures", John Wiley Sons, 2008.
3. Gambhir M L, "Design of Reinforced Concrete Structures", Prentice Hall of India, 2012.
4. Sinha S N, "Handbook of Reinforced Concrete Design", Tata McGraw Hill Education, 2017.

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20MG802PE	ENGINEERING ECONOMICS (COMMON TO CIVIL AND MECH)	L T P C 3 0 0 3

OBJECTIVES:

The Students should be made to:

- Understand the fundamentals of engineering economics and cost analysis
- Impart knowledge on value engineering and time value of money
- Know about the methods of cash flow
- Familiarize with the concepts of replacement and maintenance analysis
- Learn the various methods of depreciation and inflation factors

(Use of Interest Tables is permitted)

UNIT I INTRODUCTION TO ECONOMICS 9

Introduction to economics – flow in an economy, law of supply and demand – concept of engineering economics – engineering efficiency – economic efficiency – scope of engineering economics – elements of cost – marginal cost, marginal revenue, sunk cost and opportunity cost – breakeven analysis – PV ratio – elementary economic analysis – material selection for product – design selection for product – process planning.

UNIT II VALUE ENGINEERING 9

Make or buy decision – value engineering – aim, function and procedure – interest formulae and their applications – time value of money – single payment compound amount factor – single payment present worth amount factor – equal payment series compound amount factor – equal payment series sinking fund factor – equal payment series payment present worth amount factor – equal payment series capital recovery amount factor – uniform gradient series annual equivalent amount factor – effective interest rate – examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method - revenue dominated and cost dominated cash flow – future worth method - revenue dominated and cost dominated cash flow – annual equivalent method - revenue dominated and cost dominated cash flow – rate of return method – examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Introduction – types of maintenance – types of replacement problem – determination of economic life of an asset – replacement of an asset with a new asset – capital recovery with return – concept of challenger and defender – simple probabilistic model for items which fails completely.

UNIT V DEPRECIATION 9

Introduction – straight line method of depreciation – declining balance method of depreciation – sum of the years digits method of depreciation – sinking fund method of depreciation – service output method of depreciation – evaluation of public alternatives – inflation adjusted decisions - procedures – examples on comparison of alternatives and determination of economic life of asset.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Apply the basics of economics and cost analysis to take economically sound decisions
- Analyze the make or buy decision and applications of time value of money
- Evaluate the investment decision by using cash flow methods
- Describe the replacement and maintenance analysis for improvement
- Gain the knowledge on depreciation, inflation and cost benefit ratio

TEXT BOOKS:

1. Panneer Selvam R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2nd Edition, 2013.
2. Chan S Park, "Contemporary Engineering Economics", Pearson Education, 6th Edition, 2015.

REFERENCES:

1. Degarmo E P, Sullivan W G and Canada J R, "Engineering Economy", Macmillan, New York, 7th Edition, 2011.
2. Donald G Newman, Jerome P Lavelle, "Engineering Economics and analysis", Oxford University Press, 8th Edition, 2017.
3. Zahid A khan, Arshad Noor Siddiquee and Brajesh Kumar, "Engineering Economy", Pearson Education, New Delhi, 1st Edition, 2012.

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20CE605PE GEO-ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge on sources, production, classification of waste, causes of soil pollution and failures of foundation due to waste movement.
- Understand stability of landfills, current practice of waste disposal, passive containment system and application of geosynthetics.
- Learn contaminant transport in sub surface, contaminant transformation, and ground water pollution.
- Acquire knowledge on stabilization, solidification of wastes and utilization of solid waste for soil improvement.
- Assess remediation methods of contaminated soils.

UNIT I GENERATION OF WASTES AND CONSQUENCES OF SOIL POLLUTION **9**

Introduction to Geo environmental engineering – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals – Failures of foundation due to waste movement.

UNIT II SITE SELECTION AND SAFE DISPOSAL OF WASTE **9**

Safe disposal of waste – Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Biomedical Waste- Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

UNIT III TRANSPORT OF CONTAMINANTS **9**

Contaminant transport in sub surface – Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

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UNIT IV WASTE STABILIZATION **9**

Stabilization - Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – Case studies.

UNIT V REMEDIATION OF CONTAMINATED SOILS **9**

Exsitu and Insitu remediation – Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Assess the contamination in the soil.
- Understand the current practice of waste disposal.
- Prepare the suitable disposal system for particular waste.
- Stabilize the waste and utilization of solid waste for soil improvement.
- Select suitable remediation methods based on contamination.

TEXT BOOKS:

1. Hari D Sharma and Krishna R Reddy, "Geo-Environmental Engineering", John Wiley and Sons, INC, USA, 2004.
2. Daniel B E, "Geotechnical Practice for Waste Disposal", Chapman & Hall, London, 1st Edition, 1993.
3. Manoj Datta, "Waste Disposal in Engineered Landfills", Narosa Publishing House, 1997.

REFERENCE BOOKS:

1. Westlake K, "Landfill Waste Pollution and Control", Albion Publishing Ltd., England, 1st Edition, 1995.
2. Wentz C A, "Hazardous Waste Management", McGraw Hill, Singapore, 1989.
3. Proceedings of the International symposium on "Environmental Geotechnology" (Vol.I and II). Environmental Publishing Company, 1986 and 1989.
4. Ott W R, "Environmental Indices, Theory and Practice", Ann Arbor, 1978.

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CIVIL

20MA601PE **QUANTITATIVE AND REASONING APTITUDE**
(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Sense the problems and develop strategies to find the solutions.
- Derive conclusions and make decision by analyzing mathematical functions.
- Build the right decision quantitatively based on the situations that depends upon the factors.
- Evaluate the validity and possible biases in the arguments presented in authentic contexts based on multiple sources of quantitative information.
- Do aptitude actively such as analyzing data, constructing hypotheses, solving problems, reflecting on their work and making connections.

UNIT I QUANTITATIVE ANALYSIS ON NUMBERS AND PERCENTAGE **9**

Numbers - Simplification – H.C.F and L.C.M of Numbers – Square Root and Cube Root – Surds and Indices – finding Unit and Last two digits of given expression – Remainder Theorem - Average -Logarithm - Percentage – Profit, Loss and Discount.

UNIT II ANALYSIS ON EFFICIENCY, TIME AND SPEED **9**

Simple Interest – Compound Interest - Time and Work – Pipes and Cistern – Chain rule - Time, Speed, Distance – Trains - Boats and streams- Races and games – Calendar -Clocks - Crypt arithmetic Problems.

UNIT III ANALYTICAL THINKING ABILITY OF RATIO & PROPORTION AND PROBABILITY **9**

Ratio and Proportion -Problems on Ages – Partnership – Alligation or Mixture - Permutation and Combination – Probability - Height and Distance – Trigonometry–Mensuration (Two dimensional and Three dimensional figures) - Data Interpretation.

UNIT IV REASONING ABILITY – I **9**

Series Completion – Coding and Decoding - Odd man out - Blood Relations - Sequential output Tracing – Analogy – Direction Sense Test - Classification - Ranking - Seating Arrangements - Dice – Cubes and Cuboids.

UNIT V REASONING ABILITY – II **9**

Syllogism – Statement and Conclusion -Statement and Assumption – Cause and effect - Transformation of Matrices - Matrix Reasoning - Mirror and Water Image – Paper folding – Completion of incomplete pattern- Embedded Images.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Solve a real-time problem which requires interpretation and comparison of complex numeric summaries.
- Get reason, models, and draw the conclusions or make decisions with mathematical, statistical and quantitative information.
- Justify and communicate effectively with conclusions in the appropriate ways to the audience.
- Apply probabilistic reason to draw conclusions, to make decisions, and to evaluate outcomes of decisions.
- Perceive success in future courses, gain skills for the workplace, and participate as a productive citizens in society.

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing; New Delhi, Revised edition, 2017.
2. Aggarwal R S, "A Modern Approach to Verbal and Non – Verbal Reasoning", S Chand Publishing; New Delhi, Revised edition, 2018.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; 6th edition, 2016.
2. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; 8th edition, 2018.
3. Kailash Chandra and Sunil Kumar, "General Intelligence and Reasoning (Verbal and Non – Verbal)", Arihant Publications, 13th edition, 2019.
4. Anand P A and Lalith Singh, "Wiley's Verbal Ability and Reasoning for Competitive Examinations", 2016.

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24/6/24

20CE701PE ADVANCED STEEL DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on eccentric and moment connections.
- Analyze and design industrial structures as per standards.
- Design steel truss girder bridges as per IS requirements.
- Develop design skills of steel bunkers and silos.
- Evaluate basic concepts of cold formed steel structures.

UNIT I ECCENTRIC AND MOMENT CONNECTIONS **9**

Introduction – Beams – Column connections – Connections subjected to eccentric shear – Bolted framed connections – Bolted seat connections – Bolted bracket connections – Bolted moment connections – Welded framed connections – Welded bracket connections – Moment resistant connections.

UNIT II ANALYSIS AND DESIGN OF INDUSTRIAL STRUCTURES **9**

Dead loads, live loads and wind loads on roofs – Design wind speed and pressure, wind pressure on roofs, wind effect on cladding and louvers – Design of angular roof truss, tubular truss, truss for a railway platform – Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions – Design of bracings.

UNIT III DESIGN OF STEEL TRUSS GIRDER BRIDGES **9**

Types of truss bridges – Component parts of a truss bridge – Economic proportions of trusses and self weight of truss girders – Design of bridge compression members, tension members – Wind load on truss girder bridges – Wind effect on top lateral bracing – Bottom lateral bracing – Portal bracing and sway bracing.

UNIT IV DESIGN OF STEEL BUNKERS AND SILOS **9**

Introduction – Janseen's theory – Airy's theory – Design of Parameters – Design criteria – Analysis of bins – Hopper bottom – Design of bins.

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UNIT V COLD FORMED STEEL STRUCTURES **9**

Introduction – Advantages of cold formed steel sections – Types of stiffened and unstiffened elements – Local buckling -- Lateral buckling – Empirical methods – Z Purlins – Design rules PEB buildings – Steel concrete composite constructions.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand beam-column connections subjected to eccentric shear and moment
- Calculate various loads subjected to industrial structures and design its components as per standards
- Execute design of different types of steel truss girder bridges
- Analyze stability and design criteria of various components of steel bunkers and silos
- Attain knowledge on concepts, types, advantages and design rules of cold formed steel structures

TEXT BOOKS:

1. Duggal S K, "Limit State Design of Steel Structures", Tata Mcgraw Hill, New Delhi, 3rd Edition, 2019.

REFERENCE BOOKS:

1. Subramanian, "Design of Steel Structures", Oxford University Press, 2018.
2. Dr Ramachandra and Gehlot Virendra, "Design of Steel Structures – II", Scientific Publishers, 2015.
3. Rhodes J and Lawson R M "Design of Structures using Cold Formed Steel Sections", SCI Publication 089, The Steel Construction Institute, U.K. 1992.
4. Ponnuswamy S, "Bridge Engineering", Tata McGraw Hill, New Delhi, 2017.
5. IS 800 – 2007, General Construction in Steel – Code of Practice, Steel Tables.

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20CE702PE	PRESTRESSED CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on basic principles and methods of prestressing in structures.
- Design of pre-tensioned and post-tensioned sections for flexure and shear.
- Calculate deflections due to creep and shrinkage and design anchorage zone reinforcement.
- Analyze and design composite and continuous beams.
- Understand design concepts of prestressed water tanks, pipes, and compression, tension members.

UNIT I INTRODUCTION **9**

Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel Blaton, LeeMc Call and Killick anchorage systems – Analysis of sections for stresses by stress concept, strength concept and load balancing concept – Calculation of losses of prestress in pretension and post tension.

UNIT II DESIGN FOR FLEXURE AND SHEAR **9**

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per IS1343 Code – Design of section for flexure – Design of sections of type I and type II post – tensioned and pre – Tensioned beams – Check for strength limit state based on IS 1343 Code – Location of wires in pre-tensioned beams – Design for shear based on IS1343 code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE **9**

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection – Determination of anchorage zone stresses in post – Tensioned beams by Magnel's method, Guyon's method and IS 1343 code – Design of anchorage zone reinforcement.

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UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Types of RCC – PSC composite beams – Analysis and design of composite beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tanks, pipes, and compression, tension members – Use of non-prestressed reinforcement – Definition, methods of achieving, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the behavior of pre stressed concrete structural elements.
- Design the pre stressed concrete members for flexure and shear as per IS code.
- Analyze deflection of prestressed concrete members and design anchorage zone.
- Determine secondary moments and stresses acting on composite and continuous beams.
- Evaluate design principles of pre stressed concrete structures such as sleepers, tanks, pipes and poles.

TEXT BOOKS:

1. Krishna Raju N, "Prestressed concrete", Tata McGraw Hill Company, New Delhi, 5th Edition, 2018.
2. Pandit G S and Gupta S P, "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd., 2016.

REFERENCE BOOKS:

1. Rajagopalan N, "Prestressed Concrete", Narosa Publishing House, 2nd Edition, 2017.
2. Dayaratnam P, "Prestressed Concrete Structures", Oxford and IBH, 6th Edition, 2018.
3. Lin T Y and Ned H Burns, "Design of Prestressed Concrete Structures", Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.
5. IS: 3370 – 2008 (Part 4), Indian standard Code of practice for Concrete Structures for the Storage of Liquid – Design Tables, Code of Practice, Bureau of Indian Standards, New Delhi.

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20/6/24

20CE703PE	PRECAST TECHNOLOGY IN BUILDING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of various types of precast concrete structures.
- Impart knowledge on various precast structural systems.
- Calculate various loads acting on shear walls and to check stability of precast concrete structures.
- Analyze concepts and principles of various precast concrete elements.
- Acquire skills to learn production methods for various special concrete.

UNIT I INTRODUCTION **9**

Definition – Precast concrete – Materials used in precast structures – Concrete – Steel reinforcement – Structural steel and bolts – Non-cementitious materials – Types of precast concrete structures – Connections for precast concrete construction – Purlin supports – Roof beam supports – Floor slab supports – Down stand beam supports – Wall element supports – Column/foundation.

UNIT II PRECAST STRUCTURAL SYSTEMS **9**

Precast concrete floors options – Floor arrangements – Precast concrete beams – Non-composite reinforced concrete beams – Composite reinforced beams – Non-composite pre stressed beams – Composite pre stressed – Propping – Horizontal interface shear – Production, transport and Erection – Sustainability.

UNIT III STABILITY OF PRECAST CONCRETE STRUCTURES **9**

Introduction – Loads on stability components – Wind load case – Out of plumb load case – Seismic load case – Restraint load case (shrinkage and temperature) – Load bearing members for stability – Typical stability elements – Shear wall – Segmented shear walls – Shear walls with large openings – Frames and girders – Three dimensional systems – Plates made from precast concrete elements – Arrangement of stability elements – Distribution of horizontal loads – Construction details – Floor diaphragms – Shear walls.

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UNIT IV PRECAST CONCRETE ELEMENTS **9**

Floor and roof elements – Solid slabs – Hollow core slabs – Prestressed hollow core slabs – Conventionally reinforced hollow – Core slabs – Precast floor plates with in situ concrete topping – Prestressed precast floor plates with in situ concrete topping – Ribbed elements – Other floor systems – Beams – Purlins, frame beams, down stand beams – Roof beams – Columns – Walls – Precast concrete wall elements – Foundations – Monolithic foundations – Pocket and pad foundations – Punching shear – Other types of foundation .

UNIT V PRODUCTION **9**

Production methods – Production using fixed moulds – Concretes for precast concrete elements – Fresh concretes – Hardened concretes – Ultra high performance concretes – Self compacting concretes – Fiber reinforced concretes – Heat treatment and curing – Reinforcement – Bending and assembling reinforcement – Pre tensioning in prestressing beds – Quality assurance.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain knowledge on various types of precast structures with its support conditions.
- Analyze composite and non-composite reinforced and pre stressed beams.
- Check stability of precast concrete structures with its different load conditions.
- Determine working principles of various precast concrete elements.
- Evaluate production methods, strength properties and applications of ultra high performance and high strength concrete.

