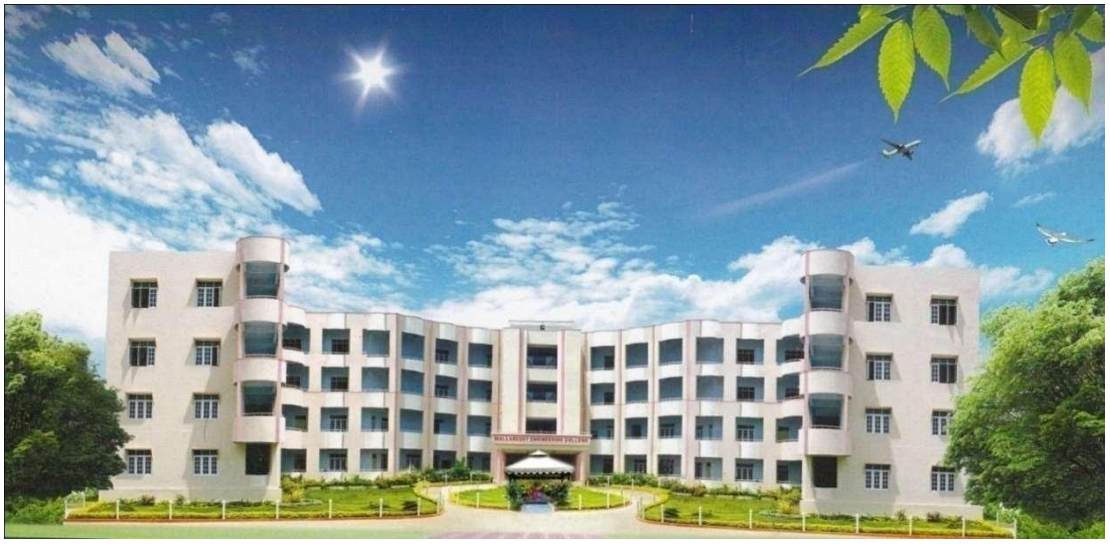
COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2020-21 onwards



Department of Civil Engineering (CE)

For

B.Tech. - Four Year Degree Programme

(MR20 Regulations)

MALLA REDDY ENGINEERING COLLEGE

(Autonomous)

(UGC Autonomous Institution, Approved by AICTE New Delhi & Affiliated to JNTUH, Hyderabad). Accredited 3rd time by NAAC with 'A++' Grade, Maisammaguda(H), Medchal-Malkajgiri District, Secunderabad, Telangana State-500100, www.mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
MR20 –B.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year **2020-21** onwards

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad, Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

VISION OF THE INSTITUTE

To be a premier center of professional education and research, offering quality programs in a socio-economic and ethical ambience.

MISSION OF THE INSTITUTE

- To impart knowledge of advanced technologies using state-of-the-art infrastructural facilities.
- To inculcate innovation and best practices in education, training and research.
- To meet changing socio-economic needs in an ethical ambience.

VISION OF THE DEPARTMENT

To establish a center of excellence in civil engineering with research and innovative technical skills withethical ambience.

MISSION OF THE DEPARTMENT

- To impart quality education and research to undergraduate and postgraduate students in Civil Engineering to produce entrepreneurs, professionals, scientists and bureaucrats.
- To impart conceptual and practical education in advanced technologies, keeping in view socio- economic and ethical needs.
- To enhance research and consultancy activities in collaboration with government, public and private sector units.

PROGRAMME OUTCOMES (POs)

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution ofcomplex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual and as amember or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide students with a solid foundation in Mathematical, Scientific, Software skills and Engineering fundamentals required to solve engineering problems and also to pursue higher studies.

PEO2: To train students with research and innovative skills so as to comprehend, analyze, design and create novel products and solutions for the real life problems.

PEO3: To provide students with good professional and ethical attitude, effective communication skills, teamwork skills, Multidisciplinary approach and ability to relate engineering issues to broader social context.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Analyze, Design, Construct, Maintain and Operate infrastructural projects.

PSO2: Assess the environmental impact of various projects and take required measures to curb environmental deterioration.

PSO3: Able to use latest software's pertaining to various streams of Civil Engineering.

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

COURSE STRUCTURE – B.Tech. CIVIL ENGINEERING

(MR20 Regulations - Effective from Academic Year 2020 – 21 onwards)

I SEMESTER							
S.No	**Category**	**Course Code**	**Name of the Subject**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1.	HSMC	A0H01	English	3	0	0	3
2.	BSC	A0B05	Linear Algebra and Differential Equations	3	1	0	4
3.	BSC	A0B12	Engineering Physics	3	1	0	4
4.	ESC	A0301	Engineering Graphics	2	0	2	3
5.	ESC	A0501	Programming for Problem Solving	3	0	0	3
6.	BSC	A0B13	Engineering Physics Lab	0	0	2	1
7.	ESC	A0502	Programming for Problem Solving Lab	0	0	2	1
8.	HSMC	A0H02	English Language Lab	0	0	2	1
9.	ESC	A0302	Engineering Workshop	0	0	2	1
10.	AC	A00A1	NSS/SPORTS/YOGA	0	0	3	0
Total				**14**	**2**	**13**	**21**
Total Contact Hours				**29**			

II SEMESTER							
S.No	**Category**	**Course Code**	**Name of the Subject**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1.	BSC	A0B06	Vector Calculus and Numerical Techniques	3	1	0	4
2.	ESC	A0303	Engineering Mechanics	3	0	0	3
3.	BSC	A0B17	Engineering Chemistry	3	1	0	4
4.	ESC	A0201	Basic Electrical and Electronics Engineering	3	0	0	3
5.	ESC	A0553	Basic Python Programming Lab	0	1	2	2
6.	ESC	A0304	Engineering Mechanics Lab	0	0	2	1
7.	BSC	A0B18	Engineering Chemistry Lab	0	0	2	1
8.	ESC	A0202	Basic Electrical and Electronics Engineering Lab	0	0	2	1
Total				**12**	**3**	**8**	**19**
Total Contact Hours				**23**			

III SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	BSC	A0B02	Probability & Statistics	3	-	-	3
2	ESC	A0101	Engineering Geology	2		-	2
3	PCC	A0102	Strength of Materials – I	3	1	-	4
4	PCC	A0103	Surveying & Geomatics	3	-	-	3
5	PCC	A0104	Fluid Mechanics	3	1	-	4
6	ESC	A0105	Engineering Geology Lab	-	-	2	1
7	PCC	A0106	Strength of Materials Lab	-	-	2	1
8	PCC	A0107	Surveying Lab	-	-	2	1
9	ESC	A0554	Fundamentals of Data Structures Lab	-	-	4	2
10	MC	A00M2	Environmental Science	2	-	-	-
Total				**16**	**2**	**10**	**21**
Total Contact Hours				**28**			

IV SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	PCC	A0108	Building Materials Construction & Planning	3	-	-	3
2	PCC	A0109	Strength of Materials – II	3	1	-	4
3	PCC	A0110	Concrete Technology	3	-	-	3
4	PCC	A0111	Hydraulics & Hydraulic Machinery	3	-	-	3
5	PCC	A0112	Water Resources Engineering	3	-	-	3
6	ESC	A0113	Computer Aided Drafting of Buildings Lab	-	-	2	1
7	PCC	A0114	Mechanics of Fluids & Hydraulic MachineryLab	-	-	2	1
8	PCC	A0115	Concrete Technology Lab	-		2	1
9	ESC	A0555	Object Oriented Programming Lab	-	-	4	2
10	MC	A00M1	Gender Sensitization	-	2	-	-
Total				**15**	**3**	**10**	**21**
Total Contact Hours				**28**			

V SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	HSMC	A0H08	Engineering Economics and Accountancy	3	0	0	3
2	PCC	A0116	Structural Analysis	3	0	0	3
3	PCC	A0117	Structural Engineering I (RCC)	3	1	0	3
4	PCC	A0118	Geotechnical Engineering	3	0	0	3
5	PEC I	A0119	Disaster Management & Mitigation	3	0	0	3
		A0122	Irrigation Structures & Water power Engineering				
		A0123	Water Resource System Analysis				
		A0124	Advanced Fluid Mechanics				
		A0125	River Engineering				
6	PEC II	A0126	Construction Project Management	3	0	0	3
		A0127	Urban Planning				
		A0128	Architecture & Town Planning				
		A0129	Energy Efficient Architecture				
		A0132	Solid & Hazardous Waste Management				
7	HSMC	A0H03	English Communication & Presentation Skills lab	0	0	2	1
8	PCC	A0120	Geotechnical Engineering lab	0	0	2	1
9	PCC	A0121	Structural Analysis lab	0	0	2	1
10	MC	A00M3	Quantitative Aptitude & Verbal Reasoning I	1	1	0	0
11	MC	A00M5	Introduction to Cyber Security	2	0	0	0
Total				**21**	**2**	**6**	**21**
Total Contact Hours				**29**			

VI SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	HSMC	A0H10	Industrial Management	3	0	0	3
2	PCC	A0133	Structural Engineering II (Steel)	3	1	0	3
3	PCC	A0134	Environmental Engineering	3	0	0	3
4	PEC III	A0135	Foundation Engineering	3	0	0	3
		A0136	Ground Improvement Techniques				
		A0137	Soil Structure Interaction				
		A0138	Dynamics of Soils and Foundation				
		A0139	Subsurface Investigation and Instrumentation				
5	PEC IV	A0140	Rehabilitation & Retrofitting of Structures	3	0	0	3
		A0141	Offshore Structures				
		A0142	Prefabricated Structures				
		A0143	Advanced Concrete Technology				
		A0144	Principles of Bridge Engineering				
6	OEC I			3	0	0	3
7	PCC	A0130	Environmental Engineering lab	0	0	2	1
8	PCC	A0131	Structural Design Lab	0	0	2	1
9	ESC	A0562	Fundamentals of Database Management Systems Lab	0	1	2	2
10	MC	A00M4	Quantitative Aptitude & Verbal Reasoning II	1	1	0	0
11	MC	A00M6	Introduction to Artificial Intelligence	1	1	0	0
Total				**20**	**4**	**6**	**22**
Total Contact Hours				**30**			