TEXT BOOKS:

1. Alfred Steinle, Hubert Bachmann and Mathias Tillmann, "Precast Concrete Structures", 2nd Edition, 2019.

REFERENCE BOOKS:

1. Elliot and Kim S "Precast Concrete Construction" Butterworth Heinemann Publications, 2002.

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24/6/22

20CE704PE MODERN CONSTRUCTION MATERIALS **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn engineering and technology of materials.
- Understand atomic bonding, structure of solids and movement of atoms in solids.
- Gain knowledge on fracture mechanics.
- Analyze concepts of wood and wood products and fiber reinforced polymer.
- Execute water proofing, floor finish techniques.

UNIT I BASICS AND CLOSURE **9**

Prologue – Introduction to the course – Science, engineering and technology of materials – Environmental concerns – Social perception of construction materials – Closure.

UNIT II MICROSTRUCTURE **9**

Atomic bonding – Structure of solids – Movement of atoms – Development of microstructure.

UNIT III MATERIAL BEHAVIOUR **9**

Surface properties – Response to stress – Failure theories – Fracture mechanics – Rheology - Thermal properties.

UNIT IV STRUCTURAL MATERIALS **9**

Review of construction materials and criteria for selection – Wood and wood products – Polymers – Fiber reinforced polymers – Metals – Bituminous materials – Concrete – Glass.

UNIT NON-STRUCTURAL MATERIALS, ACCESSORIES AND FINISHES **9**

Review of non-structural materials and criteria for selection - Waterproofing materials - Polymer Floor finishes – Paints – Tiles – Acoustic treatment – Dry walls – Anchors.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Analyze different modern materials used in construction.
- Develop skills to learn development of microstructure and movement of atoms in solids.
- Elaborate fracture theories and mechanics.
- Acquire knowledge about wood products, bituminous material and fiber reinforced polymer.
- Execute water proof techniques, floor finishes and anchors.

TEXT BOOKS:

1. Varghese P C, "Building Materials", Prentice Hall India Learning Private Limited, 2nd Edition, 2015.

REFERENCE BOOKS:

1. Raghavan V, "Materials Science and Engineering", Prentice Hall India Learning Private Limited, 6th Edition, 2015.
2. Higgins R A, "The Properties of Engineering Materials", Industrial Press Inc, U.S, 2nd Edition, 1994.
3. Neville A M, "Properties of Concrete", Pearson Education India, 5th Edition, 2012.
4. Illston J M and Demone P L J, "Construction Material, Their Nature and Behaviour", CRC Press, 2001.

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24/6/21

20CE705PE BASIC STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of equation of motion for single degree of freedom system.
- Derive equation of motion for multi degree of freedom system.
- Determine characteristics of earthquake motion with its estimation parameters.
- Analyze effects of earthquake on different types of structures.
- Evaluate concepts of earthquake resistant design for masonry and RCC structures.

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9

Definition of degree of freedom – Idealization of structure as SDOF system – Formulation of equation of motion for various SDOF system – 'D' Alemberts principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM 9

Formulation of equation of motion for multi degree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING 9

Elements of Engineering Seismology – Definitions, introduction to seismic hazard, earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of strong earthquake motion – Estimation of earthquake parameters.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9

Effect of earthquake on different types of structures – Behavior of RCC, Steel and prestressed concrete structures under earthquake loading – Pinching effect – Bouchinger effects – Evaluation of earthquake forces – IS Code 1893: 2002 – Response spectra – Lessons learnt from past earthquakes.

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UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9

Causes of damage – Planning considerations /Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze structures subjected to dynamic loading with single degree of freedom.
- Calculate response to free and forced vibration of damped and undamped MDOF system.
- Design structures for seismic loading conditions as per IS code provisions.
- Enumerate effects of earthquake on various types of structures.
- Elaborate concepts of design and detailing of earthquake resistant structures as per IS code provisions.

TEXT BOOKS:

1. Damodarasamy S R and Kavitha S, "Basics of Structural Dynamics and Aseismic Design", PHI Learning Pvt. Ltd., 2017.
2. Mario Paz, "Structural Dynamics – Theory and Computations", 2nd Edition, CBS Publishers, 2004.

REFERENCE BOOKS:

1. Pankaj Agarwa and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd., 2011.
2. IS: 13920 – 1993, "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice".
3. IS: 1893 – 2002 (Part I), "Indian Standard Criteria for Earthquake Resistant Design of Structures".
4. IS: 4326 – 1993, "Earthquake Resistant Design and Construction of Buildings Code of Practice", 2nd Revision.

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24/6/24

20CE706PE **PAVEMENT ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand types of pavement and its stress distribution.
- Design flexible pavements as per IRC guidelines.
- Acquire skills on various IRC standards in design of rigid pavements.
- Evaluate performance, quality and serviceability conditions of roads.
- Measure stabilization of pavements as per standards.

UNIT I **TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM** **9**

Introduction – Pavement as layered structure – Pavement types rigid and flexible – Resilient modulus – Stress and deflections in pavements under repeated loading.

UNIT II **DESIGN OF FLEXIBLE PAVEMENTS** **9**

Flexible pavement design factors influencing design of flexible pavement, empirical – Semi empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III **DESIGN OF RIGID PAVEMENTS** **9**

Cement concrete pavements factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV **PERFORMANCE EVALUATION AND MAINTENANCE** **9**

Pavement Evaluation – Causes of distress in rigid and flexible pavements – Evaluation based on surface appearance, cracks, patches and pot holes, undulations, raveling, roughness, skid resistance – Structural evaluation by deflection measurements – Pavement serviceability index – Pavement maintenance (IRC Recommendations only).

UNIT V **STABILIZATION OF PAVEMENTS** **9**

Stabilization with special reference book to highway pavements – Choice of stabilizers – Testing and field control – Stabilization for rural roads in India – Use of geosynthetics in roads.

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TOTAL: 45 PERIODS

OUTCOMES:

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

- Calculate stress and deflections in pavements under repeated loading.
- Design flexible pavement as per IRC standards.
- Understand design concepts of rigid pavement as per IRC guidelines.
- Execute various techniques to evaluate performance and maintenance of pavements.
- Evaluate stabilization of pavements as per reference book of highway pavements.

TEXT BOOKS:

1. Wright P H, "Highway Engineers", John Wiley and Sons, Inc., New York, 2003.
2. Khanna S K, Justo C E G and Veeraragavan A, "Highway Engineering", Nem Chand and Brothers, Roorkee, 10th Edition, 2014.
3. Kadiyali L R, "Principles and Practice of Highway Engineering", Khanna Tech. Publications, New Delhi, 2016.

REFERENCE BOOKS:

1. Yoder R J and Witchak M W, "Principles of Pavement Design", John Wiley, 2015.
2. Rajib B Mallick, Tahar El Korchi, "Pavement Engineering Principles and Practice", CRC Press, 2nd Edition, 2017.
3. IRC: 37 – 2018, "The Indian Roads Congress, Guidelines for the Design of Flexible Pavements", New Delhi, 2001.
4. IRC: 58 – 2015, "The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways", New Delhi, 1991.

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20CE707PE TRAFFIC ENGINEERING AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the functions, organizations and importance of traffic engineering.
- Acquire knowledge on traffic surveys and methods of measuring spot speeds.
- Evaluate different alignment and geometric design of intersections.
- Familiarize with various traffic signs, signals and control measures.
- Attain skills required for traffic management, level of service and simulation of traffic.

UNIT I TRAFFIC PLANNING AND CHARACTERISTICS 9

Definitions – Functions – Organizations – Importance of traffic engineering under Indian conditions – Human factor governing road user behavior – Power performance of vehicles – Other vehicle characteristics.

UNIT II TRAFFIC SURVEYS 9

Introduction – Use of speed, journey and delay surveys – Methods of measuring spot speeds – Vehicle volume counts, classification and occupancy – Origin and Destination survey – Parking surveys.

UNIT III GEOMETRIC DESIGN 9

Introduction – Highway classification – Traffic – Horizontal alignment – Vertical alignment – Combination of horizontal and vertical alignment – Sight distance – Cross sectional elements – Control of access – Intersection – Grade separated intersection – Bus facilities – Driveway – Design of pedestrian facilities – Design criteria for separate cycle tracks.

UNIT IV TRAFFIC CONTROLS 9

Importance of traffic signs – General principles of traffic signing – Types of traffic signs – Route marker signs – Types of road marking – Center line – Traffic lane lines – Pedestrian crossing – Route direction arrows – Object marking – Signal indication – Signal face – Number and location of signal faces – Warrants for signals – Area traffic controls – Road accidents – Effect of accidents – Pedestrian safety – Road safety audit.

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UNIT V TRAFFIC MANAGEMENT **9**

Introduction – Travel demand management – Traffic management – Passenger car unit – Level of service – Capacity of urban street – Relationship between the variables – Fundamental diagram of traffic flow – Car following theory – Simulation of traffic.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the basics of traffic planning and characteristics.
- Attain adequate knowledge on traffic surveys and studies.
- Acquire skills on geometric design of intersections, pedestrian facilities and cycle tracks.
- Execute various traffic control measures, warrants for signals and road safety.
- Evaluate the concepts of travel demand, traffic management strategies.

TEXT BOOKS:

1. Dr Kadiyali L R, "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2011.

REFERENCE BOOKS:

1. Fred L Mannering and Scott S Washburn, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 7th Edition, 2019.
2. Garber Nicholas J and Lester A Hoel, "Principles of Traffic and Highway Engineering", Thomson Press, India Ltd., 1st Edition, 2010.

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REFERENCE BOOKS:

1. Bureau of Indian Standards, "Hand Book of Functional Requirements of Buildings, (SP-41 & SP- 32)", Bureau Indian Standard, 1987 and 1989.
2. Denison Campbell, Allen and Harold Roper, "Concrete Structures: materials, Maintenance and Repair", Longman Publishers, 1991.
3. Faye C McQuiston, Jerald D Parker, Jeffrey D Spitler, "Heating, Ventilating, and Air Conditioning: Analysis and Design", Wiley Publishers, 6th Edition, 2020.

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2e. 1/6/24

20CE709PE **IRRIGATION AND ENVIRONMENTAL ENGINEERING DESIGN AND DRAWING**

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand fundamentals of design of tank components.
- Acquire design skills of impounding structures and cross drainage works.
- Execute design and drawing of canal regulation structures.
- Impart knowledge on design of water supply and its treatment components.
- Design and draw various treatment and disposal units of sewage.

UNIT I TANK COMPONENTS 9

Fundamentals of design – Tank surplus weir – Tank sluice with tower head – Drawings showing foundation details, plan and elevation.

UNIT II IMPOUNDING STRUCTURES AND CROSS DRAINAGE WORKS 9

Design principles – Earth dam – Profile of gravity dam – General design principles – Aqueducts – Syphon aqueduct (type III) – Canal drop (notch type) – Drawing showing plan, elevation and foundation details.

UNIT III CANAL REGULATION STRUCTURES 9

General principles – Direct sluice – Canal regulator – Drawing showing detailed plan, elevation and foundation details.

UNIT IV WATER SUPPLY AND TREATMENT 9

Design and drawing of flash mixer – Rapid sand filter – Service reservoirs – Pumping station – House service connection for water supply.

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UNIT V SEWAGE TREATMENT AND DISPOSAL **9**

Design and drawing of grit channel – Primary clarifier – Activated sludge process – Aeration tank – Trickling filter – Sludge digester – Sludge drying beds – Septic tank and disposal arrangement.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Evaluate design steps and draw tank components in detail.
- Apply design principles in dams, canal drops, aqueduct, and syphon aqueduct.
- Analyze design procedure and drawing details of direct sluice and canal regulator.
- Execute design and drawing of flash mixer, filters, service reservoir, pumping station and house service connection.
- Design and draw various sewage treatment and disposal units with its basic standards.

TEXT BOOKS:

1. Satya Narayana Murty Challa, "Water Resources Engineering Principles and Practice", New Age International Publishers, New Delhi, 2nd Edition, 2020.

REFERENCE BOOKS:

1. Garg S K, "Environmental Engineering (Vol. I) Water Supply Engineering", Khanna Publishers, New Delhi, 2011.
2. Garg S K, "Environmental Engineering (Vol. II)", Khanna Publishers, New Delhi, 2010.

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20CE710PE FUNDAMENTALS OF NANOSCIENCE

L	T	P	C
3	0	0	3

OBJECTIVE:

The student should be made to:

- Learn fundamentals, mechanical, electronic, optical, magnetic and thermal properties of nano particles.
- Acquire knowledge on various methods of preparation of nanomaterials.
- Develop skills on synthesis, structure-property relationships of nanometal oxides.
- Impart knowledge on X-ray diffraction techniques, Scanning Electron Microscopy, Environmental techniques.
- Analyze various applications of Nanocomputer, molecular switch, super chip, Nanobiotechlogy, Nanoprobes in medical diagnostics and biotechnology, Nanosensors.

UNIT I INTRODUCTION 8

Nanoscale Science and technology – Implications for physics, chemistry, biology and engineering – Classifications of nano structured materials – Nano particles – Quantum dots, nano wires – ultra thin films – multilayered materials – Length scales involved and effect on properties – Mechanical, electronic, optical, magnetic and thermal properties – Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION 9

Bottom-up synthesis – Top-down approach – Co-Precipitation, ultrasonication, mechanical milling, colloidal routes, self-assembly, vapour phase deposition, MOCVD, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy, MOMBE.

UNIT III NANOMATERIALS 12

Nanoforms of Carbon – Buckminster fullerene – Graphene and carbon nanotube, single wall carbon nanotubes (SWCNT) and multi wall carbon nanotubes (MWCNT) – Methods of synthesis (arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property relationships applications – Nanometal oxides ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, ferrites, Nanoclays – Functionalization and applications – Quantum wires, quantum dots – Preparation, properties and applications.

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BoS(CIVIL)

UNIT IV CHARACTERIZATION TECHNIQUES **9**

X-ray diffraction technique, scanning Electron Microscopy – Environmental techniques, transmission electron microscopy including high resolution imaging – Surface analysis techniques – AFM, SPM, STM, SNOM, ESCA, SIMS – Nanoindentation.

UNIT V APPLICATIONS **7**

NanoInfoTech – Information storage – Nanocomputer, molecular switch, super chip, nanocrystal – Nanobiotechlogy – Nanoprobes in medical diagnostics and biotechnology, nano medicines, Targetted drug delivery, bioimaging – Micro electro mechanical systems (MEMS), Nano electro mechanical systems (NEMS) – Nanosensors, nano crystalline silver for bacterial inhibition, nanoparticles for sunbarrier products - In photostat, printing, solar cell, battery.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Evaluate nanoscale Science and technology, classifications of nano structured materials, ultra thin films, multilayered materials.
- Execute Co-Precipitation, ultrasonication, mechanical milling, colloidal routes, self-assembly, vapour phase deposition, MOCVD, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy, MOMBE.
- Analyze nanoforms of carbon, methods of synthesis, structure-property relationships applications, nanometal oxides, nanoclays, Quantum wires, quantum dots.
- Determine transmission electron microscopy including high resolution imaging surface analysis techniques, AFM, SPM, STM, SNOM, ESCA, SIMS, nano indentation.
- Develop applications of nano infotech, Information storage, nano medicines, targetted drug delivery, bio imaging, Micro Electro Mechanical Systems (MEMS), nano electro mechanical systems (NEMS).

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TEXT BOOKS:

1. Edelstein A S and Cammearata R C, "Nanomaterials Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. John Dinardo N, "Nanoscale Charecterisation of Surfaces & Interfaces", Weinheim Cambridge, Wiley-VCH, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Timp G, "Nanotechnology", AIP Press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd., New Delhi, 2007.

CHAIRMAN
BoS(CIVIL)

20CE711PE	COASTAL AND OFFSHORE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart fundamental knowledge of the waves and forces in marine/coastal zone/region.
- Calculate forces acting on offshore structures.
- Determine offshore soil investigation.
- Analyze offshore structures with single and multi degree freedom systems.
- Design various elements of offshore structures.

UNIT I WAVE THEORIES 9

Introduction to wave mechanics – Wave generation by wind – Small amplitude wave theory – Formulation and solution – Wave celerity, length and period – Classification of waves based on relative depth – Orbital motions and pressure.

UNIT II FORCES OF OFFSHORE STRUCTURES 9

Wave forces – Morison equation – Wave force on a circular cylinder – Wave forces on submarine pipelines, pipelines in proximity to seabed, pipelines within the zone of wave influence – Wave forces on sea walls and breakwaters – Applications of wave force regimes.

UNIT III OFFSHORE SOIL INVESTIGATION 9

General characteristics of offshore soil exploration – Sampling using free corer, gravity corer, tethered systems and manned submersibles – Deep penetration sampling using wire line techniques – In-situ determination of strength of submarine soils – Penetrometer, piezocone, vane and pressure meter techniques.

UNIT IV ANALYSIS OF OFFSHORE STRUCTURES 9

Modelling of offshore structures – single and multi degree freedom systems – Coupled motions - Frequency domain analysis – Time domain analysis – Newmark Beta method – Wilson Theta method – Response analysis of jacket structures – Response analysis of complaint structures – non-linear response and stability characteristics.

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UNIT V DESIGN OF OFFSHORE STRUCTURES 9

Design of decking, supporting legs, braces, deck legs – Design of platform derricks, masts, helipads.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand basics of wave theories, mechanics and its classification.
- Determine wave forces acting on various offshore structures and applications of wave force regimes.
- Explore offshore soil investigation by various techniques.
- Analyze response and stability characteristics of offshore structures by various methods.
- Design of offshore structures and its components with its basic standards.

TEXT BOOKS:

1. Dean R G and Darlymple R A, "Water Wave Mechanics for Engineers and Scientists", Prentice Hall Inc. 2001.
2. Sarpkaya T and Isaacson M, "Mechanics of Wave Forces on Offshore Structures", Van Nostrand, 1981.

REFERENCE BOOKS:

1. Turgut Sarpkaya, "Wave Forces on Offshore Structures", Cambridge University Press, 2010.
2. Chaney F, "Marine Geotechnology and Nearshore and Offshore Structures", ASTM, STP, 1986.
3. Chaney R C and Demars K R, "Strength Testing of Marine Sediments Laboratory and Insitu Measurements", ASTM, STP 883, 1985.
4. McClelland B and Reifel M D, "Planning & Design of fixed Offshore Platforms", Van Nostrand, 1986.

CHAIRMAN
BoS(CIVIL)

CIVIL

20ME807PE	PROJECT MANAGEMENT (COMMON TO CIVIL AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Know the fundamentals of project management
- Understand the principles of project estimation
- Learn about human resource management
- Recognize the organizing systems in project implementations
- Study the concepts of project control and performance measures

UNIT I CONCEPTS OF PROJECT MANAGEMENT 9

Concept of a project – categories – project life cycle phases – project management - tools and techniques – project manager – roles and responsibilities of project manager – project manager as a profession.

UNIT II PROJECT ESTIMATION 9

Feasibility report – financing arrangements – preparation of cost estimates – finalisation of project implementation schedule – evaluation of the project profitability – appointing a project manager – fixing the zero date.

UNIT III HUMAN RESOURCES AND CONTRACTING 9

Delegation – project manager's authority – project organization – accountability in project execution – contracts – trending and selection of contractors – team building.

UNIT IV PROJECT IMPLEMENTATION 9

Systems – design of systems – project work system design – Work Breakdown Structure (WBS) – Project Execution Plan (PEP) – project procedure manual – project control system – planning, scheduling and monitoring – monitoring contracts – project diary.

UNIT V PROJECT CONTROL AND PERFORMANCE 9

Project direction – communications in a project – project coordination – project control – progress control – performance control – schedule control – cost control – performance indicators – performance improvement – Construction Management (CM) and Design Management (DM) companies – project management environment.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the concepts of project management
- Carry out costing and budgeting during project estimation
- Apply the human resource management techniques
- Facilitate the organizing system in project implementations
- Execute the concepts of project control and performance measures

CHAIRMAN
BoS (MECH)

TEXT BOOKS:

1. Harold kerzner, "Project Management - A Systems Approach to Planning, Scheduling, and Controlling", Wiley India Pvt. Ltd, 10th Edition, 2013.
2. Choudhury S, "Project Management", Tata McGraw-Hill Education Pvt. Ltd, 2013.

REFERENCES:

1. Chitkara K K, "Construction Project Management - Planning, Scheduling and Controlling," Tata McGraw Hill Education, 3rd Edition, 2019.
2. Khanna R B, "Project Management", PHI Learning Private Limited, New Delhi, 2011.
3. Mike Field & Laurie Keller, "Project Management", Thompson Business Press, Washington, 3rd Edition, 2012.

CHAIRMAN
BoS (MECH)

20CE801PE INDUSTRIAL STRUCTURES **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basic types, roof system and elements of industrial buildings.
- Execute basic functional requirements of industrial buildings as per IS standards.
- Design various industrial steel structures such as industrial roofs, gantry girders, bunkers, silos and steel chimneys.
- Develop design concepts of R.C. structures such as deep beams, shear walls.
- Acquire knowledge about prefabrication.

UNIT I INTRODUCTION **9**

Industrial building – Types – Factors affecting site selection – Roof system – Elements in industrial buildings.

UNIT II FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation – Heating – ISO Standards – Staircases – Crane columns – Bracings – Longitudinal and Transverse directions.

UNIT III DESIGN OF STEEL STRUCTURES **9**

Industrial roofs – Crane gantry girders – Design of bunkers and silos – Types of steel chimneys.

UNIT IV DESIGN OF R.C. STRUCTURES **9**

Design of R.C. members for fire resistance – Deep beams – Design – Design of shear walls.

UNIT V PREFABRICATION **9**

Construction of precast segments – Cast in-situ construction – Prestressed concrete truss – Folded plates – Pressure vessels.

TOTAL: 45 PERIODS

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BoS(CIVIL)

OUTCOMES:

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

- Attain basic knowledge on industrial buildings.
- Idealize the requirements of industrial buildings as per IS standards.
- Design gantry girders, bunkers and silos and chimneys.
- Analyze and design various types of R.C. structures used in industries.
- Demonstrate construction procedure of precast segments, pre stressed concrete truss, folded plates and pressure vessels.

TEXT BOOKS:

1. Varghese P C, "Advanced Reinforced Concrete Design", PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Ramachandra and Virendra Gehlot, "Design of Steel Structures – 2", Standard Publishers, 2010.

REFERENCE BOOKS:

1. Henn W, "Buildings for Industry, Vol. I and II", London Hill Books, 1995.
2. "Handbook on Functional Requirements of Industrial Buildings", SP32 – 1986, Bureau of Indian Standards, New Delhi 1990.

CHAIRMAN
BoS(CIVIL)

20CE802PE WATER RESOURCES SYSTEMS ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge on classification, and characteristics of systems.
- Understand linear programming, graphical solution, and sensitivity analysis.
- Analyze forward and backward recursion techniques in dynamic programming.
- Evaluate single and multipurpose reservoir simulation models and deterministic simulation.
- Apply advanced optimization techniques using integer and parametric linear programming.

UNIT I SYSTEM APPROACH **9**

Definition, classification, and characteristics of systems – Philosophy of modeling – Goals and Objectives – Basics of system analysis concept – Steps in systems engineering.

UNIT II LINEAR PROGRAMMING **9**

Introduction to operation research – Linear programming problem formulation – Graphical solution – Simplex method – Sensitivity analysis – Application to operation of single purpose reservoir.

UNIT III DYNAMIC PROGRAMMING **9**

Bellman's optimality criteria, problem formulation and solutions – Water allocation for three state (user), forward and backward recursion techniques in dynamic programming – Shortest pipe line route problem – Application to reservoirs capacity expansion.

UNIT IV SIMULATION **9**

Basic principles and concepts – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic simulation – Rule curve development for reservoir.

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UNIT V ADVANCED OPTIMIZATION TECHNIQUES 9

Integer and parametric linear programming – Goal programming types – Applications to reservoir release optimization – Application of evolutionary algorithms like genetic algorithm, particle swarm, simulated annealing to reservoir release optimization.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Learn philosophy of modeling and basics of system analysis concept.
- Develop linear programming in operation research, and operation of single purpose reservoir.
- Determine Bellman's optimality criteria, problem formulation and solutions and shortest pipe line route problem.
- Execute Monte Carlo techniques, model development, and rule curve development for reservoir.
- Demonstrate advanced optimization techniques, evolutionary algorithms like genetic algorithm, particle swarm, simulated annealing to reservoir release optimization.

TEXTBOOKS:

1. Vedula S and Majumdar P P "Water Resources Systems – Modeling Techniques and Analysis", Tata McGraw Hill, New Delhi, 5th Edition, 2010.

REFERENCE BOOKS:

1. Hall Warren A and John A Dracup, "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.
2. Chadurvedi M C, "Water Resource Systems Planning and Management", Tata McGraw Hill Inc., New Delhi, 1997.
3. Taha H A, "Operation Research", McMillan Publication Co., New York, 1995.

CHAIRMAN
BoS(CIVIL)

20CE803PE MUNICIPAL SOLID WASTE MANAGEMENT **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge on types, sources and characteristics of solid waste and estimation of solid waste quantity.
- Understand primary collection, types of collection system, need and types of transfer station.
- Analyze fuel gas characteristics, pyrolysis and treatment.
- Evaluate different phases, types of composting and types of bio-gas digesters.
- Determine site selection and types of land fill, financing in MSWM projects.

UNIT I EVOLUTION OF SOLID WASTE MANAGEMENT **9**

Introduction to solid waste – Functional elements – Types and sources of solid waste – Sampling and Characteristics – Estimation of solid waste quantity – Factors affecting solid waste generation rate – Construction and demolition waste – Management of bio medical, e – waste and inert waste – Integrated solid waste management (ISWM) – Municipal solid waste management rules.

UNIT II WASTE HANDLING, COLLECTION AND TRANSFER **9**

Handling, separation and storage at source – Processing at source – Primary collection – Types of collection system – Analysis of collection system – Need and types of transfer station – Transport means and methods – Unit operation for component separation – Material recovery facilities (MRF) – Recycling of dry waste components.

UNIT III INCINERATION **9**

Waste of fuel – Incineration /combustion – Fuel Gas characteristics and treatment – Solid residue generation, characterization and treatment – Waste to energy (WtE) plants – Pyrolysis and gasification – Case studies.

UNIT IV COMPOSTING **9**

Definition and phases of composting – Factors affecting composting process – Types of composting I – Types of composting II – Composting quality – Vermicomposting – Definition, stages and factors affecting anaerobic digestion – Pretreatment and co digestion for enhancement of biogas production – Types of biogas digesters.

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UNIT V LANDFILL & MANAGEMENT 9

Site selection and types of landfill – Leach ate collection and treatment – Landfill gas collection and treatment – Design of landfill & bio – Mining of old dumpsite – Financing in MSWM projects – Public – Private – Partnership (PPP) in MSWM projects.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Learn characteristics, types and management of biomedical, e-waste and inert waste.
- Develop skills to handle waste, processing and material recovery and recycling of dry waste components.
- Execute incineration, fuel gas treatment and gasification.
- Elaborate composting methods, vermi composting, biogas production and types of bio gas digesters.
- Acquire knowledge on site selection of land fill, types, treatment and design of landfill.

TEXT BOOKS:

1. Thomas H Christensen, "Solid Waste Technology & Management", Wiley Publication, Volume 1 & 2, 2010.
2. Debra R Reinhart and Timothy G Townsend, "Landfill Bioreactor Design & Operation", CRC Press, 1st Edition, 1998.

REFERENCE BOOKS:

1. George Tchobanoglous G and Frank Kreith, "Handbook of Solid Waste Management", McGraw Hill, 2nd Edition, 2002
2. George Tchobanoglous, Hilary Theisen and Samuel A Vigil "Integrated Solid Waste Management Engineering Principles and Management Issues", McGraw Hill, 2nd Edition, 1993.
3. Roger T Haug, "The Practical Handbook of Compost Engineering", Lewis Publishers, 1993
4. "Hand Book of Compost Engineering", Lewis Publishers, 1993.

CHAIRMAN
BoS(CIVIL)

20CE804PE GROUNDWATER ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the various types of aquifers and hydro geological parameters.
- Impart knowledge on steady and unsteady flow in well hydraulics.
- Evaluate the concepts of ground water management with examples.
- Analyze the sources, standard measures of groundwater quality.
- Acquire skills on various recharge methods of groundwater conservation.

UNIT I HYDRO GEOLOGICAL PARAMETERS 9

Introduction – Water bearing properties of rock – Type of aquifers – Aquifer properties – Permeability, specific yield, and storage coefficient – Determine of hydraulic conductivity – Ground water table fluctuation due to evapotranspiration -- Meteorological – Tides – Ground water utilization – Groundwater in the hydrological cycle.

UNIT II WELL HYDRAULICS 9

Objectives of ground water hydraulics – Darcy's law – Ground water equation – Steady radial flow – Well in uniform flow – Unsteady state flow in a confined aquifer – Unconfined aquifer – Well flow near aquifer boundaries – Partial penetrations of wells.

UNIT III GROUND WATER MANAGEMENT 9

Concepts of basin management – Equation of hydrologic equilibrium – Ground water basin investigations – Data collection – Alternative basin yields – Evaluation of perennial yield – Basin management by conjunctive use – Examples of ground water management.

UNIT IV GROUNDWATER QUALITY 9

Sources of salinity – Measures of water quality – Chemical analysis – Physical analysis – Biological analysis – Groundwater samples – Water quality criteria – Changes in chemical composition – Dissolved gases – Temperature – Saline ground water.

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UNIT V GROUNDWATER CONSERVATION 9

Concept of artificial recharge – Recharge methods – Occurrence of saline water intrusion – Control of saline water of intrusion – Pollution in relation to water use – Municipal sources and causes – Industrial sources and causes – Agricultural sources and causes – Attenuation of pollution – Evaluation of pollution potential – Monitoring ground water quality.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze the basic properties of various hydro geological parameters.
- Determine steady and unsteady flow in confined and unconfined aquifers in well hydraulics.
- Check stability of ground water basin and evaluate perennial yield.
- Perform different ground water quality analysis with various measures.
- Evaluate various sources, causes and control measures of saline water intrusion.

TEXT BOOKS:

1. Todd D K and Larry W Mays, "Ground Water Hydrology", John Wiley and Sons, New York, 3rd Edition, 2010.
2. Raghunath H M, "Ground Water", New Age International, Pvt. Ltd., New Delhi, 2007.

REFERENCE BOOKS:

1. Neven Kresic and Zoran Stevanovic, "Groundwater Hydrology of Springs", Butterworth Heinemann, 1st Edition, 2009.
2. Charles Fitts "Groundwater Science", Academic Press, 1st Edition, 2002.
3. Ramakrishnan S, "Ground Water" K.J. Graph arts, Chennai, 1998.
4. Jacob Bear, "Hydraulics of Groundwater", Dover Publication, 2012.
5. John H Cushman and Daniel M Tartakovsky, "The Handbook of Groundwater Engineering", CRC Press; 3rd Edition, 2016.