VII SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	PCC	A0145	Estimation & Costing	3	1	0	3
2	PCC	A0146	Transportation Engineering	3	0	0	3
3	PEC V	A0147	Advanced Reinforced Concrete Design	3	0	0	3
		A0148	Prestressed Concrete Structures				
		A0149	Seismic Design of Structures				
		A0150	Advanced Structural Analysis				
		A0151	Advanced Steel Design				
4	PEC VI	A0152	Traffic Engineering & Management	3	0	0	3
		A0153	Pavement Design				
		A0154	Public Transportation				
		A0155	Remote Sensing & Geographical Information System				
		A0156	Road Safety System				
5	OEC II			3	0	0	3
6	OEC III			3	0	0	3
7	PCC	A0157	Transportation Engineering Lab	0	0	2	1
8	PCC	A0158	Remote Sensing & Geographical Information System Lab	0	0	2	1
9	PROJ	A00P1	Mini Project	0	0	2	2
Total				**18**	**1**	**6**	**22**
Total Contact Hours				**25**			

VIII SEMESTER							
Sl. No.	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	PROJ	A00P2	Major Project	0	0	24	12
2	PROJ	A00P3	Seminar	0	0	2	1
Total				0	0	26	13

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0H01	ENGLISH (Common for CE, EEE, ME, ECE, CSE,CSE(AIML), CSE(DS), CSE (CS), CSE(IOT),IT and Min.E)	L	T	P
Credits: 3		3	-	-

Course Objectives:

The objective of this course is to improve the English Language and Literary competence of the students. The course provides requisite insights into grammar, vocabulary, prose, and short stories. Further, it also helps in developing the skills of Reading and Writing. The course also equips students to study their academic subjects more effectively using the theoretical and practical components of the English language and literature.

MODULE – I

Speech **:** "Go Kiss the World" by Subroto Bagchi
Poem **: "**Leisure" by W. H. Davies
Vocabulary **:** Formation of Words, Prefixes, Suffixes, and Root Words
Grammar **:** Articles and Prepositions
Reading **:** Skimming and Scanning
Writing **:** Introduction to Writing Skills, Characteristics of Effective Writing

MODULE – II

Short story **:** "Gift of Magi" by O' Henry
Poem **: "**No Man is an Island" by John Donne **Vocabulary** **:** One Word Substitutions; Synonyms and Antonyms**Grammar** **:** Degrees of Comparison, Voice – Exercises **Reading :** Intensive Reading and Extensive Reading
Writing **:** Paragraph Writing- Cohesive devices; Jumbled Sentences; Punctuation

Module – III

Essay **:** "Lucidity, Simplicity, Euphony" by W. Somerset Maugham
Poem **: "**The Mask" by Maya Angelou
Grammar **:** Tense and Aspect
Vocabulary **:** Homonyms, Homophones, Homographs**Reading** **:** Reading for Topic and Theme **Writing** **:** Letter Writing

MODULE – IV

Short story **:** "The Night Train at Deoli" by Ruskin Bond**Poem** **: "**Gift of India" by Sarojini Naidu **Grammar :** Question Tags; Concord
Vocabulary **:** Idiomatic Expressions; Phrasal Verbs
Reading **:** Reading for Interpretation
Writing **:** Essay Writing, Describing, Defining and Classifying

MODULE – V

Essay **:** "Toasted English" by R. K. Narayan
Poem **:** "If" by Rudyard Kipling
Grammar **:** Direct and Indirect Speech, Misplaced Modifiers
Vocabulary **:** Redundancies and Clichés
Reading **:** Reading for Specific Purposes, Reading Comprehension practice
Writing **:** Paraphrasing & Summarizing,

* Exercises from the texts not prescribed shall also be used for classroom tasks.

Prescribed Textbook:

Reference Books:

1. Azar, Betty and Stacy A, Hagen**.** *Understanding and Using English Grammar*. 4th edition, Foundation Books, 2009.
2. Chaudhuri, Santanu S. *Learn English: A Fun Book of Functional Language, Grammar and Vocabulary.* Tata McGraw Hill Education, New Delhi, 2013.
3. Eastwod, John. *Oxford Guide to English Grammar.* 4th edition, Oxford University Press, 1994.
4. Field, Marion**.** *Improve Your Written English*. 5th Edition. How to Books, UK, 2009.
5. Leech, Geoffrey and Svartvik, J. *A Communicative Grammar of English*. 3rd edition, Routledge, 2013.

Related Websites:

1. http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes
2. http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd.
3. http://www.zsme.tarnow.pl/jezykiobce/wp-content/uploads/2013/11/writing-letters1.pdf.

Course Outcomes:

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

1. Use Written And Spoken English Considerably Well For Academic Purposes.
2. Communicate In Enrich Accurately And Fluently.
3. Employ Extensive And Intensive Reading Skills.
4. Gain Confidence In Writing For Academic And Real Life Situations.
5. Use Standard Grammar, Punctuation, And Spelling In Technical Documents.

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

COS	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2									
CO2	3	2										
CO3	3	2		2								
CO4	3	2	2									
CO5	2	2	1									

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:A0B05	LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS (Common For CE, ME & MINING)	L	T	P
Credits: 4		3	1	-

Prerequisites: Matrices, Differentiation, and Integration

Course Objectives:

1. To learn rank of the matrix and its application to consistency of system of linear equations
2. To learn Eigen Values, Eigen Vectors and nature of Quadratic forms.
3. To learn the concept of the mean value theorems, partial differentiation and maxima and minima.
4. To learn methods of solving differential equations and its applications to basic engineering problems.
5. To learn basics of partial differential equations and the standard forms of partial differential equations.

Module -I: Matrix algebra

Vector Space, basis, linear dependence and independence (Only Definitions)
Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew- Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; solving system of Homogeneous and Non-Homogeneous linear equations. LU - Decomposition Method

Module- II: Eigen Values and Eigen Vectors

Eigen values , Eigen vectors and their properties; Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem; Singular Value Decomposition.
Quadratic forms: Nature, rank, index and signature of the Quadratic Form, Linear Transformation and Orthogonal Transformation, Reduction of Quadratic form to canonical forms by Orthogonal Transformation Method.

Module - III: Differential Calculus

Mean value theorems: Rolle's theorem and Lagrange's Mean value theorem with their Geometrical Interpretation and its applications, Cauchy's Mean value Theorem. Taylor's Series. Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Module –IV: Ordinary Differential Equations
First Order and First Degree ODE: Orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.
Second and Higher Order ODE with Constant Coefficients: Introduction-Rules for finding complementary function and particular integral. Solution of Homogenous, non-homogeneous differential equations, Non-Homogeneous terms of the type e^{ax} , sin(ax), cos

(ax), polynomials in x, e^{ax} V(x), x V(x), Method of variation of parameters.

Module – V: Partial Differential Equations

Formation of partial differential equations by eliminating arbitrary constants or arbitrary function, solutions of first order linear (Lagrange) equations, solutions of non linear first order equations (four standard types). Equations reducible to linear, Charpit's Method.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R K Jain SRK Iyengar , Advanced engineering mathematics, Narosa publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.

Reference Books:

1. G. B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications,Reprint, 2008.
3. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

E – RESOURCES:

1. https://www.mathplanet.com/education/algebra-2/matrices/how-to-operate-with-matrices (Systems of linear equations, matrices)
2. http://math.mit.edu/~gs/linearalgebra/ila0601.pdf(Eigen values, Eigen vectors)
3. http://www.math.cmu.edu/~wn0g/noll/2ch6a.pdf(Differential Calculus)
4. https://www.intmath.com/differential-equations/1-solving-des.php(Differential Equations)
5. https://www.math.uni-leipzig.de/~miersemann/pdebook.pdf(Partial differential Equations)

NPTEL:

1. https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_j2 B_T&index=5 (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=wrSJ5re0TAw (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=yuE86XeGhEA (Quadratic forms)

Course Outcomes:

1. The student will be able to find rank of a matrix and analyze solutions of system of linear equations.
2. The student will be able to find Eigen values and Eigen vectors of a matrix, diagonalization a matrix, verification of Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. The student will be able to verify mean value theorems and maxima and minima of function of two variables.
4. Formulate and solve the problems of first and higher order differential equations
5. Apply knowledge of Partial differential equations in real world problems.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**
CO1	3	2	2	3	3				2			3
CO2	3	2	2	3	2				2			3
CO3	3	2	2	3	2				2			2
CO4	3	2	2	3	3				2			2
CO5	3	2	2	3	3				2			2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:A0B12	Engineering Physics (Common For CE, ME&MINING)	L	T	P
Credits: 4		3	1	-

Prerequisites: Fundamentals of Physics

Course Objectives:

- The main objective of this course is to provide the basic physics principles, would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches.
- This would create awareness about the vital role played by science and engineering in the development of new technologies.

Module – I: Waves and Oscillations

Simple harmonic Oscillator; damped harmonic oscillator; types of damping – heavy, critical and light damping; energy decay in a damped harmonic oscillator; relaxation time, quality factor; Forced harmonic Oscillator; electrical and mechanical analogy for a simple oscillator.

Module – II

Acoustics: Introduction, Reverberation and Reverberation time; Basic requirements of acoustically good hall; Absorption coefficient, Jaeger's method for derivation of Sabine's formula; factors affecting the architectural acoustics and their remedies.

Ultrasonics: Introduction, Production of Ultrasonic Waves - Piezo Electric Effect, Inverse piezo electric effect, Piezo-Electric crystal Method, Magnetostriction effect, Magnetostriction Method; Detection ofUltrasonic waves - Piezo Electric detector, Kundt's tube method, Sensitive Flame method and Thermal Detection Method; Applications of Ultrasonics - Medical, SONAR, Ultrasonic drilling and welding.

Module – III: LASERs and Optical Fibers

LASER: Introduction, Characteristics of LASER; Absorption, spontaneous and Stimulated emission; Einstein's coefficients Derivation; population inversion; pumping mechanisms; Basic components of a laser system; three and four level laser systems; Ruby LASER; He-Ne LASER; Semiconductor diode LASER (Homo junction); Applications of LASER - Computers, Medical, Military.

Optical Fibers: Introduction to Optical fibers, total internal reflection; Acceptance angle, and acceptance cone; numerical aperture; types of optical fibers; Losses in optical fibers - absorption losses, scattering losses and bending losses; Applications of optical fibers - Communications, Level Sensor, LASER angioplasty.

Module – IV

Non-destructive Testing: Introduction; Objectives of Non-destructive testing; Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage; Methods of Non-destructive testing – Liquid penetrant testing, Magnetic particle testing, Ultrasonic inspection method and Radiography testing.

Module – V

Dielectric Properties: Electric dipole, Dipole moment, Dielectric constant, Polarizability, Electric Susceptibility, Displacement Vector; Determination of dielectric constant by resonance method; Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities - Electronic and ionic; Internal field (qualitative treatment); Clausius-mossotti equation; Applications of Dielectric materials.

Nanomaterials: Introduction to nanomaterials, Types of nano materials; factors affecting the properties of nano materials - surface area to volume ratio and Quantum confinement effect; Properties of nano materials; Synthesis of nanomaterials - Sol-gel and Chemical vapour deposition method; Applications of Nanomaterials.

Text Books:

1. M N Avadhanulu, P G Kshirsagar, "A Textbook of Engineering Physics", Revised Edition 2014.
2. K Vijaya Kumar, S Chandralingam, "Modern Engineering Physics'' Volume I & II, S. Chand, 1st Edition,2017.
3. B K Pandeyand S. Chaturvedi, "Engineering Physics" Cengage Learning India Revised Edition, 2014.

References:

1. P K Palanisamy, "**Engineering Physics"**, 4th Edition, SciTech Publications, 2014.
2. G Prasad and Bhimashankaram, "**Engineering Physics"**, B S Publications, 3rd Edition, 2008.
3. M.K.Verma, "Introduction to Mechanics", Universities Press.
4. Ajoy Ghatak, "Optics", McGraw-Hill Education, 2012

e-Resources

1. http://www.gistrayagada.ac.in/gist_diploma/PHYSICS-StudyMaterial.pdf
2. http://www.faadooengineers.com/threads/3300-Applied-Physics-Ebooks-pdf-free-download?s=1b6cb6b1de4e7152298bd9d60156cd11

Journals:

1. http://aip.scitation.org/journal/jap
2. http://www.springer.com/physics/journal/340

NPTEL Videos:

1. http://nptel.ac.in/courses/115106061/13
2. https://nptel.ac.in/courses/115/106/115106119/

Course Outcomes:

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

1. Distinguish free, damped and forced vibrations.
2. Using the knowledge of acoustics in designing acoustically important buildings and ultrasonicsfor designing materials.
3. Understand the concepts and applications of LASER and Optical fibers.
4. Apply the knowledge of Ultrasonic to understand non-destructive testing.
5. Understand the importance of dielectric and nanomaterials and their properties.

CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**												**PSOS**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1										3	2	
CO2	2	2	1										3		
CO3	3	2	2										3	2	
CO4	3	1	2										3		
CO5	3	2	2										3		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0301	ENGINEERING GRAPHICS (Common for CE, ME and Min.E)	L	T	P
Credits: 3		2	-	2

Prerequisites: Nil

Course Objectives:
To develop in students, graphic skills for communication of concepts and ideas of engineeringproducts.

MODULE I: Introduction to Engineering Drawing, Scales and Curves Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance. Lettering and dimensioning. Geometrical Constructions: Regular polygons only. **Scales:** Plane Scale, Comparative Scale, Diagonal Scale, Vernier Scale
Curves: Conic Sections, Cycloidal Curves and Involutes.

MODULE II: Projection of Points, Lines and Planes
Projection of Points: Principles of Orthographic Projections – Conventions – First and ThirdAngle projections. Projection of points including all four quadrants.
Projection of Lines: Projection of Lines - parallel, perpendicular, inclined to one reference planeand inclined to both reference planes. True length and true angle of a line.
Projection of Planes: Projection of Planes - Axis inclined to one reference plane.

MODULE III: Projection of Solids, Section of Solids and Development ofSurfaces
A. Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder andcone by rotating object method. Axis inclined to one reference plane.
B. Section of Solids: Sectioning of single solid with the cutting plane inclined to one plane andperpendicular to the other - true shape of section.
Development of Surfaces: Development of lateral surfaces of simple Solids.

MODULE IV: Isometric Projections and Transformation of Projections
Isometric Projections: Principles of Isometric Projection – Isometric Views– Conventions – PlaneFigures, Simple Solids.
Transformation of Projections: Conversion of Isometric Views to Orthographic Views and viceversa– simple objects.

MODULE V: Introduction to Computer Aided Drafting
CAD workstation, Advantages of CAD, CAD Software, AutoCAD – Opening and Creating Drawings-Exploring the AutoCAD interface-Zooming and Panning, AutoCAD Commands andToolbars-Basic Drawing and Editing Commands.

TEXT BOOKS

1. K.L.Narayana, S.Bheemanjaneyulu "**Engineering Drawing with Auto CAD-2016**" NewAge International Publishers, 1st Edition, 2018.
2. N.D. Bhat, "**Engineering Drawing**", Charotar Publishing House, 53rd Edition, 2014.

REFERENCES

1 K.L.Narayana, P.Kannaiah, "**Engineering Drawing**", SciTech Publishers. 2nd Edition, 2017
2 K.Venugopal,"**Engineering Drawing**",NewAge International Publishers, 3rd Edition, 2014.
3 K. V. Natarajan, "**A text book of Engineering Graphics**", Dhanalakshmi Publishers, 2015.
4 M.S. Kumar, "**Engineering Graphics**", D.D. Publications, 2011.
5 Trymbaka Murthy, "**Computer Aided Engineering Drawing**", I.K. internationalPublishing House, 3rd Edition, 2011.

E - RESOURCES

1 https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
2 https://www.wiziq.com/tutorials/engineering-drawing
3 http://freevideolectures.com/Course/3420/Engineering-Drawing
4 http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711
5 http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics
6 http://nptel.ac.in/courses/112103019/

Course Outcomes:

At the end of the course students will be able to

1. Understand the basics of drawings and importance of curves.
2. Draw the projection of lines and planes.
3. Draw the projection of solids and section of solids.
4. Produce development of surface and isometric projections.
5. Convert orthographic views to isometric views and vice-versa.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		1					3		3	2		
CO2	3		1		1					3		3	2		
CO3	3		1		1					3		3	2		
CO4	3		1		1					3		3	2		
CO5	3		1							1		1			

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0501	PROGRAMMING FOR PROBLEM SOLVING (Common for ALL)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

1. Understand the basic terminology, write, compile and debug programs in computer programming
2. Implement different control statements for solving problems.
3. Understand the concept of structured program and arrays.
4. Implement the idea of strings and pointers.
5. Analyse the usage of structures and different file operations.

MODULE I: Fundamentals and Introduction to 'C' Language

Introduction Fundamentals– Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

Introduction to 'C' Language: – Background, C-tokens- Keywords, Identifiers, Basic data types, Variables, Constants, Preprocessor directives-include, define, Managing Input / Output functions - formatted input / output functions, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Simple C Programming examples.

MODULE II: Conditional Statements and Repetition Statements

Control Statements: if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

Repetition statements – while, for, do-while statements, nested looping, other statements related to looping – break, continue, goto, Simple C Programming examples.

MODULE III: Designing Structured Programs and Arrays

Designing Structured Programs-Introduction to function, Advantages, user defined functions, inter function communication-call by value, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion – recursive functions-Towers of Hanoi problem.

Arrays: Basic Concepts, Types of arrays, applications- Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods, arrays and functions.

MODULE IV: Strings and Pointers

Strings: Concepts, String Input / Output functions, arrays of strings, string manipulation functions, string conversion, C program examples.

Pointers – Basic Concepts, Pointers for inter function communication-call by reference, pointers to pointers, Pointer arithmetic, array of pointers, pointers to array, applications, pointers to void, pointers to functions, Dynamic memory allocation functions.

MODULE V Structures and File Handling

Structures – Declaration, definition and initialization of structures, accessing structure elements, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, difference between structures and union, typedef, bit fields, enumerated types, C programmingexamples.

Files – Basic Concept of a file, file input / output operations, text files and binary files, file statusfunctions (error handling), Random file access functions, command –line arguments.

C program examples.

TEXTBOOKS

1. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, OxfordUniversity Press.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, PearsonEducation.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, CengageLearning
2. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

E–RESOURCES

1. http://oxford university press.ac.in/eBooks/ Programming in C.
2. https://www.journals.elsevier.com/science-of-computer-programming
3. http://www.ejournalofsciences.org
4. http://onlinecourses.nptel.ac.in/iiitk_cs-101
5. http://onlinevideolecture.com/ebooks/?subject=C-Programming

Outcomes:

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

1. Translate the algorithms/flowcharts to programs (in C language).
2. Decompose a problem into functions and to develop modular reusable code.
3. Apply different types of control structures and arrays in a computer programming.
4. Develop programs that make use of concepts such as strings, pointers and structures.
5. Analyse file operations and command line arguments.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2				2	1	1	3	3	2	2
CO2	3	3	2	2	2				2	1	1	3	3	2	1
CO3	3	3	3	2	2				1			3	3	2	1
CO4	3	2	3	2	2				1		1	2	3	2	1
CO5	3	3	3	2	2				1	1	1	2	3	2	1

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0B13	ENGINEERING PHYSICS LAB (Common to ME, CE and Min. E)	L	T	P
Credits: 1		-	-	2

Course objectives:

The main objective of this course is to provide the necessary exposure to the practical aspects, which isan essential component for learning science.

List of Experiments:

1 Melde's Experiment – Longitudinal and Transverse modes

To determine frequency of electrically maintain Tuning fork using Melde's apparatus.

2 RLC series circuit

To determination of resonant frequency, bandwidth and quality factor.

3 Ultrasonic Interferometer

To determine the velocity of ultrasonic sound through different liquid media..

4 Numerical Aperture of an Optical Fiber

To determine the Numerical aperture of the given fiber.

5 Bending loss of the given fiber.

To determine the bending loss of the given fiber.

6 Diffraction grating

To determine the wavelength of LASER using Diffraction grating.

7 B-H Curve

To study the Magnetization of Ferro magnetic material in presence of magnetic field.

8 Dispersive Power

To determine the dispersive power of glass prism.

9 LASER

To determination of pitch of the screw gauge using LASER.

10 Torsional Pendulum

Determine the rigidity Modulus of given Wire.