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BoS(CIVIL)

24/6/21

20CE805PE PREFABRICATED STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts serviceability, functionality and durability of structural systems.
- Impart knowledge on various prefabricated elements.
- Evaluate proportions of mix, steel reinforcement, casting, fixing and lifting devices.
- Analyze the various types of joints in structural members.
- Acquire skills on design of earthquake resistant concept and cyclones.

UNIT I INTRODUCTION **9**

Serviceability – Functionality and durability of the building – Structural systems – Production – Transportation – Erection.

UNIT II PREFABRICATED ELEMENTS **9**

General – Concrete sandwich panels – Suspended façade panels – Beams – Columns – Walls – Foundation – Floor and roof elements.

UNIT III PROPORTIONING OF MIX **9**

Exposure, cover and strength – Mortars and grouts – Dry pads – Substitute materials – Steel reinforcement – Rebars – Mesh – Stainless steel rebars – Structural steel work – Welding – Cast – ing, fixing and lifting devices – Cast in sockets and anchorage – Non cementacious materials.

UNIT IV JOINTS IN STRUCTURAL MEMBERS **9**

Basic mechanism – Compression joints – Bearing pads – Shear joints – Shear friction – Dowel action – Tension joints – Moment resisting connection – Floor connection at load bearing walls – Flexural strength and stiffness.

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BoS(CIVIL)

UNIT V DESIGN OF EARTHQUAKE RESISTANT CONCEPT AND CYCLONES 9

Basic concept – Geologic earthquake effects – Seismic hazard analysis – Stable foundation – Continuous load path – Adequate stiffness and strength – Seismic design categories – Design ground motion – Ductility and toughness.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Elaborate different concepts of structural systems.
- Understand the working principles of various prefabricated elements.
- Calculate proportions of mix under various exposure conditions.
- Learn basic mechanism in various types of joints and connections in structural members.
- Design stable foundation, ground motion with adequate stiffness, strength, ductility and toughness.

TEXT BOOKS:

1. Kim S and Elliott, "Precast Concrete Structures" CRC Press, 2019.
2. Alfred Steine, Hubert Bachimann and Mathias Tillmann, "Precast Concrete Structures", Wiely Ernst and Solin, 2011.
3. Guide to Good Practice Task 6.2, "Structural Connections for Precast Concrete Buildings by International Federation for Structural Concrete (FIB)" 2008.

REFERENCE BOOKS:

1. Koncz T, "Manual of Precast Concrete Construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural Design Manual, "Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete", Netherland Betor Verlag, 2009.

CHAIRMAN
BoS(CIVIL)

Civil

20GE601	PROFESSIONAL ETHICS IN ENGINEERING (COMMON TO CIVIL, EEE, IT AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Understand the ethical behaviour and human values
- Expose the basic knowledge about engineering ethics and ethical theories
- Familiarize with the codes of ethics
- Know about the safety, responsibilities and rights of an engineer
- Gain the knowledge about MNCs, Environmental and Computer ethics

UNIT I HUMAN VALUES 9

Morals, values and ethics – integrity – work ethic – service learning – civic virtue – respect for others – living peacefully – caring – sharing – honesty – courage – valuing time – cooperation – commitment – empathy – self confidence – character – spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy - Kohlberg's theory and Gilligan's theory – consensus and controversy – models of professional roles – theories about right action – self interest – customs and religion – uses of ethical theories.

UNIT III ENGINEER AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation – engineers as responsible experimenters – codes of ethics – balanced outlook on law – the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk – assessment of safety and risk – risk benefit analysis and reducing risk – the three mile island and Chernobyl case studies. Respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – Intellectual Property Rights (IPR) – discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporation (MNC) – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – code of conduct – corporate social responsibility.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Develop an awareness on human values
- Recognize the basic view of various moral and ethical issues
- Clarify the various social issues, code of ethics and role of professional ethics
- Assess the safety and risk benefit analysis
- Acquire knowledge on global issues and corporate social responsibility

CHAIRMAN
BoS (MECH)

TEXT BOOKS:

1. Mike W Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 4th Edition, 2017.
2. Naagarazan R S, "Professional Ethics and Human Values", New Age International Publishers, 1st Edition, 2017.

REFERENCES:

1. Govindarajan M, Natarajan S and Senthil Kumar V S, "Engineering Ethics", Prentice Hall of India, New Delhi, 12th Edition, 2011.
2. Charles B Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 4th Edition, 2014.
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 6th Edition, 2019.
4. John R Boatright, Jeffery D Smith and Bibhu Prasan Patra "Ethics and the Conduct of Business", Pearson Education, New Delhi, 8th Edition, 2017.

CHAIRMAN
BoS (MECH)

20CE806PE MAINTENANCE AND REPAIR OF CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn concepts of embedded metal corrosion, its significance, types, assessment quality on TMT and corrosion in prestressed concrete.
- Determine deterioration in cementitious systems under various exposure conditions using different onsite tests.
- Evaluate assessment and protective treatment of rebars.
- Execute coating and strengthening on concrete structures, structural strength in joints and connections.
- Develop skills on service life estimation studies with various case studies.

UNIT I EMBEDDED METAL CORROSION **9**

Prologue – Corrosion of embedded metal – Significance and fundamentals of corrosion – carbonation induced and chloride – Induced corrosion – Corrosion of embedded metal – Types of reinforcement – Bare steels – TM ring test for assessing the quality of TMT / QST steel rebars – Metallic and non metallic coated rebars – Corrosion in prestressed concrete

UNIT II DETERIORATION IN CEMENTITIOUS SYSTEMS AND TESTING **9**

Deterioration of cementitious systems – Introduction – Sulphate attack, biofouling and acid attack – Frost attack freeze – Thaw and alkali – Silica reaction – Shrinkage and creep – Fire attack – Abrasion and erosion – Condition assessment of concrete structure – Exposure conditions – Visual inspection – Onsite concrete testing – Testing of concrete in laboratory.

UNIT III ASSESSMENT AND PROTECTIVE TREATMENT **9**

Assessment of concrete structure – Mechanical and corrosion testing of rebars – Strategies and materials for surface repair – Surface preparation and protective treatment.

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BoS(CIVIL)

UNIT IV COATING AND STRENGTHENING 9

Coatings on concrete infrastructure – Water proofing of concrete structures – Structural strengthening & stabilization – Load effects and introduction to S&S – Beams and slabs – Column & walls – Structural strengthening (joints and connections) – Injection grouts for concrete repair – Structural repair for prestressed concrete systems.

UNIT V SERVICE ESTIMATION AND CASE STUDIES 9

Case studies on structural repair (right methodologies and systematic approach / case studies) – cathodic protection in concrete structures – Laboratory and field studies – Service life estimation.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze significance and fundamentals of corrosion, metallic and non-metallic coated rebars.
- Determine deterioration in cementitious systems and condition assessment of concrete structure
- Elaborate assessment and protective treatment on concrete structures.
- Determine strengthening techniques on structural elements, joints and connections.
- Acquire knowledge on service estimation of concrete structures by various field studies and case studies.

TEXT BOOKS:

1. Varghese P C, "Maintenance Repair and Rehabilitation & Minor Works of Buildings", PHI Learning Pvt. Ltd., New Delhi, 2014.
2. Michael Raupach and Till Buttner, "Concrete Repair to EN1504 – Diagnosis, Design, Principles and Practice", CRC Press, 2019.

REFERENCE BOOKS:

1. Dodge Woodson R, "Concrete Structures – Protection, Repair and Rehabilitation", Butterworth Heinemann, 1st Edition, 2009.

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24/6/21

20CE807PE	COASTAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart fundamental knowledge of the waves and forces in marine/coastal zone/region.
- Calculate forces acting on offshore structures.
- Determine offshore soil investigation.
- Analyze offshore structures with single and multi degree freedom systems.
- Design various elements of offshore structures.

UNIT I WAVE THEORIES **9**

Introduction to wave mechanics – Wave generation by wind – Small amplitude wave theory – Formulation and solution – Wave celerity, length and period – Classification of waves based on relative depth – Orbital motions and pressure.

UNIT II FORCES OF OFFSHORE STRUCTURES **9**

Wave forces – Morison equation – Wave force on a circular cylinder – Wave forces on submarine pipelines, pipelines in proximity to seabed, pipelines within the zone of wave influence – Wave forces on sea walls and breakwaters – Applications of wave force regimes.

UNIT III OFFSHORE SOIL INVESTIGATION **9**

General characteristics of offshore soil exploration – Sampling using free corer, gravity corer, tethered systems and manned submersibles – Deep penetration sampling using wire line techniques – In-situ determination of strength of submarine soils – Penetrometer, piezocone, vane and pressure meter techniques.

UNIT IV ANALYSIS OF OFFSHORE STRUCTURES **9**

Modelling of offshore structures – single and multi-degree freedom systems – Coupled motions - Frequency domain analysis – Time domain analysis – Newmark Beta method – Wilson Theta method – Response analysis of jacket structures – Response analysis of complaint structures – non-linear response and stability characteristics.

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BoS(CIVIL)

UNIT V DESIGN OF OFFSHORE STRUCTURES **9**

Design of decking, supporting legs, braces, deck legs – Design of platform derricks, masts, helipads.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand basics of wave theories, mechanics and its classification.
- Determine wave forces acting on various offshore structures and applications of wave force regimes.
- Explore offshore soil investigation by various techniques.
- Analyze response and stability characteristics of offshore structures by various methods.
- Design of offshore structures and its components with its basic standards.

TEXT BOOKS:

1. Dean R G and Darlymple R A, "Water Wave Mechanics for Engineers and Scientists", Prentice Hall Inc., 2001.
2. Sarpkaya T and Isaacson M, "Mechanics of Wave Forces on Offshore Structures", Van Nostrand, 1981.

REFERENCE BOOKS:

1. Turgut Sarpkaya, "Wave Forces on Offshore Structures", Cambridge University Press, 2010.
2. Chaney F, "Marine Geotechnology and Nearshore and Offshore Structures", ASTM, STP, 1986.
3. Chaney R C and Demars K R, "Strength Testing of Marine Sediments Laboratory and Insitu Measurements", ASTM, STP 883, 1985.
4. McClelland B and Reifel M D, "Planning & Design of Fixed Offshore Platforms", Van Nostrand, 1986.

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BoS(CIVIL)

20CE808PE BRIDGE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand fundamentals of road bridge, river bridge, railway bridge and highway bridge.
- Calculate longitudinal analysis, transverse analysis, temperature analysis, distortional analysis.
- Design truss bridges, plate girder bridges.
- Analyze slab bridges, T-beam bridges, PSC bridges.
- Evaluate different types of foundation and bridge bearings and expansion joints.

UNIT I INTRODUCTION **9**

History of bridges – Classification of road bridges – Selection of site and initial decision process – Survey and alignment – Geotechnical investigations and interpretations – River bridge – Selection of bridge site and planning – Collection of bridge design data – Hydrological calculation - Road bridges – IRC codes – Standard loading for bridge design – Influence lines for statically determinate and indeterminate structures –Transverse distribution of live loads among deck longitudinal – Load combinations for different working state and limit state designs - Loadings for railway bridges – railroad data – Pre design considerations – Railroad vs. highway bridges.

UNIT II SUPERSTRUCTURES **9**

Bridge decks – Structural forms and behavior – Choices of superstructure types – Behavior and modeling of bridge decks – Simple beam model – Plate model – Grillage method – Finite element method – Different types of superstructure (RCC and PSC) – Longitudinal analysis of bridge – Transverse analysis of bridge - Temperature analysis – Distortional analysis – Effects of differential settlement of supports – Reinforced earth structures.

UNIT III DESIGN OF STEEL BRIDGES **9**

Design of Truss Bridges – Design of Plate girder bridges.

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UNIT IV DESIGN OF RC AND PSC BRIDGES 9

Design of slab bridges – T beam bridges – PSC bridges.

UNIT V SUBSTRUCTURE, BEARINGS AND EXPANSION JOINTS, PARAPETS AND RAILINGS 9

Substructure – Pier – Abutment – Wing walls – Importance of soil structure interaction – Types of foundations – Open foundation – Pile foundation – Well foundation – Simply supported bridge – Continuous bridge – Different types of bridge bearings and expansion joints – Parapets and railings for highway bridges.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify loads on bridges and selection of type of bridge for the site condition.
- Analyze the super structure by various methods.
- Calculate load acting on components of trussed bridge and plate girder bridges.
- Execute design calculation of reinforced and prestressed concrete bridges.
- Evaluate different types of foundation, bridge bearings and expansion joints.

TEXTBOOKS:

1. Johnson Victor D, "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 2009.
2. Jagadeesh T R and Jayaram M A, "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013.

REFERENCE BOOKS:

1. Phatak D R, "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S, "Bridge Engineering", Tata McGraw Hill, New Delhi, 1996.
3. Rajagopalan N, "Bridge Superstructure", Alpha Science International, 2006.

CHAIRMAN
BoS(CIVIL)

24/6/24

20CE809PE INTEGRATED WATER RESOURCES MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on various system, optimization and simulation of water resources systems.
- Analyze operation research, water allocation for crops and reservoir operation for various purposes.
- Design dynamic programming water resource systems by analyzing various problems.
- Understand the components of a simulation model and plan formulation.
- Evaluate the conditions of economic analysis and reservoir operation.

UNIT I SYSTEM APPROACH **9**

Definition – Types of system – Systems approach – System analysis – Optimization using calculus – Linear programming – Dynamic programming – Simulation – Combination of simulation and optimization.

UNIT II LINEAR PROGRAMMING **9**

Introduction to operation research – Irrigation water allocation for single and multiple crops – Multi reservoir system for irrigation planning – Reliability capacity tradeoff for multi crop irrigation – Reservoir operation for irrigation – Reservoir operation for hydropower optimization.

UNIT III DYNAMIC PROGRAMMING **9**

Introduction – Solution of DP problems based on Bellman's principle of optimality – Backward recursion – Water allocation problem – Forward recursion – Characteristics of a DP problem – short route problem – Reservoir operation problem – Capacity expansion problem – Multiple state variables.

UNIT IV SIMULATION **9**

Definition – Basic principles and concepts – Components of a simulation model – Combination of simulation and optimization – Multi objective planning – Non inferior solutions – Plan formulation – Plan selection.

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UNIT V ECONOMIC ANALYSIS AND RESERVOIR SYSTEMS 9

Basics of engineering economics – Economic analysis – Conditions of project optimality – Benefit cost analysis – Reservoir sizing – Reservoir operation – Probability theory – Chance constrained linear programming – Stochastic dynamic programming for reservoir operation.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Execute effective system analysis and approach of water resources systems.
- Understand water allocation, multi reservoir system, reliability capacity and reservoir operation for irrigation.
- Analyze characteristics and solution of dynamic programming problems based on Bellman's principle of optimality.
- Familiarize with the principles, concepts and components of simulation model and Plan formulation.
- Demonstrate basics of engineering economics, economic analysis of reservoir systems.

TEXT BOOKS:

1. Vedula, S and Majumdar P P, "Water Resources Systems – Modeling Techniques and Analysis", Tata McGraw Hill, New Delhi, 5th Edition, 2010.
2. Daniel P Loucks and Eelco Van Beek, "Water Resource Systems Planning and Management", Springer Publication, 1st Edition, 2017.

REFERENCE BOOKS:

1. Hall Warren A and John A Dracup, "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.
2. Andrew A Dzurik, "Water Resources Planning", Rowman and Littlefield Publisher, Inc. USA, 3rd Edition, 2002.
3. Taha H A, "Operation Research an Introduction", Pearson Prentice Hall, Pearson Education, New Jersey 8th Edition, 2007.