11 Sonometer

To verify the frequency of AC power Supply**.**

12. **NDT** – Magnetic particle testing

Course Outcomes:

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

1. Develop skills to impart practical knowledge in real time solution.
2. Understand principle, concept, working, application and comparison of results with theoreticalcalculations.
3. Design new instruments with practical knowledge.
4. Understand measurement technology
5. Use new instruments and real time applications in engineering studies.

CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1												
CO2	3	1	1												
CO3	3														
CO4	3														
CO5	3														

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0502	PROGRAMMING FOR PROBLEM SOLVING LAB (Common for ALL)	L	T	P
Credits: 1		-	-	2

Prerequisites: NIL

Objectives:

1. Understand the various steps in Program development
2. Identify syntax and semantics of C Programming Language
3. Illustrate the usage of structured programming approach in solving problems.
4. Develop programs that make use of arrays, strings, pointers and structures in C language
5. Analyse different file operations

Software Requirements: C

List of Programs:

1. a. Practice various Internal and External DOS Commands.
   b. Write sample examples of C programs to implement basic operations.
2. a. Write a C program to find smallest and largest of given three numbers.
   b. Write a C program to find the roots of a quadratic equation.
   c. Write a C program to check whether given character is alphabet, digit or special symbol
3. a. Write a C program to find the sum of individual digits of a positive integer.
   b. Write a C program to generate the first ‘n’ terms of the sequence.
   [A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.]
4. a. Write a C program to find whether the given number is palindrome, perfect, Armstrong or strong.
   b. Write a C program to generate all the prime numbers between n1 and n2, where n1 and n2 are values supplied by the user.
5. Write C programs that use both recursive and non-recursive functions
   a. To find the factorial of a given integer.
   b. To find the GCD (greatest common divisor) of two given integers.
6. a. Write a C program to find both the largest and smallest number in a list of integers.
   b. Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search.
   c. Write a C program that uses recursive and non -function to search for a Key value in a given sorted list of integers using Binary search.
7. a. Write a C program that implements the Bubble sort method to sort a given array of integers in ascending order.
   b. Write a C program that implements the Selection sort method to sort a given list of names in ascending order.
8. Write a C program to perform the following:
   a. Addition of Two Matrices
   b. Multiplication of Two Matrices

9. Write a C program that uses functions to perform the following operations:
   a. To insert a sub-string into given main string from a given position.
   b. To delete n characters from a given position in a given string.
   c. To find substring in a given string
10. a. Write a C program to determine if the given string is a palindrome or not
    b. Write a C program to count the lines, words and characters in a given text.
11. a. Write a C program to swap two numbers, which implement call by value and call by reference.
    b. Write a C program to display the below student details using structures

Roll No.	Name	Gender	Branch	Attendance Percentage
501	John	Mal	CSE	77.3
502	Alice	Male	ECE	80.5
503	Sam	Male	IT	90.7

    c. Write a C program to find grade of a student using structures.
12. a. Write a C program which copies one file to another
    b. Write a C program to find sum of two numbers using command line arguments
13. a. Develop a mini project which implement the Library Management System
    b. Develop a mini project which implement the Student Record System.

TEXT BOOKS:

a. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press
b. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
c. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES:

a. C Programming & Data Structures, B.A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
b. C for Engineers and Scientists, H. Cheng, Mc. Graw-Hill International Edition
c. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

Outcomes:

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

1. Analyse concepts in problem solving and write diversified solutions for a given problem.
2. Identify situations where computational methods and computers would be useful.
3. Understand the programming tasks using techniques learned and write pseudo-code.
4. Compare the program on a computer, edit, compile, debug, correct, recompile and execute it.
5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task

CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3										2	2	
CO2	3	3	3										2	2	
CO3	2	2	2										2	2	
CO4															
CO5															

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0H02	ENGLISH LANGUAGE LAB (Common for CE, EEE, ME, ECE, CSE,CSE(AIML), CSE(DS), CSE (CS), CSE(IOT),IT and Min.E)	L	T	P
Credits: 1		-	-	2

The Language Lab focuses on the production and practice of sounds of language and familiarizes thestudents with the use of English in everyday situations and contexts.

Course Objectives:

The course aims to develop students' intelligibility in their pronunciation of English - speech sounds, word accent, intonation and rhythm. It also helps to improve the fluency in spoken English and make them aware of nuances of major skills, namely, listening and speaking skills. It also trains students to understand nuances of both verbal and non-verbal communication during all activities. The course enables the learners to develop their confidence levels so as to participate in discussions, debates and public speaking.

Listening Skills:

Objectives:

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skillsapproach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people ofdifferent backgrounds and regions

*Students should be given practice in listening to the sounds of the language to be able to recognize them, awareness regarding stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives:

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Just A Minute (JAM) Sessions.

Syllabus: English Language Communication Skills Lab shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language Communication Skills Lab

Module - I:

CALL Lab : Introduction to Phonetics – Speech Sounds – Vowels and Consonants

ICS Lab : Ice-Breaking activity and JAM session; Listening: listening for sounds in context, for ideas; Speaking: ideation and translation of ideas into sentences.

Module - II:

CALL Lab : Structure of Syllables - Past Tense Marker and Plural Marker – WeakForms and Strong Forms - Consonant Clusters.

ICS Lab : Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette; Listening: listening for specific purposes, for details; Speaking: speaking in the above situations with clarity, connectivity, maintaining voice characters.

Module - III:

CALL Lab : Word accent and Listening Comprehension-reading(aloud) meaningfully.

ICS Lab : Descriptions- Narrations- Giving Directions and guidelines; Listening: listening for intelligible English; Speaking: formal and informal conversations, register.

Module - IV:

CALL Lab : Intonation and Common errors in Pronunciation- reading aloud (evaluating through recording).

ICS Lab: Extempore- Public Speaking, Oral Presentation Skills; Listening: note taking and listening for speaker's tone/attitude; Speaking: organizing, connecting ideas and sentences, short forms in spoken English, errors in spoken English

Module - V:

CALL Lab : Neutralization of Mother Tongue Influence and Conversation Practice

ICS Lab : Information Transfer, Debate

Minimum Requirement of infra structural facilities for EL Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facilityand English language software for self- study by learners.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

a) P – IV Processor b) Speed – 2.8 GHZ c) RAM – 512 MB Minimum

d) Hard Disk – 80 GB e) Headphones of High quality

2. **Interactive Communication Skills (ICS) Lab:** The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digitalstereo –audio & video system and camcorder etc.
Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDsof the text book which are loaded on the systems):

Prescribed Lab Manual:
Rani, Sudha. *English Language Communication Skills Laboratory*. 5th edition, Pearson Publication,2014.

Reference Books:

1. Gairns, Ruth and Redman, Stuart. *Oxford Word Skills: Learn and Practice English Vocabulary*.2nd edition, Oxford University Press, 2008.
2. Hughes, John and Mallett, Andrew. *Successful Presentations DVD and Student's Book Pack*.Oxford University Press, 2013.
3. Hancock, Mark. *English Pronunciation in Use* (Intermediate). 2nd edition, Cambridge UniversityPress, 2009.
4. Karia, Akash. *Public Speaking Mastery: Speak Like a Winner*. Kindle edition, 2013.
5. Lucas, Stephen. *The Art of Public Speaking***.** 11th edition, Tata McGraw Hill, 2011.

Websites:
1. http://www.mindtools.com/CommSkll/ActiveListening.htm
2. http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity
3. http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20 article%20for%20Monika%20(2010).pdf

Course Outcomes:
After completion of the course, students will be able to:
1. Understand the nuances of language through audio- visual experience and group activities.
2. Neutralize the accent for intelligibility
3. realize the importance of listening skills and speaking skills and their application in real life situations.
4. Recognize significance of non-verbal communication and develop confidence to face audience and shed inhibitions.
5. Speak with clarity and confidence; thereby enhance employability skills of the students.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1				1		1	2	2		1			
CO2										1		1			
CO3							1		1	2		2			
CO4								1	1	2		2			
CO5										2		2			

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:A0302	ENGINEERING WORKSHOP (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

COURSE OBJECTIVES:

To understand the usage of hand tools, acquire the skills in model / pattern making and familiarizewith various work materials and tools.

I. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry 2.Fitting 3. Tin-Smithy
4. House-wiring 5.Foundry 6.Arc welding

II. TRADES FOR DEMONSTRATION & EXPOSURE

1. Machine shop
2. Plumbing
3. Wood working lathe
4. Identification of Electronic Components
5. Black smithy
6. Computer Peripherals

COURSE OUTCOMES

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

1. Knowledge of carpentry process and methods used in the design and fabrication, installation, maintenance and repair of structures and fixtures (e.g., furniture, cabinets) to accomplish work assignments.
2. Assembling together of part and removing metals to secure the necessary joint by using fitting and welding.
3. Understand the hardware components of house wiring.
4. Understand the manufacturing process using machine shop.
5. Analyze the different types of computer Peripherals

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				2	2	1		3			3		2	
CO2	3				2	2	1		3			3		2	
CO3	3				2	2	1		3			3		2	
CO4	3				2	2	1		3			3		2	
CO5	3				2	2	1		3			3		2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code:A0B06	VECTOR CALCULUS AND NUMERICAL TECHNIQUES (Common For CE, ME & MINING)	L	T	P
Credits: 4		3	1	-

Pre- requisite: Basics of vectors, Differentiation and Integration.

Course Objectives: To learn

1. The physical quantities involved in engineering field related to vector valued functions.
2. The basic properties of vector valued functions and their applications to line, surface and volumeintegrals.
3. The various numerical techniques which are indispensable tools to solve many algebraic andtranscendental equations.
4. Numerical methods of solving the ordinary differential equations.
5. Evaluation of PDE and their applications by using numerical techniques.

MODULE – I: Vector Differentiation
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directionalderivatives,. Scalar potential functions. Solenoidal and Irrotational vectors. Vector Identities.

MODULE – II: Vector Integration
Line, Surface and Volume Integrals. Green Theorem, Gauss Divergence Theorem and Stokes Theorem(without proofs) and their applications.

MODULE III: : Algebraic and Transcendental equations and Interpolation

(A) Solution of Algebraic and Transcendental Equations: Introduction-Errors, types of errors. Bisection Method, Method of False Position. The Iteration Method – Newton-Raphson Method

(B) Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences-Forward Differences-Backward differences – Symbolic relations and separation of symbols, Differences of a polynomial-Newton's formulae for interpolation, Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

MODULE – IV: Numerical solution of Ordinary Differential Equations and Numerical Integration

Numerical solution of Ordinary Differential Equations Introduction-Solution by Taylor's series method - Picard's Method of successive Approximations, Euler's Method,Modified Euler's Method – Runge-Kutta Methods.
Numerical Integration: Trapezoidal Rule, Simpson's $1/3^{rd}$ Rule, Simpson's 3/8 Rule.

MODULE – V: Numerical solution of PDE
Classification of second order equations , Finite difference approximations to derivatives ,-standard 5- point formula ,diagonal 5-point formula , solution of Laplace equation, Solution

of Poisson's equation. Solution of one-dimensional heat, wave equations (by Crank-Nicolson explicit/implicit formula only).

Text Books:

1) B.S. Grewal, **HigherEngineering Mathematics**, Khanna Publishers, 36th Edition, 2010.
2) R K Jain S R KIyengar, **Advanced engineering mathematics**, Narosa publications.
3) Erwin Kreyszig, **Advanced Engineering Mathematics**, Wiley publications.
4) M. K Jain, S R K Iyengar, R.K Jain, **Numerical Methods for Scientific and EngineeringComputation**, New age International publishers.
5) S.S.Sastry, **Introductory Methods of Numerical Analysis**,5th Edition,PHI Learning PrivateLimited

Reference Books:

1. Kanti B. Datta **"Mathematical Methods of Science and Engineering",** Cengage Learning.
2. Alan Jeffrey **"Mathematics for Engineers and Scientists"**, Chapman & Hall/ CRC, 6th Edition2013
3. Michael Greenberg **"Advanced Engineering Mathematics"**, Pearson Education Second Edition.
4. G.B. Thomas and R.L. Finney, **Calculus and Analytic geometry**, 9th Edition, Pearson, Reprint, 2002

E Resources:

a) Concerned Website links

1. http://www.mecmath.net/calc3book.pdf(VectorCalculus)
2. http://www.simumath.com/library/book.html?code=Alg_Equations_Examples (Algebraic andtranscendental equation text book by YURG BERENGARD)
3. http://jupiter.math.nctu.edu.tw/~smchang/9602/NA_lecture_note.pdf (Interpolation)
4. http://nptel.ac.in/courses/104101002/downloads/lecturenotes/module1/chapter6.pdf (Numerical Differentiation and Integration)
5. http://www.sam.math.ethz.ch/~hiptmair/tmp/NPDE10.pdf (Numerical Solution of Partial Differential Equations)

b) Concerned Journals/Magazines links

1. https://www.jstor.org/stable/27953736?seq=1#page_scan_tab_contents(Algebraic andtranscendental equation by William L. Schaaf)
2. http://www.ijcsi.org/papers/IJCSI-9-6-2-413-419.pdf(Algebraicandtranscendental equation byMd. Golam Moazzam)
3. http://www.iosrjournals.org/iosr-jm/papers/Vol6-issue6/J0665862.pdf (Interpolation)

c) NPTEL Videos

1. http://nptel.ac.in/courses/122102009 (Algebraic andtranscendental equation)
2. http://nptel.ac.in/courses/112104035/14 (Mathematical methods in engineering and science byProf.Bhaskar Dasgupta)
3. http://nptel.ac.in/courses/111107063 (Numerical solution of Ordinary Differential Equations)
4. http://nptel.ac.in/courses/111105038 (Numerical Solution of Partial Differential Equations)

Course Outcomes:

After completion of this course, students will be able to:

1. Apply the concept of Gradient, Divergence and Curl of a vector valued functions and scalarvalued functions in engineering and physical problems.
2. Apply vector integral theorems in engineering and physical problems.
3. Apply numerical methods to solve some algebraic and transcendental equations to the desiredlevel of accuracy and by applying interpolation concept to evaluate missed data in data analysis.
4. Apply differential equations in engineering-oriented problems and to observe patterns by usingnumerical techniques.
5. To find out the Numerical solution of partial differential equations.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2								1
CO2	3	3	2	3								
CO3	3	3	3	3								1
CO4	3	3	3	3								
CO5	3	3	3	3								

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0303	ENGINEERING MECHANICS (Common for CE, ME and Min.E)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

COURSE OBJECTIVES:

The objective of this subject is to provide the basic concepts and effect of system forces on rigid bodies, Geometrical Properties of Planes and Solids, problem solving in kinematics and kinetics using different methods and to analyze the types of friction for moving bodies and problems related to friction.

MODULE I: Introduction to Mechanics & System of Forces

Introduction: Basic Concepts, Laws of Motion, Force - types, characteristics - Principle of transmissibility - Types of Forces - Concurrent and non-concurrent Forces - Composition of force – Resultant - Triangle, Polygon and Parallelogram Law of Forces - Moment of Force and its Application -Varignon‘s theorem, Couples - Free Body Diagrams, Types of Supports and their reactions, Internal and External Forces - Types of Equilibrium, Equations of Equilibrium, Conditions of Equilibrium - Lami‘s Theorem.

MODULE II: Friction, Centroid and Center of Gravity

Friction: Types of friction, Limiting friction, Laws of friction, static and dynamic friction, application of laws of friction. Motion of bodies - wedge, screw, screw jack.

Centroid and Center of Gravity: Introduction, Centroids of Lines and Areas - simple figures - Centroid of composite figures. Pappus theorem - Centre of gravity of simple solids, composite solids - Centroids of volumes.

MODULE III: Moment of Inertia

A: Area Moment of Inertia: Definition - Moment of Inertia of plane areas, Polar Moment of Inertia,Transfer Theorem, Moments of Inertia of Composite Figures.

B: Mass Moment of Inertia: Introduction-moment of inertia of masses - Radius of gyration-Transferformula for mass moment of inertia- by integration - Moment of Inertia of composite bodies.

MODULE IV: Kinematics & Kinetic

Kinematics: Rectilinear motion - Motion of Rigid Body under uniform and variable accelerations -motion under gravity- curvilinear motion – Projectiles - rotary motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation - D’Alemberts Principle - Connected bodies- Kinetics of rotating bodies.

MODULE V: Work, Power, Energy & Mechanical Vibrations

Work, Power and Energy: Introduction, work-energy equation - motion of connected bodies - work done by a spring - general plane motion. Mechanical Vibrations: Definitions, concepts - simple harmonic motion - free vibrations - Simple and compound pendulums.

TEXT BOOKS

1. S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati**, "EngineeringMechanics"**, Tata McGraw-Hill Education, 5th Edition, 2013.
2. K.Vijaya Kumar Reddy, J. Suresh Kumar**, "Engineering Mechanics"**, B SPublications, 3rd Edition, 2013

REFERENCES

1. Beer, F.P and Johnston Jr. E.R. "**Vector Mechanics for Engineers**", Tata McGraw-Hill Education 10th Edition (India) Pvt Ltd.. 2013.
2. Fedinand. L. Singer, **"Engineering Mechanics"**, Harper & Row Publishers, 3rdEdition, 1975.
3. R.S. Khurmi, "**A Text Book of Engineering Mechanics"**, S.Chand Publications, 21st Edition, 2007.
4. K L Kumar, "**Engineering Mechanics"**, Tata McGraw Hill Education, 4th Edition, 2011.
5. D.S.Kumar Patil, "**Engineering Mechanics"**, SK Kataria & Sons Publishers, 2ndEdition, 2009.

E - RESOURCES

1. http://www.mathalino.com/reviewer/engineering-mechanics/equilibrium-force-system
2. http://nptel.ac.in/courses/112103109/
3. http://ascelibrary.org/journal/jenmdt
4. https://tll.mit.edu/sites/default/files/SUTDVideoThumb/freebodydiagrams.pdf
5. http://nptel.ac.in/courses/112106180/

COURSE OUTCOMES

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

1. Determine the resultant of a system of forces and draw free body diagrams and can frameappropriate equilibrium equations from the free body diagram.
2. Understand and solve the fundamental static problems and able to find centroid and centreof gravity.
3. Determine area and mass moment of inertia for various sections.
4. Apply fundamental concepts of kinetics and kinematics of particles to the analysis ofsimple practical problems.
5. Understand and solve fundamental work, power and energy related problems and know theconcepts of mechanical vibrations.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3								3	2		
CO2	3	3	1	3								3	2		
CO3	3	3	1	3								3	2		
CO4	3	3	1	3								3	2		
CO5	3	3	1	3								3	2		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech II Semester		
Code: A0B17	Engineering Chemistry (Common for CSE, IT, ECE, EEE, CE, ME and Min.E)	L	T	P
Credits: 4		3	1	-

Course objectives:

The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital's, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction path way mechanisms and synthesis of drugs. Listing out various types of fuels and understanding the concept of calorific value and combustion.

Module I: Water and its treatment

Introduction to water, hardness of water, causes of hardness, expression of hardness, units and types of hardness-Numerical Problems. Alkalinity of water, specifications of potable water (BIS); Estimation of temporary & permanent hardness of water by EDTA method. Boiler troubles - Scale & Sludge, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water - Internal treatment (colloidal, phosphate, carbonate and calgon conditioning). External treatment - Lime Soda process (cold & hot) and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonization. Desalination by Reverse osmosis and its significance.

Module II: Molecular structure and Theories of Bonding:

Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital's (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital's. Molecular orbital energy level diagrams of diatomic molecules -, N_2 ,O_2 and F_2. Introduction to coordination compounds-ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes in octahedral ($[CoF_6]^{3-}$ and $[Co(CN)_6]^{3-}$) and tetrahedral ($[NiCl_4]^{2-}$ and $[Ni(CO)_4]$) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

Module III: Electrochemistry and Corrosion

A. Electrochemistry:

Introduction to Electrochemistry-Conductance (Specific and Equivalent) and units. Types of cells- electrolytic & electrochemical cells (Galvanic Cells)-Electrode potential- cell potential (EMF).Electrochemical series and its applications, Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode and Glass electrode-determination of pH using glass electrode. Batteries: Primary (dry cells) and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

B. Corrosion:

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling- Bedworth rule, Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion

control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization), Electroplating (Copper) and Electroless plating (Nickel).