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CIVIL

20MG701	TOTAL QUALITY MANAGEMENT (COMMON TO CIVIL, CSE, ECE, EEE, IT AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Provide an overview of basic approaches of TQM
- Familiarize with the concepts and principles of TQM
- Impart knowledge on basic and new quality tools
- Learn the applications of TQM techniques in various industries
- Understand the various quality systems, standards and procedures

UNIT I INTRODUCTION 9

Definition of quality and TQM – basic needs of quality – contributions of Deming, Juran and Crosby – TQM framework – historical review of quality management – dimensions of quality – barriers to TQM – benefits of TQM – quality council – quality statements.

UNIT II TQM PRINCIPLES 9

Customer satisfaction – customer perception of quality, customer complaints, service quality and customer retention – employee involvement – motivation, empowerment, team and teamwork, recognition and reward, performance appraisal – continuous process improvement – PDSA cycle, 5s and Kaizen – supplier partnership – supplier selection and supplier rating.

UNIT III TQM TOOLS 9

Basic seven tools of quality – new seven management tools – six sigma – concepts and process – quality costs – reengineering process – improvement strategies – Taguchi principles – quality loss function – role of IT in TQM.

UNIT IV TQM TECHNIQUES 9

Benchmarking - reasons, types and process – Failure Mode of Effect Analysis (FMEA) - procedures and types – Quality Function Deployment (QFD) - benefits and process – Total Productive Maintenance (TPM) - process.

UNIT V QUALITY SYSTEMS 9

Benefits of ISO registration – ISO 9000 series of standards – ISO 9000 requirements and implementation – other sectors specific standards – documentation – audit – ISO 14000 series of standards - concepts, requirements and benefits – quality awards.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Implement the concept of quality, TQM to bring quality management
- Improve the customer supplier relationship management and enrich the employee involvement
- Apply the basic and new quality tools for enhancing quality
- Explore the usage of TQM techniques for measuring, controlling and improving the quality
- Execute the various quality systems, its standards and procedures to increase the quality assurance

CHAIRMAN
BoS (MECH)

TEXT BOOKS:

1. Dale H Besterfiled, "Total Quality Management", Pearson Education Asia, 3rd Edition, 2013.
2. Poonia M P and Sharma S C, "Total Quality Management", Khanna Publication, 1st Edition, 2018.

REFERENCES:

1. James R Evans and William M Lindsay, "The Management and Control of Quality", South-Western Cengage Learning, 6th Edition, 2010.
2. Vijayan V and Ramakrishnan H "Total Quality Management", S Chand Publication, Pune, 1st Edition, 2014.
3. Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd, 7th Edition, 2011.
4. Poornima M Charantimath, "Total Quality Management", Pearson Education, 3rd Edition, 2017.

CHAIRMAN
BoS (MECH)

24/6/22

20CE810PE CONSTRUCTION PLANNING AND SCHEDULING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the basic concepts in the development of construction plans, work tasks and estimation of activity durations and requirements.
- Impart knowledge on scheduling procedures and techniques in construction.
- Analyze cost control monitoring and accounting.
- Execute safety standards and quality control by statistical methods in construction.
- Acquire knowledge on computerized organization and use of project information.

UNIT I CONSTRUCTION PLANNING **6**

Basic concepts in the development of construction plans – Choice of technology and construction method – Defining work tasks – Definition – Precedence relationships among activities – Estimating activity durations – Estimating resource requirements for work activities – Coding systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES **12**

Relevance of construction schedules – Bar charts – The critical path method – Calculations for critical path scheduling – Activity float and schedules – Presenting project schedules – Critical path scheduling for activity on – Node and with leads, lags and windows – Calculations for scheduling with leads, lags and windows – Resource oriented scheduling – Scheduling with resource constraints and precedences – Use of advanced scheduling techniques – Scheduling with uncertain durations crashing and time cost tradeoffs – Improving the scheduling process.

UNIT III COST CONTROL MONITORING AND ACCOUNTING **9**

The cost control problem – The project budget – Forecasting for activity cost control – Financial accounting systems and cost accounts – Control of project cash flows – Schedule control – Schedule and budget updates – Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION **9**

Quality and safety concerns in construction – Organizing for quality and safety – Work and material specifications – Total quality control – Quality control by statistical methods –Statistical quality control with sampling by attributes – Statistical quality control by sampling and variables – Safety – Applications of construction planning and scheduling.

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BoS(CIVIL)

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information – Accuracy and use of information – Computerized organization and use of information – Organizing information in databases – Relational model of data bases – Other conceptual models of databases – Centralized database management systems – Databases and application programs – Information transfer and flow – MS primavera – MS office.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain knowledge on the basic concepts in construction planning, choice of technology and construction method.
- Calculate bar charts, critical path schedule and advanced scheduling procedures and techniques in construction.
- Evaluate project budget, financial accounting systems, cost accounts and schedule control.
- Apply statistical quality control with sampling by attributes and safety concerns in construction.
- Execute organizing information in databases and other conceptual models of databases and application programs.

TEXT BOOKS:

1. Chitkara K K, "Construction Project Management Planning, Scheduling and Controlling", Tata McGraw Hill Publishing Co., New Delhi, 1998.
2. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 1988.

REFERENCE BOOKS:

1. Moder J, Phillips C and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1983.
2. Willis E M, "Scheduling Construction projects", John Wiley and Sons, 1986.
3. Halpin D W, "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985.

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BoS(CIVIL)

20ME601OE	PRODUCTION TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Identify and select suitable materials for various engineering applications
- Understand the concept of metal casting process
- Know about the various types of welding processes
- Understand the working principles of machine tools such as Lathe, Shaping, Milling, Drilling and Grinding
- Learn about the basic concepts of Computer Numerical Control (CNC) machine tool

UNIT I ENGINEERING MATERIALS **9**

Engineering Materials – Classification – Mechanical properties of materials – strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability and weldability – Steels and Cast irons : Carbon steels – classifications based on percentage of carbon – properties and applications – Alloy steels: Stainless steel and tool steel.- Cast iron and its types.

UNIT II METAL CASTING PROCESSES **9**

Sand Casting : Sand mould – Type of patterns – Pattern materials – Pattern allowances – Moulding sand properties – Core – Moulding machines – Types and applications; Melting furnaces : Blast and Cupola furnaces; Principle of special casting processes: Shell – investment – Ceramic mould – Pressure die casting – Centrifugal casting - Stir casting; Defects in sand casting.

UNIT III WELDING **9**

Introduction, classification of welding processes – Gas welding, types of flames and applications. Electric arc welding, Resistance welding, Soldering and Brazing processes and their uses.

UNIT IV MACHINING **9**

Centre lathe – Constructional features – Specifications – Operations performed – Special machines: Shaper, Drilling, Milling and Grinding machines – Constructional details and its operations.

UNIT V CNC MACHINE **9**

Numerical Control (NC) machine tools – CNC: types, constructional details, special features – design considerations of CNC machines for improving machining accuracy – Structural members – Slide ways – Linear bearings – Ball screws – Spindle drives and feed drives.

TOTAL: 45 PERIODS

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BoS (MECH)

OUTCOMES:

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

- Gain knowledge on engineering materials
- Know about the casting process and its defects
- Understand the construction and working principles of gas, arc welding and resistance welding process
- Identify the suitable machining process for the given component
- Describe the constructional and operational features of CNC machines

TEXT BOOKS:

1. Kalpakjian and Schmid, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2014.
2. Hajra Choudry S K, "Elements of Workshop Technology-Vol. II", Media Promoters and Publishers Pvt. Ltd, 2010.

REFERENCES :

1. Nagendra Parashar B S and Mittal R K, "Elements of Manufacturing Processes", Prentice Hall of India, 2011.
2. Rao P N, "Manufacturing Technology, Metal Cutting and Machine Tools", Tata McGraw Hill, New Delhi, 2013.
3. Chapman W A J, "Workshop Technology", Part I, II, III, E.L.B.S. and Edward Arnold Publishers Ltd, London, 2004.

CHAIRMAN
BoS (MECH)

20ME602OE BASICS OF AUTOMOTIVE COMPONENTS

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the various engine components of automobiles
- Illustrate the different types of transmission system used in automobiles
- Study the construction of various engine auxiliary systems
- Learn about working principles of steering, suspension and braking systems
- Describe about the fundamentals of alternative energy sources and Ignition

UNIT I ENGINE COMPONENTS **9**

Overview – Engine Components – Engine block, Crank shaft, Connecting rod, Cylinder Liners, Piston, Piston rings, Cylinder head – Camshaft, Valve, Rocker Arm, Spark Plug, Injector, Carburetor, Fuel pump.

UNIT II TRANSMISSION COMPONENTS **9**

Flywheel – Clutch – Friction plate, Clutch housing, Pressure plate. Gearbox – Propeller shaft – Differential – Conventional Differential, Rear axle.

UNIT III BODY COMPONENTS **9**

Types of automobiles – Vehicle construction and different layouts, Chassis, Frame and body – Vehicle aerodynamics.

UNIT IV STEERING, SUSPENSION SYSTEMS AND BRAKES **9**

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS).

UNIT V ALTERNATIVE FUELS AND IGNITION SYSTEMS **9**

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles. Ignition System – Battery and Magneto Ignition System – Principles of Combustion and detonation CI Engines. Lubrication and Cooling systems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Recognize the various parts of the automobile and their functions
- Distinguish the working of different types of power transmission systems like clutch, gears
- Demonstrate the Vehicle construction and Vehicle aerodynamics
- Explain about the Steering, Brakes and Suspension systems
- Predict possible alternate sources of energy and ignition system for automotive Engines

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BoS (MECH)

TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Vol. 1 and 2, Seventh Edition, Standard Publishers, New Delhi, 14th Edition 2017.
2. Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 4th Edition, 2018.

REFERENCES:

1. Joseph Heitner, "Automotive Mechanics," East-West Press, Second Edition, 1999.
2. Jain K K and Asthana R B, "Automobile Engineering", Tata McGraw Hill Publishers, New Delhi, 2002.
3. Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Good Heart-Will Cox Company Inc, USA , 1978.

CHAIRMAN
BoS (MECH)

20EC503PE	INTERNET OF THINGS (COMMON TO BME, CIVIL, ECE, EEE AND MECH)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of Internet of Things
- Study about domain specific IoTs & M2M
- Design the IoT using Python
- Build a small low cost embedded system using Raspberry Pi
- Apply the concept of internet of things in the real world scenario

UNIT I INTRODUCTION TO IoT **9**

Internet of Things – characteristics- Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - IoT Platforms Design Methodology.

UNIT II DOMAIN SPECIFIC IoTs & M2M **9**

Domain Specific IoTs- M2M- Difference between IoT & M2M- Software Defined Networking- Network Function Virtualization.

UNIT III IoT LOGICAL DESIGN USING PYTHON **9**

Introduction –Python Data types & Data structures-Control Flow-Functions-Modules-Packages-File Handling-Classes-Python Packages of Interest for IoT.

UNIT IV IoT PHYSICAL DEVICES & ENDPOINTS **9**

IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Devices – Arduino.

UNIT V CASE STUDIES **9**

Home Automation – Cities – Environment – Agriculture - Structural Health monitoring - Weather monitoring.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the concepts of Internet of Things
- Analyze the domain specific applications of IoT
- Apply the knowledge of Python for IoT
- Design a portable IoT using Rasperry Pi
- Implement basic IoT applications on embedded platform

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

M Chairman
Bos/ECE

REFERENCES:

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
3. Jan Holler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Chairman
Bos/ECE

20EC501OE	SENSORS AND TRANSDUCERS	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the concepts of measurement and characteristics of transducers
- Learn the various sensors used to measure various physical parameters
- Apply the concept of sensors for force, magnetic and heading sensor
- Explain the concept of optical, pressure and temperature sensors
- Distinguish the DAQ systems with different sensors for real time applications

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types- First order and Second order Transducer systems.

UNIT II MOTION AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – Light Detection and Ranging (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 9

Strain Gauge, Load Cell and Magnetic Sensors – types and principle –Magnetoresistive – Hall Effect – Eddy Current sensor- Heading Sensors: Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE TEMPERATUREAND SMART SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure: Diaphragm, Bellows, Piezoelectric – Temperature – Thermistor, RTD, Thermocouple. Acoustic Sensors: Flow and level measurement, Radiation Sensors – Smart Sensors – MEMS and Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING and DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging – applications – Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL : 45 PERIODS

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OUTCOMES:

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

- Expertise in various calibration techniques and signal types for transducers
- Understand the basic principles of various motion and ranging sensors
- Analyze the various sensor in force, heading and temperature applications
- Apply the various sensor applications in optical, pressure, temperature and smart sensor
- Implement the DAQ systems with different sensors for real time applications

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems-Applications and Design", Tata McGraw Hill, 2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", Dhanpat Rai and Co, New Delhi, 12th Edition, 2013.

REFERENCES:

1. Patranabis D, "Sensors and Transducers", PHI, New Delhi, 2nd Edition ,2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook", CRC Press, 2nd Edition ,2015.
4. Dr Sengolrajan T and Sampath A, "Sensors and Transducers", Sri Krishna Hitech Publishing Company Pvt. Ltd, 1st Edition, 2019.
5. Dr Vijayachitra S, "Transducer Engineering", PHI Learning Pvt. Ltd, 1st Edition, 2016.

CHAIRMAN
BoS (ECE)

20EE501OE NON-CONVENTIONAL ENERGY RESOURCES L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:

- Acquire knowledge on various sources of non-conventional energy
- Learn the fundamental concepts about solar energy systems and devices
- Design wind turbine system and know about facts of wind energy in electricity generation
- Understand the geothermal and biomass energy system
- Discuss other energy sources

UNIT I INTRODUCTION **9**

Electric energy from conventional sources – Energy reserves – Power scenario in India – Types of renewable energy sources – New technologies of energy resources – Impact on renewable generation on environment – Biochemical cycles – Global warming potential – Forest resources and water management in India – Biodiversity.

UNIT II SOLAR ENERGY **9**

Solar radiation – Geometry, Estimation and Measurements – Solar thermal energy storage – Solar thermal electric power plant – Solar ponds – Solar air heaters – Solar cookers – Solar air conditioning and refrigerators – Solar greenhouse – Solar photovoltaic system and its standards – Application of PV system – PV hybrid system.

UNIT III WIND ENERGY **9**

Classification of wind turbines and rotors – Terms used in wind energy – Wind energy characteristics – Land for wind energy – Design of wind turbine rotor – Modes of wind power generation – Estimation of wind energy potential – Wind resource assessment in India – Grid system and properties.

UNIT IV GEOTHERMAL AND BIOMASS ENERGY **9**

Structure of Earth's interior – Geothermal resources and its power generation – Biomass resources – Biomass conversion technology – Biochemical conversion – Biomass gasification – Biogas and its plant – Power generation from liquid waste – Biomass cogeneration – Biodiesel – Biofuel petrol.

UNIT V OTHER ENERGY SOURCES **9**

Tidal energy: Tidal characteristics – Tidal energy and its potential estimation – Development of tidal power scheme – important component of tidal power plant – Tidal power development in India. Wave Energy: Factors affecting the wave energy – Mathematical analysis of wave energy – Principle of wave energy plant – Wave energy conversion machines. Ocean Thermal Energy Conversion (OTEC): Working Principle – Closed cycle OTEC system – Thermoelectric OTEC – Application and global development.

TOTAL: 45 PERIODS

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BoS (EEE)

OUTCOMES:

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

- Demonstrate the various causes of renewable energy sources with environmental aspect
- Illustrate the concept of solar energy technology
- Analyze the techniques used in wind energy sources
- Know the classification and operation of geothermal and biomass sources
- Enumerate the details of other energy sources

TEXT BOOK:

1. Kothari P, Singal K C and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", 2nd Edition, PHI Pvt. Ltd., New Delhi, 2011.