Module IV: Stereochemistry, Reaction mechanism & synthesis of drug molecules and NMR spectroscopy:

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism of n-Butane. Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution (SN^1 & SN^2) and (E1&E2) reactions with suitable example. Ring opening (Beckmann rearrangement), oxidation and reduction (Cannizaro reaction), cyclization (Components of Diels-Alder reaction-Mechanism of Diels-Alder reaction with suitable example) reactions. Synthesis of Paracetamol, Aspirin and their applications.

Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift and spin-spin splitting.

Module V: Fuels and Combustion

Fuels: Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG. **Combustion:** Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel. Determination of calorific value by Junkers gas calorimeter-Numerical problems on combustion.

Text Books:

1. P.C.Jain and Monica Jain, "**A Text Book of Engineering Chemistry"**, DhanpatRai Publications, New Delhi, 16th Edition 2014.
2. S.S. Dara and S.S. Umare, "**A Text Book of Engineering Chemistry"**, S Chand Publications,New Delhi, 12th Edition 2010.
3. A.Jaya Shree, "Text book of Engineering Chemistry", Wiley, New Delhi, 2018.

Reference Books:

1. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, **"Text Book of Engineering chemistry"**, Cengage Learning India Pvt.Ltd,2016.
2. M.G. Fontana and N. D. Greene, "**Corrosion Engineering"**, McGraw Hill Publications, NewYork, 3rd Edition, 1996.
3. K. P. C. Volhardt and N. E. Schore, **"Organic Chemistry: Structure and Function"**, 5thEdition, 2006.

e-Resources:

a) Concerned Website links:

1) https://books.google.co.in/books?isbn=0070669325 (Engineering chemistry by Sivasankar).
2) https://www.youtube.com/watch?v=yQUD2vzfgh8 (Hot dipping Galvanization).
3)https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic_Chemistry
_Structure_Function_6th_djvu.txt.

b) Concerned Journals/Magazines links:

1) http://americanhistory.si.edu/fuelcells/sources.htm (Fuel Cell Information Sources)
2) https://www.abctlc.com/downloads/courses/WaterChemistry.pdf (Water Chemistry)

c) NPTEL Videos:

1) nptel.ac.in/courses/113108051/ (corrosion & electrochemistry web course)
2) https://www.youtube.com/watch?v=V7-8EOfZKeE (Stereochemistry)

Course Outcomes:

After completion of the course students will be able to:

1. Understand water treatment, specifically hardness of water and purification of water by variousmethods.
2. Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theoryrelated to conductivity.
3. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.
4. Acquire basic knowledge on the concepts of stereochemistry, reaction mechanisms and interpretationof NMR in organic molecules.
5. Acquire the knowledge of various fuels and identify a better fuel source of less pollution.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2										
CO2	2	1		2	1										
CO3	3	3	2	2	1		2								
CO4	3	1	1	1	2	1	3								
CO5	3	3	3	1			3								

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for ALL)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

MODULE I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws

- Series, parallel, series-parallel, star-to-delta and delta-to-star transformation- analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

MODULE II: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

MODULE III: Introduction to Electrical Machines

A: DC Machines: Construction & Principle of Operation of DC Generators – E.M.F Equation. Principle of operation DC Motors – Back E.M.F. - Torque equation – Brake Test - Characteristics.

B: AC Machines: Construction and Principle of operation of Transformer- EMF Equation. Construction and Principle of Operation of 3 Phase Induction Motors - Brake test on 3-Phase Induction Motor – Applications.

MODULE IV: P-N Junction Diode

P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator.

Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.

Filters: Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

MODULE V: BJT and Junction Field Effect Transistor (JFET)

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations

Junction Field Effect Transistor and MOSFET: Construction, Principle of Operation, Symbol, Pinch- Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

TEXT BOOKS

1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, "Basic Electrical andElectronics Engineering", S.Chand and Company Limited, New Delhi, 1st Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, "Electronic Devices & Circuit Theory", Pearson Education,2007.

REFERENCES

1. V.K. Mehtha and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand& Co., 2009.
2. Jacob Milliman, Christos C. Halkias, Satyabrata Jit (2011), "Electronic Devices and Circuits", 3rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

E - RESOURCES

1. https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/
2. https://www.eeweb.com/passives
3. http://nptel.ac.in/courses/108108076/
4. http://nptel.ac.in/downloads/108105053/

Course Outcomes:

At the end of the course, students will be able to:

1. Apply basic laws in electrical circuit.
2. Analyze the single phase circuits
3. Comprehend the construction and Operation of DC and AC machines
4. Know the practical importance of Diode and its characteristics
5. Recognize the construction and operation of BJT and JFET

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3									3	3	3	3
CO2	3	3	3									3	3	3	3
CO3	3	3	3									3	3	3	3
CO4	3	3	3									3	3	3	3
CO5	3	3	3									3	3	3	3

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0553	Basic Python Programming Lab (Common for CE, EEE, ME, ECE, MiE)	L	T	P
Credits: 2		-	1	2

Prerequisites: NIL

Course Objectives: To be able to introduce core programming basics and program design with functions using Python programming language, understand a range of Object-Oriented Programming, as well as in- depth data and information processing techniques.

Software Requirements: PythonList of Programs:

1. a) Write a program to demonstrate different number data types in Python.

b) Write a program to perform different Arithmetic Operations on numbers in Python.

2. a) Write a program to create, concatenate and print a string and accessing sub-string from agiven string.

b) Write a python script to print the current date in the following format "Sun May 29 02:26:23IST 2017"

3. Write a program to create, append, and remove lists in python.
4. Write a program to demonstrate working with tuples in python.
5. Write a program to demonstrate working with dictionaries in python.
6. a) Write a python program to find largest of three numbers.

b) Write a Python program to convert temperatures to and from Celsius, Fahrenheit.[Formula : c/5 = f-32/9]

7. a) Write a Python script that prints prime numbers less than 20.

b) Write a python program to find factorial of a number using Recursion.

8. a) Write a python program to define a module to find Fibonacci Numbers and import themodule to another program.

b) Write a python program to define a module and import a specific function in that module toanother program.

9. a) Write a program that defines and print a matrix.

b) Write a program to perform addition of two square matrices.

c) Write a program to perform multiplication of two square matrices.

10. a) Write a function dups to find all duplicates in the list.

b) Write a function unique to find all the unique elements of a list.

11. a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

12. Write a script named copyfile.py. This script should prompt the user for the names of two text files.The contents of the first file should be input and written to the second file.

TEXT BOOKS:

1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Publications.
2. Mark Lutz," Learning Python", Orielly Publishers

REFERENCES:

1. Allen Downey, "Think Python", Green Tea Press

2. W. Chun, “Core Python Programming”, Pearson.
3. Kenneth A. Lambert, “Introduction to Python”, Cengage

Course Outcomes:

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

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions..
2. Demonstrate proficiency in handling modules, strings and file systems
3. Create, run and manipulate Python Programs using regular expressions and multithreaded programming environments
4. Interpret the concepts of object-oriented programming in Python.
5. Implement exemplary GUI applications related to Web Programming in Python

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2		3		3				1		1	2	2	1	
CO2			2		3							1	1		
CO3			2		2							2			2
CO4	1	2	3	2	3		1		3		1	2			3
CO5					3						1	2			2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0304	ENGINEERING MECHANICS LAB (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

COURSE OBJECTIVES:

The objective of this subject is to provide the basic concept of force, moment of inertia, reactionand moments by practically.

List of Experiments

1. Verify the triangle law and polygon law of forces.
2. To find the equilibrium of coplanar concurrent force system-forces in the jib crane.
3. To determine the support reaction for a beam.
4. To determine the moment of inertia of a flywheel.
5. To verify the law of moments by disc apparatus.
6. To determine the coefficient of friction.
7. To verify the equilibrium of Non Concurrent forces.
8. To verify the equilibrium of forces using force table.
9. To determine the efficiency of a simple screw jack apparatus.
10. To estimate the value of acceleration due to gravity by using compound pendulum.
11. To determine the efficiency of Worm and Worm Wheel apparatus.
12. To determine the efficiency of a Differential Wheel and Axle apparatus.

COURSE OUTCOMES

At completion of the course, students will be able to

1. Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
2. Apply basic knowledge of mathematics and physics to solve real-world problems.
3. Determine the coefficient of friction.
4. Determine the efficiency of a simple screw jack apparatus, Worm and Worm Wheel apparatus and Differential Wheel and Axle.
5. Estimate the value of acceleration due to gravity.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3					3			2	2		
CO2	3	1	1	3					3			2	2		
CO3	3	1	1	3					3			2	2		
CO4	3	1	1	3					3			2	2		
CO5	3	1	1	3					3			2	2		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0B18	ENGINEERING CHEMISTRY LAB (Common for CE, EEE, ME, ECE, CSE,CSE(AIML), CSE(DS), CSE (CS), CSE(IOT),IT and Min.E))	L	T	P
Credits: 1		-	-	2

Course Objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical andinstrumental methods for developing experimental skills in building technical competence.

List of Experiments:

1. Calibration of Volumetric apparatus.
2. Estimation of Total Hardness of water by EDTA Method.
3. Estimation of an acid by P^H metry.
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn^{+2} ion in $KMnO_4$ by Colorimetry.
8. Determination of viscosity of given liquids by Ostwald's viscometer.
9. Determination of surface tension of given sample using stalagmometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.

Course outcomes:

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

1. Estimate the hardness of given water samples.
2. Select lubricants for various purposes.
3. Prepare advanced polymers & drug materials.
4. Know the strength of an acid present in batteries.
5. Calculate the amount of Mn^{+2} present in unknown substances/ores using instrumental methods.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1											
CO2	2	1	2												
CO3	2	2		1											
CO4	2	2	1												
CO5	2	1	2												

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common for ALL)	L	T	P
Credits: 1		-	-	2

Prerequisites: NILCourse Objectives:
To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET andalso analyse the performance of DC Motors, AC Motors and Transformers.

List of Experiments:
1. Verification of Kirchhoff's Laws.
2. Verification of Maximum Power Transfer Theorem.
3. Determination of Phase Angle for RC series circuit.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves
5. Load Tests on Single Phase Transformer
6. Brake Test on Three Phase Induction Motors. Determination of Performance curves
7. V-I Characteristics of PN junction Diode
8. V-I Characteristics of Zener Diode
9. Half Wave Rectifier and Full Wave rectifier.
10. Input and Output characteristics of BJT with CE configuration
11. Input and Output characteristics of BJT with CB configuration
12. Input and Output Characteristics of JFET.