REFERENCES:

1. Godfrey Boyle, "Renewable Energy - Power for a Sustainable Future", Oxford University Press, U.K, 1996.
2. Twidell J W and Weir A, "Renewable Energy Sources", EFN Spon Ltd., UK, 1986.
3. Tiwari G.N, "Solar Energy – Fundamentals Design", Modelling and Applications, Narosa Publishing House, New Delhi, 2002.
4. Shobh Nath Singh, "Non-Conventional Energy Resources", Pearson Education, 2015.
5. Scott Grinnell, "Renewable Energy and Sustainable Design", Cengage Learning, USA, 2016.

CHAIRMAN
BoS (EEE)

20EE502OE	INDUSTRIAL AUTOMATION	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on industrial automation systems
- Illustrate the field level equipment's in industrial automation
- Develop basic programming with PLC
- Understand the theory and operation of SCADA system
- Design a industrial application based problems

UNIT I INTRODUCTION **9**

Industrial control system – Automation and process control – Purpose of industrial automation – Industrial automation circuits – Computer based industrial control and automation – Architecture of the basic three level integrated industrial automation systems – Distributed control system.

UNIT II FIELD LEVEL EQUIPMENTS **9**

Sensors: Thermal overload relay – Proximity and photoelectric switch – Limit, level and flow switches – Temperature and pressure switch. Actuators: Electric motors – Pneumatic actuators – Micro Electro Mechanical System – Solenoid linear actuators – Different types of relays – Timers, Drum switches and special components – Pneumatic devices.

UNIT III PROGRAMMABLE LOGIC CONTROLLERS **9**

Introduction to PLCs – Modular construction of PLC – PLC I/O components – I/O modules – Special purpose of I/O modules – Central processing unit – PLC expansion and I/O configuration – Introduction to programming of PLCs – Basic programming instructions – PID control in the industry.

UNIT IV HMI AND SCADA **9**

HMI controls for data acquisition – Developer and runtime packages – Available tools – Definition of tags – Display of real time parameters in graphical form – Generation of various reports – Logging of alarms, trend curves and historical reports.

UNIT V COMMUNICATION PROTOCOLS **9**

Serial and Parallel communication – Communication topology – Field bus and similar standards – RTU/MTU communications.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain knowledge on the basics of industrial automation system
- Understand the working of different field level equipments
- Analyze the theory and operation of PLC programming instructions
- Impart the knowledge of SCADA system
- Develop various industrial automation applications

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TEXT BOOKS:

1. Stamatios Manesis and George Nikolakopoulos, "Introduction to Industrial Automation", CRC Press, 2018.
2. Stuart A Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Edition, ISA Press, USA, 2009.

REFERENCES:

1. John W Webb and Ronald A Reis, "Programmable Logic Controllers: Principles and Applications", Prentice Hall India, 2003.
2. William Bolton, "Programmable Logic Controllers", Elsevier, Sixth Edition, 2015.
3. Gupta A K, "Industrial Automation and Robotics: An Introduction", Mercury Learning & Information, 2016.
4. Krishna Kant, "Computer Based Industrial Control", Second Edition, Prentice Hall of India, 2010.
5. Popovic D and Bhatkar V P, "Distributed Computer Control for Industrial Automation", Marcel Dekkar Inc., Newyork, 1990.

CHAIRMAN
BoS (EEE)

20IT501OE	FUNDAMENTALS OF OPERATING SYSTEMS	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Acquire basic knowledge of operating system structures and its functioning
- Study the concept of process management
- Learn the basics of memory management
- Understand the structure of file systems
- Familiarize with different operating systems

UNIT I OPERATING SYSTEMS OVERVIEW **9**

Introduction to operating systems – Computer system organization – architecture – Operating system structure – operations – Process, memory, storage management – Open source operating systems – OS services – User interface – System calls – System programs – Process concept – scheduling – Operations on processes – Cooperating processes – Inter-process communication – Threads.

UNIT II PROCESS MANAGEMENT **9**

Basic concepts – Scheduling algorithms – Algorithm evaluation – The critical section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Deadlocks – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT III MEMORY MANAGEMENT **9**

Memory management – Swapping – Contiguous memory allocation – Paging – Segmentation – Virtual memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing.

UNIT IV FILE MANAGEMENT **9**

File concept – Access methods – Directory structure – File-system mounting – Protection – Directory implementation – Allocation methods – Free space management – Disk scheduling – Disk management.

UNIT V LINUX AND WINDOWS **9**

The Linux system – History – Process management – Scheduling – Memory management – File systems – Inter Process Communication – Windows OS – History – Design principles.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Identify the components of operating system and their functionalities
- Analyze the various process management algorithms
- Evaluate the performance of various memory management techniques
- Design a simple file system and analyze the performance
- Work with some popular operating systems like Linux, Windows

TEXTBOOK:

1. Abraham Silberschatz, Peter B Galvin and Greg Gagne, "Operating System Concepts Essentials", John Wiley and Sons Inc., 8th Edition, 2011.

REFERENCE BOOKS:

1. Andrew S Tanenbaum, "Modern Operating Systems", Addison Wesley, 2nd Edition, 2001.
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 1996.
3. Dhamdhere D M, "Operating Systems: A Concept-based Approach", Tata McGraw Hill Education, 2nd Edition, 2007.
4. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall, 7th Edition, 2011.

CHAIRMAN
BoS (IT)

20IT502OE	INTRODUCTION TO DATABASE	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Correlate the role of database management systems in information technology applications
- Structure data using relational model
- Explore the features of structured query language
- Reduce the anomalies using Normalization
- Manage transaction and concurrency control techniques

UNIT I DATABASE FUNDAMENTALS **9**

Purpose of Database Systems – View of Data - Database System Architecture – Database Users and Administrators – Data Models – Structure of Network Model – Structure of Hierarchical Model – Entity Relationship Model – Constraints – Removing Redundant Attributes in Entity Sets – E-R Diagrams – Design Issues – Extended E-R Features – Introduction of Relational Model – E-R Reduction to Relational Schemas

UNIT II RELATIONAL DATABASE MODEL **9**

Structure of Relational Databases – Database Schema – Schema Diagrams – Relational Query Languages – Relational Algebra – Tuple Relational Calculus – Domain Relational Calculus

UNIT III STRUCTURED QUERY LANGUAGE **9**

Overview of SQL query language – SQL Data definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null values – Aggregate Operations – Nested Subqueries – Joins – Views – Integrity Constraints – Authorization. Introduction to Advanced SQL: Functions and Procedures – Triggers

UNIT IV NORMALIZATION **9**

Functional Dependencies – Non-loss Decomposition – Dependency Preservation – First, Second, Third Normal Forms – Boyce Codd Normal Form

UNIT V TRANSACTION AND CONCURRENCY CONTROL **9**

Transaction Model – ACID properties – Transaction States – Serializability – Conflict serializability – View Serializability – Testing Serializability. Concurrency Control – Lock Based Protocols – Deadlocks – Multiple Granularity – Time Stamp Based Protocols – Validation Based Protocols.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Draw the ER Diagram for enterprise applications
- Design databases using relational model
- Query the database using SQL
- Apply normalization techniques on the databases
- Perform transaction and concurrency control techniques

TEXTBOOKS:

1. Henry F Korth, Abraham Silberschatz, Sudharshan S, "Database System Concepts", McGraw Hill, 6th Edition, 2011.
2. Date C J, Kannan A and Swamynathan S, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.

REFERENCE BOOKS:

1. Elmasri R and Navathe S B, "Fundamentals of Database Systems", Pearson Education/Addison Wesley, 6th Edition, 2010.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2009.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition 2004.

CHAIRMAN
BoS (IT)

20CS506OE FUNDAMENTALS OF SOFTWARE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Explore the fundamental concepts of software engineering
- Learn the requirements engineering process and planning for software development
- Understand the software design principles
- Know coding standards and different testing strategies
- Learn the project management principles and quality assurance standards

UNIT I SOFTWARE AND SOFTWARE ENGINEERING 8

The Nature of Software - Software Engineering - Software Myths – Process Models: Prescriptive Process Models, Specialized Process Models, Personal and Team Process Models – Overview of Agile Process -Overview of CMMi

UNIT II REQUIREMENTS ENGINEERING AND PLANNING 10

Requirements Engineering: Establishing the Groundwork - Eliciting Requirements - Negotiating Requirements - Validating Requirements - Requirements Analysis using scenario based modeling. Process and Project Metrics: Software Measurement - Metrics for Software Quality. Estimation: The Project Planning Process – Resources - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models - Project Scheduling

UNIT III MODELLING AND DESIGN 9

Modelling: Data Modeling Concepts - Class-Based Modeling - Flow-Oriented Modeling - Creating a Behavioral Model Design Concepts - Architectural Design: Software Architecture, Architectural Styles, Architectural Design, Architectural Mapping Using Data Flow - User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis

UNIT IV CODING AND SOFTWARE TESTING 9

Coding standards and guidelines - Testing: Strategic approach to Software Testing - Test Strategies for Conventional Software - Validation Testing - System Testing – Debugging – White-box Testing - Basis Path Testing - Control Structure Testing - Black-box Testing

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BoS (CSE)

UNIT V PROJECT MANAGEMENT AND SOFTWARE QUALITY 9

Project Management Concepts: The Management Spectrum, People, Product and Process – Software Configuration Management – Risk Management - Quality Management: Software Quality, Achieving Software Quality - Elements of Software Quality Assurance - The ISO 9000 Quality Standard

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply software engineering principles for software development.
- Formulate software requirement specification and plan for software development
- Design software according to the specification
- Code the software using guidelines / standards and conduct testing
- Manage and maintain the software process by assuring the quality

TEXT BOOKS:

1. Roger S. Pressman and Bruce R. Maxim, "Software Engineering – A practitioner's approach", McGraw Hill Publications, Eighth Edition, 2014

REFERENCES:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, Third Edition, 2005
2. Ian Sommerville, "Software engineering", Pearson Education Asia, Seventh Edition, 2007.
3. Watts S.Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.
4. James F.Peters and WitoldPedrycz, "Software Engineering, Engineering Approach", Wiley-India, 2007.
5. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill, 2007.
6. S.A.Kelkar, "Software Engineering", Prentice Hall of India Pvt, 2007

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BoS (CSE)

20CS507OE INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- To introduce the basics of problem solving techniques and analysis of algorithms
- To learn the various searching and sorting techniques
- To impart knowledge on ADTs such as List, Stack, Queue
- To explore the binary trees and priority queues
- To get exposure on hashing techniques and graphs

UNIT I ANALYSIS OF ALGORITHMS **9**

Introduction to Algorithms and algorithmic problem solving – Problem types. Analysis of Algorithms: Analysis Framework - Asymptotic Notations – Best case, worst case and average cases - Mathematical analysis of non-recursive algorithms - Recurrence equations – Solving recurrence equations - Mathematical analysis of recursive algorithms.

UNIT II SEARCHING AND SORTING ALGORITHMS **9**

Search Algorithms: Linear search - binary search - Analysis of Search algorithms. Sorting Algorithms: Bubble sort - Exchange sort - Insertion sort – Merge sort – Quick sort – Heap sort - Analysis of Sorting Algorithms.

UNIT III LISTS, STACKS AND QUEUES **9**

Abstract Data Types – The List ADT – Singly Linked List – Doubly Linked List – Circular Linked List – Applications and analysis of List. The Stack ADT – Applications and Analysis of Stack. The Queue ADT – Applications and Analysis of Queues.

UNIT IV TREES AND HEAPS **9**

Preliminaries – Binary Trees – Expression Trees- Traversals. The Search Tree ADT – Binary Search Trees – Applications of BST. Priority Queues – Binary heap – Heap operations - Applications of heaps.

UNIT V HASHING AND GRAPHS **9**

Hashing – Closed hashing: Separate Chaining – Open Addressing - Linear probing. Graph ADT – Representation of graph – Graph Traversals: DFS and BFS. Applications of Graph - Finding Shortest Path - Connected components.

TOTAL: 45 PERIODS

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BoS (CSE)

OUTCOMES:

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

- Analyze recursive and non recursive algorithms for complexity
- Apply various searching / sorting algorithms for solving real-world problems
- Implement List, Stack and Queue with appropriate data structures
- Work with binary trees and heap based priority queue
- Exploit the hashing technique and graph algorithms

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, Second Edition, 1997.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, "Data Structures and Algorithms", Pearson Education, New Delhi, 2006
2. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C", Orient Longman, Second Edition, 2008.
3. Jean-Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, New Delhi, Second Edition, 1991.

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BoS (CSE)

20BM501OE	BASICS OF BIOMEDICAL INSTRUMENTATION	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge about various physiological parameters of both electrical and non-electrical
- Know the importance of pH, pO_2, pCO_2 levels in human
- Add insights on the various methods of recording and also the methods for transmitting these parameters
- Study about the various assist devices used in hospitals
- Gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of biomedical signals, Bio-potentials, Bio-potential electrodes, Biological amplifiers, ECG, EEG, EMG, PCG, Typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMENTER MEASUREMENT 9

pH, pO_2, pCO_2, Colorimeter, Blood flow meter, Cardiac output, Respiratory, Blood pressure, Temperature and Pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES AND IMAGING SYSTEMS 9

Cardiac Pacemakers, DC Defibrillator, Dialyzer, Ventilators, Computed Tomography, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems (Block diagrammatic approach would suffice).

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies – Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Telemedicine, Insulin Pumps, Radio Pill, Endoscopy, Brain Machine Interface, Lab on a Chip.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Know the human body electro-physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement-body temperature, blood pressure, pulse, blood cell count, blood flow meter…
- Interpret the various assist devices used in the hospitals viz pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods. E.g) Ultrasonic, Shortwave, Microwave surgical diathermies and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

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BoS (BME)

TEXT BOOK:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.

REFERENCES:

1. Khandpur R S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
2. John G Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007.
3. Joseph J Carr and John M Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.

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BoS (BME)

20BM502OE **INTRODUCTION TO CELL BIOLOGY** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Provide knowledge on cell structure and junctions
- Know the membranes and cell wall
- Be acquainted with cell division and its cycles
- Become aware of the significance of DNA and RNA, Proteins
- Identify various enzymes and its use in industries

UNIT I CELL STRUCTURE **9**

Cell organization, structure of organelles, extra cellular matrix and cell junctions.

UNIT II CELL ORGANELLE AND FUNCTION **9**

Nucleus, Mitochondria, Lysosomes, Endoplasmic reticulum, Golgi apparatus, vesicles, centrosomes, cell membranes, ribosomes, cytosol, chloroplasts, flagella, cell wall.

UNIT III DIVISION **9**

Cell cycle – mitosis, meiosis, cell cycle regulation and apoptosis.

UNIT IV MACROMOLECULES **9**

DNA, RNA and Proteins – basic units, architectural hierarchy and organization, functions.

UNIT V ENZYMES **9**

Enzymes – Structure, Mechanism of action, Factors that affect enzyme activity, Common enzymes used in industrial setup of plant and animal origin.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the structure of the cell and its functions
- Recognize the functions of cell wall and membrane
- Familiar with the cell cycle and its characteristics
- Apply the knowledge of DNA and RNA to study different characteristics
- Comment of various enzymes and its role by doing thorough analysis

TEXT BOOKS:

1. Lodish, Harvey etal., "Molecular Cell Biology", 5th Edition, W H Freeman, 2005.
2. Cooper G M and Hansman R E, "The Cell: A Molecular Approach", 4th Edition, ASM Press, 2007.
3. Alberts, Bruce etal., "Molecular Biology of The Cell", 4th Edition, Garland Science (Taylors Francis), 2002.

REFERENCES:

1. McDonald, F etal., "Molecular Biology of Cancer", 2nd Edition, Taylor & Francis, 2004.
2. King and Roger J B, "Cancer Biology" Addison Wesley Longman, 1996.