Course Outcomes:
At the end of the course, students will be able to
1. Analyze electrical circuits by applying basic laws
2. Analyze the performance of DC Motor, three phase Induction motor and transformer
3. Understand V-I Characteristics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3					3			3			
CO2	3	3	3	3					3			3			
CO3	3	3	3	3					3			3			
CO4	3	3	3	3					3			3			
CO5	3	3	3	3					3			3			

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0B02	PROBABILITY AND STATISTICS (Common for CE, ME & MINING)	L	T	P
Credits: 3		3	-	-

Pre-requisite: Basic Probability

Course Objectives:

1. Define event, outcome, trial, simple event, sample space and calculate the probability that anevent will occur.
2. Calculate the expectation of sums of random variables.
3. Statistical analyses are very often concerned with the difference between means.
4. Investigate the variability in sample statistics from sample to sample
5. Identify the direction and strength of a linear correlation between two factors.

MODULE - I: Introduction to Probability:

Events, sample space, mutually exclusive events. Exhaustive events. Addition theorem for 2& n events and their related problems. Dependent and Independent events, conditional probability, multiplication theorem. Boole's inequality, Bayes' Theorem.

MODULE - II: Random variables:

Discrete Probability distributions. Bernoulli, Binomial, Passion, Geometric, mean, variance, moment generating function–related problems. Continuous probability distribution, Normal distribution, Uniform,mean, variance, moment generating function, Central Limit theorem.

MODULE - III: Sampling Distributions:

A: Sampling Distributions: Definitions of population-sampling-statistic, parameter. Types of sampling, expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, point estimation and interval estimation

B:Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region,confidence interval, and Level of significance. One sided test, two-sided test.

Large sample tests:

(i) Test of significance for single proportion
(ii) Test of significance for difference of proportions
(iii) Test of significance for single mean
(iv) Test of significance for difference of means

MODULE IV: Small sample tests:

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

MODULE V: Correlation, Regression:

Correlation, Coefficient of correlation, the rank correlation. Regression, Regression Coefficient, The linesof regression: simple regression. Multiple regression for three variables.

TEST BOOKS:

1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publicaitons.
3. Monte Gomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.

REFERENCE BOOKS:

1. P. G. Hole, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall,2003 (Reprint).
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley,1968.

E RESOURCES:

1.http://www.csie.ntu.edu.tw/~sdlin/download/Probability%20&%20Statistics.pdf (Probability & Statistics for Engineers & Scientists text book)
2.http://www.stat.pitt.edu/stoffer/tsa4/intro_prob.pdf (Random variables and its distributions)
3. http://users.wfu.edu/cottrell/ecn215/sampling.pdf (Notes on Sampling and hypothesis testing)
4. http://nptel.ac.in/courses/117105085/9 (Mean and variance of random variables)
5. http://nptel.ac.in/courses/111105041/33 (Testing of hypothesis)
6. http://nptel.ac.in/courses/110106064/5 (Measures of Dispersion)

Course Outcomes:

1. The students will understand central tendency and variability for the given data.
2. Students would be able to find the Probability in certain realistic situation.
3. Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables Involved in the probability models. It is quite useful for all branches of engineering.
4. The student would be able to calculate mean and proportions (large sample) and to make Important decisions from few samples which are taken out of unmanageably huge populations.
5. The student would be able to calculate mean and proportions (small sample) and to make Important decisions from few samples which are taken out of unmanageably huge populations.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	4		3					3	1
CO2	3	3	2		3			2	1		2	
CO3	3	2	1		3					2	3	
CO4	3	3	2		2		1		1			1
CO5	3	2	2									

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:A0101	ENGINEERING GEOLOGY	L	T	P
Credits: 2		2	-	-

Pre Requisites: NIL

Course Objective: Ability to analyze representations of key concepts from geology (earth science), policy and values as they appear in geophysics, geochemistry and other natural sciences & technological sciences. To make clear key points of a complex article or research work in concrete technology, material sciences in building construction and management & conservation of natural building materials. Also, to understand the naturally occurring potable (surface and subsurface) water its origin, accumulation, migration and management of water resources.

MODULE I: Introduction

Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology. Weathering of rocks **:** Its effect over the properties of rocks, importance of weathering with reference to dams, reservoirs and tunnels. Weathering of common rock like – Granite.

MODULE II: Mineralogy and Petrology

Mineralogy: Definition of mineral, importance of study of minerals, different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite and Bauxite.

Petrology: Definition of rock. Geological classification of rocks into igneous, sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary & metamorphic rocks and their distinguishing features, Megascopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate. Rock excavation, stone aggregates.

MODULE III: Structural Geology and Geophysical Studies

A: Structural Geology: Indian stratigraphy and Geological Time Scale**.** Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities and joints their important types.

B: Geophysical Studies: Importance of Geophysical studies. Principles of Geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radiometric methods and Geothermal method. Special importance of Electrical resistivity methods and seismic refraction methods. Improvement of competence of sites by grouting, etc. Fundamental aspects of Rock Mechanics and Environmental Geology.

MODULE IV: Geology of Dams and Reservoirs and Tunnels

Geology of Dams and Reservoirs: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures

of the past. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs, Geo-hazards, ground subsidence.
Tunnels: Purposes of tunneling, Effects of Tunneling on the ground. Role of Geological Considerations (Lithological, structural and ground water) in tunneling, over break and lining in tunnels, Tunnels in rock,subsidence over old mines, mining subsidence.

MODULE V: Ground Water
Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earthquakes: their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides: landslides hazards, water in landslides, their causes and effects, measures to be taken toprevent their occurrence. Importance of study of ground water, earthquake and landslides.

TEST BOOKS:
1. N.Chennakesavulu **—A Text book of Engineering Geology**, Mac-Millan Publishers India Ltd.2nd Edition, 2013.
2. Parbin Singh **—Engineering Geology and general geology,** S. K. Kataria & Sons, 8thEdition,New Delhi, 2013.

REFERENCES:
1. F.G. Bell, "**Fundamental of Engineering Geology"** Butterworths Publications, New Delhi, 2016.
2. Krynine & Judd, "**Principles of Engineering Geology & Geotechnics"**, CBS Publishers &Distribution, 2005.
3. Tony Waltham "**Foundations of Engineering Geology"** Spon press/ Cry press Taylor & Francis,2009.

E RESOURCES:
1. www.springer.com › Home › Earth Sciences & Geography › Geology.
2. https://en.wikipedia.org/wiki/Tunnels_(novel).
3. www.icevirtuallibrary.com › Journals.
4. www.groundwater.org/get-informed/basics/groundwater.html.
5. www.soest.hawaii.edu/martel/Courses/GG303.

Course Outcomes
At the end of the course, students will be able to
1. Demonstrate an advanced knowledge of how geological principles can be applied to engineeringpractice.
2. Assess data collected in the field and the laboratory and recognize their geological importance.
3. Understand the structure and composition of earth.
4. Understand how precious earth natural resources in the management of construction industry andmineral based industries.
5. Understand how human activities in construction of major projects such as dams, tunnels,highways and reservoirs and its impact on earth environment & its economics.

CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	3	1	3	3	1		2	1	2		3	
CO2	3	3	3	3	3	2	2		2	3		3		3	
CO3	3	2	3	3	1	2	3		3	3		3		3	
CO4	3	3	3	3	2	2	3	2	3	3	3	3		3	
CO5	3	3	3	3	3	3	3	2	3	3	3	3		3	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0102	STRENGTH OF MATERIALS – I	L	T	P
Credits: 4		3	1	-

Pre Requisites: Engineering Mechanics

Course Objective: To provide basic knowledge by understanding the fundamental concepts of mechanics of deformable solids; including simple stresses and strains, principal stresses and strains, strainenergy, shear force, bending moments and geometry of deformation.

MODULE I: Simple Stresses and Strains, Strain Energy
Simple Stresses and Strains: Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Poisson's ratio and volumetric strain – relationship between Elastic constants – Bars of varying section – composite bars – Temperature stresses – Self weight.
Strain Energy: Resilience – Gradual, sudden and impact loadings – simple applications

MODULE II: Shear Force and Bending Moment (Determinant Beams)
Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading.

MODULE III: Theory of Simple Bending and Shear Stresses
A Theory of Simple Bending: Assumptions – Derivation - Neutral axis – Determination of bending stresses and section modulus of rectangular, circular sections (Solid and Hollow), I,T, Angle and Channelsections.
B Shear Stresses: Derivation– Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections

MODULE IV: Deflection of Beams (Determinant Beams)
Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam: Double Integration method, Macaulay's method, Area Moment method, Conjugate beam method.

MODULE V: Principal Stresses and Strains, Theories of failures
Principal Stresses and Strains: Introduction–Stresses on an inclined section of a uni- axial loading– compound stresses–Normal and tangential stresses on an inclined plane for biaxial stresses Two perpendicular normal stresses accompanied by a state of simple shear–Mohr's circle of stresses– Principal stresses and strains–Analytical and graphical solutions.
Theories of Failures: Introduction Various Theories of failures like Maximum Principal stress theory– Maximum Principal strain theory–Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory (Von Mises Theory).

TEST BOOKS:

1. R.K.Bansal, **"Introduction to Strength of materials"** Laxmi publications Pvt. Ltd., 6th Edition-2015, New Delhi.
2. R. Subramanian **"Strength of materials",** Oxford university press, 2nd Edition 2010 New Delhi

REFERENCES:

1. S. Ramakrishna and R.Narayan, **"Strength of Materials"**, Dhanpat Rai publications 1st Edition - 2007.
2. R.K.Rajput, **"Strength of materials"** by, S.Chand & Co, 6th Edition 2017 New Delhi.
3. **"Strength of materials"** by W A Nash, 4th Edition, 2007, Tata McGraw-Hill Education.
4. **"Mechanics of materials"** by Dr. B.C.Punmia, 2002, Lakxmi Publications.