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BoS (BME)

20ME701OE	BASICS OF HYDRAULIC AND PNEUMATIC SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Study the fundamentals of fluid power systems
- Understand the working of hydraulic pumps and actuators
- Know about control valves and accumulators in hydraulic systems
- Learn the various components of pneumatic and electro-pneumatic systems
- Identify the various trouble shoots in hydraulic and pneumatic systems

UNIT I FUNDAMENTALS OF FLUID POWER SYSTEMS **9**

Introduction – fluid power systems – types – components – properties of fluids – types of fluids – applications of Pascal's law – principle of hydraulic flow - laminar and turbulent flow – Reynolds's number – Darcy's equation – losses in valves and fittings – advantages and applications of fluid power – fluid power ANSI symbols.

UNIT II HYDRAULIC PUMP AND ACTUATORS **9**

Principles of hydraulic system – pumping theory – pump classification - gear pump, vane pump, piston pump – fluid power actuators – linear hydraulic actuators - single acting, double acting and special type – rotary actuators - gear, vane and piston motors – hydraulic cushioning.

UNIT III CONTROL COMPONENTS IN HYDRAULIC SYSTEMS AND ACCUMULATORS **9**

Directional Control Valve (DCV) - check valve, 3/2 DCV and 4/3 DCV – pressure control valve - pressure relief valve and pressure reducing valve – flow control valve - pressure compensated and non pressure compensated – mechanical servo valves – proportional valves – comparison of servo and proportional valve – accumulators – types - weight loaded, spring loaded and gas loaded accumulators – intensifier – intensifier press circuit.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS **9**

Principles of pneumatic system – properties of air – compressors – Filter, Regulator and Lubricator (FRL) unit – muffler – air control valves – pneumatic actuators – components of electrical control - switches, solenoids, relays and timers – electro pneumatic system - electro pneumatic circuits - reciprocation, sequencing and regenerative – introduction to fluidics.

UNIT V TROUBLE SHOOTING AND APPLICATIONS **9**

Hydraulic and pneumatic systems: Installation, selection, maintenance, troubleshooting and remedies – low cost automation – Case studies: Conveyor feed system, car parking barriers, pick and place robot.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the basic concepts of fluid power systems
- Describe the functions of various hydraulic pump and actuators
- Familiarize with different types of control valves and accumulators
- Understand the functions of pneumatic and electro pneumatic systems

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BoS (MECH)

- Analyse the various trouble shooting methods of hydraulic and pneumatic systems

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education India, 7th Edition, 2013.
2. Srinivasan R, "Hydraulic and Pneumatic Controls", Vijay Nicole, 3rd Edition, 2019.

REFERENCES:

1. Majumdar S R, "Oil Hydraulics Systems-Principles and Maintenance", Tata McGraw Hill, 2017.
2. Majumdar S R, "Pneumatic Systems-Principles and Maintenance", Tata McGraw Hill, 1st Edition, 2011.
3. Shanmugasundaram K, "Hydraulic and Pneumatic Controls", S.Chand & Co, 1st Edition, 2006.

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BoS (MECH)

20ME702OE	ALTERNATIVE ENERGY FUELS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Familiarize with various sources of energies available in universe
- Study the methods of liquid fuel extraction
- Know the concepts of fuel cells and types
- Learn the properties and preparation techniques of biodiesel
- Understand the production techniques of nuclear energy

UNIT I INTRODUCTION TO ENERGY 9

World energy consumption – petroleum – natural gas – coal – nuclear energy – geo thermal energy – renewable energy - solar, wind, tidal, biomass and hydropower.

UNIT II LIQUID FUELS 9

Introduction to coal pyrolysis – char oil energy development process – TOSCOAL process – Lurgi-Ruhr gas process – occidental flash pyrolysis process – clean coke process – coalcon process.

UNIT III FUEL CELLS 9

Introduction – basic concepts – design characteristics – operation – thermal efficiency – cell voltage – fuel cell system – general description – fuel cell classifications – low temperature fuel cells - proton exchange membrane fuel cells and alkaline fuel cells – high temperature fuel cells - molten carbonate fuel cells and solid oxide fuel cells.

UNIT IV BIODIESEL 9

Introduction – transesterification process for biodiesel manufacture – pretreatment of oil – transesterification reaction in a biodiesel reactor – product and by-product separation – purification – properties of biodiesel – cetane number – calorific value – general physical properties of biodiesel – cold flow properties – material compatibility.

UNIT V NUCLEAR ENERGY 9

Nuclear fission and nuclear reactor physics – electricity generation from nuclear reactors – nuclear fuel cycle – types of reactors – advanced reactors and concepts – hydrogen production – nuclear waste disposal – nuclear fusion.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the various sources of energy
- Demonstrate liquid fuel extraction through pyrolysis processes
- Understand the importance and design considerations of fuel cells
- Describe the process involved in the extraction of biodiesel
- Analyse the utilization and waste disposal of nuclear energy

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BoS (MECH)

TEXT BOOKS:

1. Sunggyu Lee, James G Speight, "Handbook of Alternative Fuel Technologies", CRC Press, Taylor & Francis Group, 2014.
2. Arumugam S Ramadhas, "Alternative Fuels for Transportation", Taylor & Francis, 2016.

REFERENCES :

1. Donald L Klass, "Biomass for Renewable Energy, Fuels and Chemicals", Elsevier-Academic Press, 1st Edition.
2. Sunggyu Lee, "Alternative Fuels", CRC Press, Taylor & Francis, 1st Edition.
3. Suresh M, Rajkumar S, Lakshminarayanan A K, "Alternative Energy Sources, Materials and Technologies", Trans Tech Publications Limited, 2015.

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BoS (MECH)

20EC701OE **CONSUMER ELECTRONICS** **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to

- Understand the audio basics and devices
- Know the performance of different audio systems
- Understand the various television systems
- Learn the operation of TV receivers and video systems
- Gain the knowledge on basics of home/office appliances

UNIT I AUDIO FUNDAMENTALS AND DEVICES **9**

Basic characteristics of sound signal: level and loudness - pitch - frequency response - fidelity and linearity - Reverberation - Audio level metering - decibel level in acoustic measurement - Microphone: working principle - sensitivity - nature of response - directional characteristics - Types: carbon - condenser - crystal - electrets - tie-clip - wireless - Loud speaker: working principle - characteristic impedance - watt capacity - Types: electrostatic - dynamic - permanent magnet etc - woofers and tweeters - Sound recording: Optical recording - stereophony and multichannel sound - MP3 standard.

UNIT II AUDIO SYSTEMS **9**

Audio system: CD player, home theatre sound system, surround ,sound- Digital console: block diagram, working principle, applications - FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T - PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification

UNIT III TELEVISION SYSTEMS **9**

Monochrome TV standards - scanning process - aspect ratio - persistence of vision and flicker - interlace scanning - picture resolution - Composite video signal: horizontal and vertical sync details - scanning sequence - Colour TV standards - colour theory - hue-brightness - saturation - luminance and chrominance - Different types of TV camera - Transmission standards:PAL system - channel bandwidth.

UNIT IV TELEVISION RECEIVERS AND VIDEO SYSTEMS **9**

PAL-D colour TV receiver - block diagram - Precision IN Line color picture tube - Digital TVs: LCD - LED - PLASMA - HDTV - 3D TV - projection TV - DTH receiver - Video interface: Composite - Component - Separate Video - Digital Video - SDI - HDMI Multimedia Interface - Digital Video Interface - CD and DVD player: working principles - interfaces.

UNIT V HOME / OFFICE APPLIANCES **9**

FAX and Photocopier - Microwave Oven: types - single chip controllers - wiring and safety instructions - technical specifications - Washing Machine: wiring diagram - electronic controller for washing machine – technical specifications - types of washing machine - fuzzy logic - Air conditioner and Refrigerators: Components features - applications - and technical specification - Digital camera and cam coder: pick up devices - picture processing - picture storage, lithium battery.

Total: 45 Periods

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BoS /ECE

OUTCOME:

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

- Develop audio circuits
- Design the audio systems
- Familiarize with TV systems
- Analysis the fault identification in TV
- Familiarize in home/office appliances

TEXT BOOKS:

1. Bali S.P, "Connsumer Electronics", Pearson Education India, 2010 , Latest Edition.
2. Bali R and Bali S.P, "Audio Video Systems: Principle Practices & Troubleshooting", Khanna Book Publishing Co.(P) Ltd., Delhi, India, Latest Edition, 2010.

REFERENCES:

1. Gulati R.R, "Modern Television Practices", New Age International Publication (P) Ltd. New Delhi Year 2011, Latest Edition
2. Gupta R.G, "Audio Video Systems", Tata McGraw Hill, New Delhi, India 2010, Latest Edition
3. Whitaker Jerry & Benson Blair, "Mastering Digital Television", McGraw-Hill Professional, Latest Edition, 2010.
4. Whitaker Jerry & Benson Blair, "Standard Handbook of Audio Engineering", McGraw-Hill Professional, Latest Edition, 2010.

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20EC702OE **RFID AND FLEXIBLE SENSORS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the basic principle of RFID system.
- Get knowledge on information processing through RFID system
- Learn the basics of readers, printers and protocols.
- Design for various applications testing software.
- Understand the principle and applications of flexible sensors

UNIT I INTRODUCTION AND RFID ARCHITECTURE **9**

Case for RFID - Eras of RFID - applications - RFID Architecture - confluence of technologies - key functionalities- system components - systemic quality considerations - architecture guidelines - System Management.

UNIT II TAGS AND PROTOCALS **9**

Basic tag capabilities - physical characteristics - power source - air interface - information storage and processing capacity - standards - protocol terms and concepts - how tags store data - singulation and anti-collision procedurestag features for security and privacy - learn to troubleshoot tag communications

UNIT III READERS, PRINTERS AND READER PROTOCOLS **9**

Physical and logical components of RFID reader - parts of RFID printer and applicator - types of readers - layout for readers and antennas - configuring readers - parts of a reader protocol - vendor protocols - EPC global protocol overview - simple lightweight RFID reader protocol - future protocols.

UNIT IV MIDDLEWARE AND INFORMATION SERVICE **9**

Motivations - logical architecture - application level events specification - commercial RFID middleware - RFID Data - EPC global network - object naming service - EPC information services.

UNIT V FLEXIBLE SENSORS **9**

World of wearables - Attributes of wearables - Textiles and clothing: The meta wearable - Challenges and opportunities - Future of wearables - Need for wearable haptic devices - Categories of wearable haptic.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the principle of operation of various components of RFID system.
- Familiar with usage of tags and protocols

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BoS /ECE

- Explain about the working principle of readers, printers and reader protocols
- Apply the methodology in engineering applications like inventory management, material handling etc
- Know about the recent trends in flexible sensors

TEXT BOOK:

1. Himanshu Bhatt, Bill Glover, "RFID Essentials", O'Reilly Media publications, 2006 Approved by third Academic council.
2. Amin Rida and Manos M. Tentzeris, RFID-Enabled Sensor Design and Applications (Artech House Integrated Microsystems), 2011, 1st edition, Artech House Publishers, UK

REFERENCES:

1. Klaus Finkenzeller, "RFID Handbook", John Wiley & Sons, Ltd, 2010
2. Stephen B. Miles, Sanjay E. Sarma, John R. Williams, "RFID Technology and Applications", Cambridge University Press, 2008
3. Patrick J Sweeney, "RFID for DUMMIES", Wiley India Publications, 2005
4. Elaine Cooney, "RFID + The Complete review of Radio Frequency Identification", 1st ed., Delmar Cengage Learning 2007.

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20EE701OE	ENERGY STORAGE SYSTEMS (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the basic concepts of energy storage devices
- Learn the performance of various types of batteries
- Explain the operation of fuel cells and ultracapacitors
- Analyse the application of energy storage devices
- Know the thermal and mechanical energy storage systems

UNIT I ENERGY STORAGE TECHNOLOGIES **9**

Introduction – Need of energy storage – Battery – Components of cells and batteries – Classification – Operation of a cell – Theoretical cell voltage, capacity and energy – Electrochemical principles and reactions: Cell polarization – Electrical double–layer capacity and ionic adsorption – Mass transport to the electrode surface – Factors affecting battery performance – Standards.

UNIT II PRIMARY AND SECONDARY BATTERIES **9**

Battery parameters and specification – Performance, charging and discharging – Storage density, energy density, classical and modern batteries: Zinc–chloride, Nickel cadmium, Leadacid, Nickel hydride and Lithium battery – Principle and working.

UNIT III ADVANCED BATTERIES FOR EV APPLICATIONS **9**

Ultracapacitors: Features – Basic principles of ultracapacitors – Performance of ultracapacitors – Mathematical model. Fuel cells: Operating principles – Characteristics – Polarization loss – Fuel cells technologies – Comparison of fuel cells, hybridization of energy storage systems.

UNIT IV APPLICATIONS OF BATTERIES **9**

Storage of solar – Greenhouse heating – Power plant application – Batteries in space – Storage in electric supply networks – Automotive application in hybrid and electric vehicles – Role of ultracapacitors in EVs.

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UNIT V THERMAL AND MECHANICAL ENERGY STORAGE 9

Thermal energy storage – Energy storage in hydrogen – Energy storage in flywheels – Pumped hydro storage – Elastic energy storage – Applications.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Describe the working of energy storage devices
- Differentiate the characteristics of various primary and secondary batteries
- Compare the operation of ultracapacitors and fuel cells
- Summarize the applications of batteries
- Explain the different energy storage techniques

TEXT BOOK:

1. Robert A Huggins, "Energy Storage–Fundamentals, Materials and Applications", 2nd Edition, Springer, 2016.

REFERENCES:

1. Ibrahim Dincer and Marc A Rosen, "Thermal Energy Storage: Systems and Applications", 2nd Edition, John Wiley and Sons, 2011.
2. Ru-shiLiuLei Zhang, Xueliang Sun, Hansan Liu andJiujun Zhang, "Electrochemical Technologies for Energy Storage and Conversion", Wiley publications, 2012.
3. Ali Emadi, Mehrdad Ehsani and John M Miller, "Vehicular Electric Power Systems", Special Indian Edition, Marcel dekker, Inc 2010.
4. Tetsuya Osaka and MadhavDatta, "Energy Storage Systems in Electronics", Gordon and Breach Science Publishers, 2000.
5. Iqbal Hussain, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd Edition, CRC Press, Taylor and Francis Group, 2011.

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20EE702OE	ELECTRICAL SAFETY ENGINEERING (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Know the concepts of safety engineering
- Learn the various electrical hazards and safety equipment
- Analyze the grounding and bonding techniques
- Compare the safety methods for various electrical equipment
- Understand the various standards for proper maintenance of electrical equipment

UNIT I CONCEPTS IN SAFETY **9**

Introduction – Electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment – Indian electricity act and rules – Statutory requirements from electrical inspectorate – International standards on electrical safety – First aid – Cardio Pulmonary Resuscitation(CPR).

UNIT II ELECTRICAL HAZARDS AND SAFETY EQUIPMENTS **9**

Primary and Secondary hazards – Arc, blast and shocks – Causes and effects – Safety equipment – Person Protection Equipment(PPE), Head and eye protection, flash and thermal protection. Rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags and locking devices – Voltage measuring instruments – Proximity and contact testers – Safety electrical one line diagram – Electrician's safety kit.

UNIT III GROUNDING AND BONDING TECHNIQUES **9**

General requirements for grounding and bonding – Definitions – Grounding of electrical equipment – Bonding of electrically conducting materials and other equipment – Connection of grounding and bonding equipment – System grounding – Purpose of system grounding – Grounding electrode system – Grounding conductor connection to electrodes – Use of grounded circuit conductor for grounding equipment – Grounding of low voltage and high voltage systems.

UNIT IV SAFETY METHODS OF EQUIPMENT **9**

The six step safety methods – Pre job briefings – Hot–Work decision tree – Safe switching of

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power system – Lockout – Tag out – Flash hazard calculation and approach distances – Calculating the required level of arc protection – Safety equipment – Procedure for low, medium and high voltage systems – The one minute safety audit.

UNIT V SAFETY SCHEDULE AND MAINTENANCE 9

Safety related case for electrical maintenance – Reliability Centered Maintenance (RCM) – Eight step maintenance programme – Frequency of maintenance – Maintenance requirement for specific equipment and location – Regulatory bodies – National electrical safety code – Standard for electrical safety in work place – Occupational safety and health administration standards.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the basic concepts related to safety
- Describe electrical hazards and safety equipment
- Identify various grounding and bonding techniques
- Select appropriate safety method for low, medium and high voltage equipment
- Conduct proper maintenance of electrical equipment according to standards

TEXT BOOK:

1. John Cadick, Mary Capelli–Schellpfeffer, Dennis K Neitzel and Al Winfield, "Electrical Safety Handbook", 4th Edition, McGraw–Hill Education, 2012.

REFERENCES:

1. Mohamed El Sharkawi, "Electric Safety–Practice and Standards", CRC Press, 2014.
2. Maxwell Adams J, "Electrical Safety–A guide to the Causes and Prevention of Electric Hazards", 1st Edition, The Institution of Engineering and Technology, 1994.
3. Ray A Jones, Ray Jones and Jane G Jones, "Electrical Safety in the Workplace", 1st Edition, Jones and Bartlett Learning, 2000.
4. Fortham Cooper W, "Electrical Safety Engineering", 1st Edition, Butterworth and Company, London, 1998
5. Kimberly Keller, "Electrical Safety Code Manual", Elsevier, 2010.

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C 5

20IT701OE	PROGRAMMING IN JAVA	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Learn the fundamentals of object oriented programming in Java.
- Be familiar with the Object Oriented concepts in Java
- Be exposed to the usage of Arrays in Java programming
- Understand the mechanism in handling exceptions, Multithreading and I/O.
- Demonstrate the concepts of AWT, event handling used in GUI.

UNIT I INTRODUCTION **9**

Introduction to Java – History of Java – FOP versus OOP – OOOPs Concepts - Java Programming Paradigm – Features of Java Programming – Java Programming Environment – C vs Java - Tools available for Java Programming – Java Architecture - Data types and Character set – Variables - Identifiers – Keywords – Operators - A Simple Java Program – Analysis of the program – Command line input in Java – Input using Scanner class

UNIT II CLASS, OBJECT and INHERITANCE **9**

Class – Class Structure – Object declaration – Object Initialization - Declaring Multiple Classes - Adding methods to Class – Constructor – this Keyword – Multiple Constructors – Constructor Overloading - Control Statements – Inheritance – Method Overriding – Super Keyword – Abstract Class– final Keyword – Access Modifiers - Packages in Java – Interface – Iterator – Cloneable – Serializable – Comparable

UNIT III ARRAYS **9**

Array in Java: Creation of Array – Storing elements in Array – Processing elements in Array – 2D Array and 3D Array – Java Scope – Static Keyword – Static Variable – Static Method – Nested Class – Recursion

UNIT IV EXCEPTION HANDLING, MUTITHREADING AND I/O STREAMS **9**

Exception Handling - Multithreading –Thread – Life Cycle of Thread – Thread Control Methods – Thread Types – Thread Scheduling – Thread Synchronization - I/O Stream – Character Stream Class - Data Input Stream – Data Output Stream – File Handling - Java networking - JDBC - Connectivity

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UNIT V APPLET, AWT and SWING 9

Java Applet Programming : Applet – Building an applet – Hosting an applet – Running an Applet – Basic Structure of an applet – Basic Methods in applet – Input passing to an Applet – Application Versus Applet – Applet Events – Basics of HTML – Applet Tag Properties - AWT Programming – Classes of AWT – Components – Methods – Containers – Event Handling – Classes – Interfaces - SWING: Introduction – Swing Components – Containers – Events - Hierarchy of Swing class

OUTCOMES:

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

- Explain the fundamentals of Java programming
- Use the concept of object oriented programming in Java
- Implement the mechanism of array and recursion.
- Develop applications for concurrent processing and I/O with exception handling.
- Build interactive GUI applications in Java programming

TEXT BOOK:

1. Hebert Schildt, "Java: The Complete Reference, Eleventh Edition", 7th Edition, McGraw-Hill, 2010.

REFERENCE(S):

1. Kathy Sierra, Bert Bates, "Head First Java", 2nd Edition, O'Reilly Media, Inc., 2005.
2. Y.Daniel Liang, "Introduction to Java Programming", 11th Edition, Pearson Education, 2017.
3. https://onlinecourses.nptel.ac.in/noc21_cs56/preview

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20IT702OE	WEB DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Enhance the knowledge of how to develop a Web page using HTML
- Classify the various style and dimensions of CSS
- Design the web page using JavaScript
- Design the web page using DOM
- Implement the various approach of database connectivity

UNIT I INTRODUCTION 9

Introduction to HTML – Benefits of HTML – Structure of an HTML Document, HTML Tags: Attributes – meta Elements – Linking – Lists- Tables- Forms- Form Elements- Form Attributes – Web services.

UNIT II CASCADING STYLE SHEETS 9

Introduction to CSS - Inline Styles – Conflicting Styles- Style Sheets- Positioning Elements – Backgrounds –Dimensions- Text Flow- Media Types – Drop-Down Menu.

UNIT III SCRIPTING LANGUAGE 9

Introduction to Scripting Language – Data Types - Variables – Expressions – Operators and Control Statements – Arrays – User Defined Functions – Events.

UNIT IV JAVASCRIPT OBJECTS 9

JavaScript Objects: String – Math – Date – Boolean and Number – Window – Document – Document Object Model(DOM) – DOM Collections – Dynamic Styles.

UNIT V IMPLEMENTATION STRATEGIES 9

Introduction to PHP: Basics – String Processing and Regular Expressions – Form Processing and Business Logic – Connecting to a Database – Using Cookies – Dynamic Content – Operator Precedence Chart – Database Connectivity: SQL: DDL – DML- MySQL: Creating Database in MySQL – Mini Project.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Identify different types of HTML tags, their functionality and attributes and learn the basics of web services
- Classify CSS to control the appearance of web pages and denote the background elements and media types
- Incorporate JavaScript variables, operators and functions in web pages and manipulate HTML forms to validate user inputs
- Demonstrate various JavaScript object models and create a web pages with dynamic style using JavaScript and DOM
- Demonstrate the database connectivity and simple PHP application program using web Server

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web: How to Program", 5th Edition, Pearson, 2011
2. KoGent Learning Solutions Inc., "Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and AJAX", Kindle Edition, Dreamtech Press, 2012.

REFERENCES :

1. Robert. W. Sebesta, "Programming the World Wide Web", 8th Edition, Pearson Education, 2015.
2. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 2007.
3. http://www.w3schools.com/

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20CS706OE **E-COMMERCE**

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Study the basics of E-Commerce.
- Learn the activities involved in the E- commerce process.
- Focus the applications related to the EDI.
- Analyze the security issues in the E –commerce.
- Apply the E-commerce at various applications.

UNIT I INTRODUCTION **9**

E-Commerce framework – E-Business models – Network infrastructure for E-commerce – Internet as a Network Infrastructure – E-commerce and World Wide Web.

UNIT II E-COMMERCE **9**

Consumer oriented E-Commerce – Applications – Mercantile process models – Electronic Payment Systems – Digital Token based EPS – Smart cards – Credit cards – Risks – designing EPS – Study of e-commerce companies

UNIT III INTERORGANIZATIONAL COMMERCE AND EDI **9**

Electronic Data Interchange: EDI applications in Business – EDI and E-Commerce – EDI standardization and implementation – Internet based EDI.

UNIT IV SECURITY ISSUES IN E-COMMERCE **9**

Network Security – Client-Server Network Security – CS Security Threats – Firewalls – Data & Message Security – Encrypted Documents – Security on the Web.

UNIT V INTRAORGANIZATIONAL E-COMMERCE AND MARKETING **9**

Internal Information System-Work-flow Automation and Coordination-Supply Chain Management-Document Library-Types of Digital Documents-Corporate Data Warehouses – Advertising and Marketing on the Internet .

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Describe the basics of E-Commerce.
- Explain the activities involved in the E- commerce process.
- Develop the applications related to the EDI.
- Analyze the security issues in the E –commerce.
- Apply the E-commerce at various applications.

TEXT BOOKS:

1. Ravi Kalakota and Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson Education Asia, 2009.

REFERENCES:

1. Marilyn Greenstein and Todd M Feinman , "Electronic commerce: Security, Risk Management and Control", Tata McGraw-Hill , 2000.
2. Judy Strauss and Raymond Frost, "E Marketing", PHI, 2002.
3. Brenda Kienan, "Managing E Commerce Business", PHI, 2001.
4. Vivek Sharma and Rajiv Sharma, "Developing E Commerce Sites – an integrated approach", Pearson Education Asia, 2000.
5. Kamalesh K. Bajaj, "E-Commerce: The Cutting Edge & Business", Tata McGraw-Hill, 2003.

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20CS708OE INTRODUCTION TO COMPUTER ORGANIZATION

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Have a knowledge on basic digital principles.
- Understand the basic structure and operation of a digital computer.
- Explore the basic processing unit
- Study the hierarchical memory system.
- Learn the pipelining architecture concepts.

UNIT I INTRODUCTION TO DIGITAL PRINCIPLES 9

Boolean functions – Simplifications of Boolean functions using Karnaugh map- Implementation of Boolean functions using logic gates - Decoders and encoders - Multiplexers and demultiplexers

UNIT II BASIC STRUCTURE OF COMPUTERS 9

Functional units – Basic operational concepts – Performance – Instructions and instruction sequencing – Addressing modes – RISC and CISC Styles – Arithmetic: Design of fast adders – Multiplication of unsigned and signed numbers – Fast Multiplication – Floating point numbers and operations.

UNIT III BASIC PROCESSING UNIT 9

Fundamental concepts – Instruction Execution – Hardware Components - Instruction Fetch and Execution Steps – Control Signals – Hardwired control

UNIT IV MEMORY SYSTEM 9

Basic concepts – Memory hierarchy - Semiconductor RAM – Read-only Memories – Direct Memory Access – Cache memories – Performance considerations – Virtual memory

UNIT V PIPELINING 9

Basic concepts – Pipeline organization and issues – Data dependencies – Memory and branch delays – Performance evaluation

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Apply digital principle concepts to design logical circuits
- Design the arithmetic circuits for faster operations
- Analyze the main processing units of a computer.
- Analyze memory hierarchy and its impact on computer cost/performance.
- Design a pipeline for consistent execution of instructions with minimum hazards

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian, "Computer Organization and Embedded Systems", McGraw Hill Higher Education, Sixth Edition, 2011.
2. M.Morris Mano, "Digital Design", Pearson Education, 3rd Edition, 2007.

REFERENCES:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Elsevier, Third Edition, 2005.
2. "Computer Organization", ISRD Group, Tata McGraw Hill, 2006.
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Sixth Edition, 2003.
4. Charles H.Roth, Jr. "Fundamentals of Logic Design", Jaico Publishing House, Cengage Earning, 4th Edition, 2005.
5. Donald D.Givone, "Digital Principles and Design", Tata McGraw-Hill, 2007.

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20BM701OE BIOINFORMATICS

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the how to acquire the DNA and protein structure and sequence
- Study the database indexing, search and sequence formats
- Learn the different data processing tools and methods
- Know the various analysis methods and software tools
- Get an awareness about the applications of Bioinformatics

UNIT I BIOLOGICAL DATA ACQUISITION 9

The form of biological information. Retrieval methods of DNA sequence, protein sequence and protein structure information

UNIT II DATABASES 9

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases – primary sequence databases, protein sequence and structure databases, Organism specific databases

UNIT III DATA PROCESSING 9

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus Global. Distance metrics. Similarity and homology. Scoring matrices.

UNIT IV METHODS OF ANALYSIS 9

Dynamic programming algorithms, Needleman-wunsch and Smith-waterman.Heuristic Methods of sequence alignment, FASTA, and PSI BLAST.Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment.

UNIT V APPLICATIONS 9

Genome Annotation and Gene Prediction, ORF finding, Phylogenetic Analysis: Comparative genomics, orthologs, paralogs. Genome analysis – Genome annotation

TOTAL: 45 PERIODS

OUTCOMES:

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

- Appreciate the DNA and protein sequence data acquisition
- Realize the database indexing, searching and various file formats
- Do Access, search and retrieval processing on data
- Analyze different methods, algorithms and software tools
- Apply the skills in different findings and do the analysis on various applications

TEXT BOOKS:

1. Arthur M Lesk, "Introduction to Bioinformatics", Fourth Edition, Oxford University Press
2. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press

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REFERENCE BOOKS:

1. Pierre Baldi, Soren Brunak, "Bioinformatics The Machine Learning Approach", MIT Press
2. Durbin R, Eddy S, Krogh A, Mitchison G, "Biological Sequence Analysis Probabilistic models of proteins and nucleic acids", Cambridge University Press, 1998
3. David Mount, "Bioinformatics: Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press, Second Edition
4. James D Tisdall, "Beginning Perl for Bioinformatics", O'Reilly Publisher

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BoS/BME

20BM702OE FUNDAMENTALS OF NUTRITION

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Develop knowledge in the basic area of Food Chemistry
- Know how digestion takes place in Human and the insights of Mechanical and Chemical digestion
- Learn the Glycemic and Non Glycemic indexes of Carbohydrates
- Understand food processing and technology subjects effectively
- Appreciate the similarities and complexities of the chemical components in food

UNIT I OVERVIEW OF NUTRITION **9**

Definition, Six classes of nutrients, calculating energy values from food using the RDA, Nutritional status, Nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations, Balanced diet planning: Diet planning principles, dietary guidelines; food groups, exchange lists, personal diet analysis

UNIT II DIGESTION **9**

Digestion, Absorption and Transport: Anatomy and Physiology: Anatomy and Physiology of the digestive tract, Mechanical and Chemical digestion, Absorption of Nutrients

UNIT III CARBOHYDRATES **9**

Glycemic and Non Glycemic carbohydrates, Blood glucose regulation, Recommendations of sugar intake for health, Health effects of fiber and starch intake, Artificial sweeteners; Importance of blood sugar regulation, Dietary recommendations for NIDDM and IDDM

UNIT IV PROTEINS AND LIPIDS **9**

Proteins; Food enzymes; Texturized proteins; Food sources, functional role and uses in foods. Review of structure, composition and nomenclature of Fats. Non-glyceride components in fats and oils; Fat replacements; Food sources, functional role and uses in foods. Health effects and recommended intakes of lipids.Recommended intakes of proteins, Deficiency – short term and long term effects.

UNIT V METABOLISM, ENERGY BALANCE AND BODY COMPOSITION **9**

Energy Balance, Body weight and Body composition, Health implications, Obesity, BMR and BMI Calculations, Weight control: Fat cell development, Hunger, Satiety and Satiation, Dangers of unsafe weight lost schemes, Treatment of obesity, Attitudes and behaviours toward weight control. Food and pharmaceutical grades, Toxicities, Deficiencies, Factors affecting bio availability, Stability under food processing conditions

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Describe the different classes nutrients
- Illustrate the digestion and absorption of Food substances
- Demonstrate the role of carbohydrates in producing the required energy
- Exhibit the energy balance and the body composition in detail
- Explain the significance of proteins and Lipids with its role

TEXT BOOKS:

1. Mann, Jim, Stewart Truswell, "Essentials of Human Nutrition", Third Edition, Oxford University Press, 2007.
2. Gibney, Michael J., et al, "Introduction to Human Nutrition", Second Edition, Blackwell, 2009.

REFERENCES:

1. Damodaran S, Parkin K L and Fennema O R, " Fennema's Food Chemistry Fourth Edition, CRC Press, 2008.
2. Belitz H D, Grosch W andSchieberle P, "Food Chemistry", Third Revised Edition, Springer, Verlag, 2004.

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