E RESOURCES:

1. http://www.aboutcivil.org/solid-mechanics.html
2. https://link.springer.com/journal/11223
3. https://www.journals.elsevier.com/mechanics-of-materials
4. http://nptel.ac.in/courses/105105108/
5. http://nptel.ac.in/downloads/112106141/

Course Outcomes:

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

1. Understand the concepts of simple stresses and strains and estimation of stresses for Bars of varyingsections, composite bars and Temperature stresses.
2. Examine the variation of bending moment and shear force at any section and identify the positionand the magnitude of maximum and minimum values for all practical loading cases
3. Examine the variation of flexural/shear stresses across the section and identify the position andmagnitude of maximum and minimum values in various sections.
4. Compute the deflections and rotations by various methods.
5. Analyze the principal stresses and strains by recognize the orientation of principal planes anddevelops an understanding of various theories of failures.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	3	1					2	2	1	
CO2	3	3	2	2	2	2	1					2	2	1	
CO3	3	3	1	2	1	3	2					3	2	1	
CO4	3	3	2	2	2	3	1					2	2	1	
CO5	3	3	1	2	2	1	1					3	2	1	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0103	SURVEYING & GEOMATICS	L	T	P
Credits: 3		3	-	-

Pre Requisites: NIL

Course Objective: Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, the field applications and concepts of leveling survey

MODULE-I: INTRODUCTION BASIC CONCEPTS:

Introduction, Objectives, classifications and Principles of surveying, Scales, Shrinkage of maps, conventional symbols and code of signals, Surveying Accessories, phases of surveying.

MEASUREMENT OF DISTANCES AND DIRECTIONS:

Linear distances: Approximate methods, Direct methods-chains – tapes, ranging- tape corrections, Indirect methods- optical methods –E.D.M methods.

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

MODULE-II: LEVELING AND CONTOURING:

Leveling: Basic definitions, types of levels and leveling staves, Temporary and permanent adjustments- method of leveling. Booking and determination of levels-HI method – Rise and fall method, effect of curvature if earth and refraction

Contouring: Characteristics and Uses of contours, Direct and indirect methods of contour surveying, interpolation and sketching of Contours.

MODULE-III

A. COMPUTATION OF AREAS AND VOLUMES: Areas: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries, Planimeter. **Volumes**: Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

B. THEODOLITE SURVEYING: Types of Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling when the base is accessible and in accessible

MODULE-IV

TRAVERSING: Methods of traversing traverse computation and adjustments, gale's traverse table, omitted measurements

TACHEOMETRIC SURVEYING: Principles of tacheometry, Stadia and tangential methods ofTacheometry.

MODULE-V

CURVES: Types of curves, design and setting out – simple and compound curves.

INTRODUCTION TO MODERN SURVEYING METHODS: Total Station, Global positioningsystem and Geographic information system (GIS)

GEOMATICS: Basic Concepts of Photogrammetry – Scale, Flying Height.

TEST BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain "**Surveying**" (Vol – 1, 2 & 3), LaxmiPublications (P) ltd., 14th Edition, 2014.
2. Duggal S K, "**Surveying**" (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. 4th Edition, 2004.

REFERENCES:

1. Arora K R "**Surveying Vol 1, 2 & 3"**, Standard Book House, Delhi, 15th Edition, 2015
2. Chandra A M, "**Plane Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 3rdEdition 2015.
3. Chandra A M, "**Higher Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 3rdEdition 2015.

E RESOURCES:

1. HYCOS/Surface Waters/Levelling_and_surveying.pdf
2. http://v5.books.elsevier.com/bookscat/samples/9780750669498/9780750669498.PDF
3. http://www.whycos.org/fck_editor/upload/File/Pacific
4. http://nptel.ac.in/courses/105107122/
5. https://www.youtube.com/watch?v=chhuq_t40rY

Course Outcomes:

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

1. Apply basic geometry to detect difference in plane and arc distance over "spherical" earth surfacefor typical length survey projects.
2. Identify the importance of the compass survey and its practical applications
3. Apply basic methods and applications of plane Table survey
4. Identify the field applications and concepts of leveling survey
5. Identify the different methods of calculation of area, contouring and measurement of volumes.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	3	3	1		2	1	2		3	
CO2	3	3	3	3	3	2	2		2	3		3		3	
CO3	3	2	3	3	1	2	3		3	3		3		3	
CO4	3	3	3	3	2	2	3	2	3	3	3	3		3	
CO5	3	3	3	3	3	3	3	2	3	3	3	3		3	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0104	FLUID MECHANICS	L	T	P
Credits: 4		3	1	-

Pre Requisites: NIL

Course Objective: To give fundamental knowledge of fluid, its properties and behavior under various conditions. To develop and understanding of fluid kinematics and classification of flows. To apply the working concepts of various devices used to measure the velocity and discharge of fluid. To apply interrelationship of various properties of fluid in practical problems and how these are used in Civil engineering.

MODULE I: Introduction and Hydrostatic Forces

Introduction: Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, Pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure, Pressure gauges, Manometers: differential and Micro Manometers.

Hydrostatic Forces: Hydrostatic forces on submerged plane, Horizontal, Vertical, Inclined and Curved surfaces – Center of pressure, Derivations and problems.

MODULE II: Fluid Kinematics and Classification of Flows

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. **Classification of Flows:** Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocitypotential functions, flownet analysis.

MODULE III: Fluid Dynamics and Applications of Momentum Principle

A: Fluid Dynamics Surface and body forces – Euler's and Bernoulli's equations for flow along a streamline for 3-D flow.

B: Applications of Momentum Principle Navier – Stokes equations (Explanationary), Momentumequation and its application – forces on pipe bend.

MODULE IV: Boundary Layer Theory and Laminar and Turbulent Flow

Boundary Layer Theory: Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers, BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift-Magnus effect.

Laminar and Turbulent Flow: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Flow between parallel plates, Flow through long tubes, Flow through inclined tubes.

MODULE V: Closed Conduit Flow and Measurement of Flow

Closed Conduit Flow: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart.

Measurement of Flow: Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular, trapezoidal and Stepped notches –Broad crested weirs.

TEST BOOKS:

1. Modi and Seth "**Fluid Mechanics**", Standard book house.20th Edition, 2015.
2. S.K.Som & G.Biswas "**Introduction to Fluid Machines**" (Tata Mc.Grawhill publishers Pvt.Ltd.) 3rd Edition, 2011.
3. Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer "**Introduction to Fluid Machines**",Oxford University Press, New Delhi, 1st Edition, 2004.

REFERENCES:

1. J.F.Douglas, J.M. Gaserek and J.A.Swaffirld, "**Fluid Mechanics**" Prentice Hall 4th Edition, 2000.
2. A.K. Mohanty, "**Fluid Mechanics**", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition 2004.
3. Subramanya "**Fluid Mechanics**", Tata McGraw-Hill Education, 2nd Edition, 2011
4. R.K.Rajput "**Fluid Mechanics**" S. Chand, 2nd Edition, 2008.

E RESOURCES:

1. http://nptel.ac.in/courses.php?disciplineId=105.
2. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078-Page1.htm.
3. http://nptel.ac.in/courses/105101082/.

Course Outcomes:

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

1. Gain knowledge about the physical properties of the fluid and their influence on fluid motion and measurement of pressure by various manometers and the hydrostatic forces acting on the submerged bodies.
2. Recognize fluid kinematics through stream line, path line and streak line and understand the classification of flows and continuity equation for one, two & three dimensional flows.
3. Understand fluid dynamics using Euler's and Bernoulli's equation for three dimensional flows and application of Momentum equation.
4. Gain the knowledge of boundary layer theory by Navier stoke's equation and Vonkarmen momentum integral equation and gain the knowledge in Laminar & Turbulent flows using Reynold's experiment.
5. Understand various frictional losses in pipes and measurement of flow using notches & weirs.

CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	1								2	2	
CO2	3	3	3	3	1								2	2	
CO3	3	2	3	3									3	2	
CO4	3	3	3	2									2	2	
CO5	3	2	2										3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0105	ENGINEERING GEOLOGY LAB	L	T	P
Credits: 1		-	-	2

Prerequisite: NIL
Course Objective: This course deals with the experiments conducted to determine engineering propertiesof rocks and minerals.

List of Experiments:

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic and microscopic description and identification of rocks referred under theory.
3. Megascopic and microscopic identification of rocks & minerals.
4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
5. Simple Structural Geology problems.

Course Outcomes
At the end of the course, students will be able to
1. Learn geology and its types, various features like fault, fissures, weathering etc., minerals, rocks,and rock formations in relation to civil engineering structures.
2. Understand various techniques to determine engineering properties of rocks etc.
3. Understand various techniques to analyze and to made possible solutions for various GeologicalEngineering problems.
4. Understand various techniques to analyze and to made possible solutions for various GeologicalEngineering problems.
5. Study the various geological maps, topographical maps etc.,

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	0	3			3	3		3		3
CO2	3	3	3		3	2	2	2	3	3	3		3	2	3
CO3	3	1	1	2	2	2	3	3	3	3	3		3		2
CO4	3	2				1			1	1	2		2	3	2
CO5	3	1				1		2		2			2		2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0106	STRENGTH OF MATERIALS LAB	L	T	P
Credits: 1		-	-	2

Prerequisite: Engineering Mechanics, Strength of Materials.

Course Objective: To determine the mechanical properties of different engineering materials underTension, Compression, Shear Impact, Hardness, Torsion, and elastic constants of beams and springs.

List of Experiments:

1. Tension test on Mild steel
2. Compression test on wood or concrete
3. Shear test
4. Brinell hardness & Rock well hardness test
5. Impact test (Charpy & Izod)
6. Torsion test
7. Spring test
8. Deflection test on (Steel / Wood) Cantilever beam.
9. Deflection test on simple support beam.
10. Deflection test. Continuous beam
11. Verification of Maxwell's Reciprocal theorem on beams.
12. Use of electrical resistance strain gauges.

Course Outcomes

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

1. Demonstrate the basic knowledge of the mechanical properties of materials
2. Estimate compressive strength of wood, concrete, brick materials and decide their suitability forthe construction purpose
3. Determine the impact resistance of steel used in construction works
4. Estimate young's modulus of wood/steel materials
5. Estimate rigidity modulus for a given spring

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	-	3	1	-	-	-	-	1	-	2	1	-
CO2	2	3	1	-	2	1	-	-	-	-	-	-	3	1	-
CO3	2	1	2	-	3	1	-	1	-	-	-	-	2	1	-
CO4	2	1	2	-	2	1	-	1	-	-	-	-	2	1	-
CO5	3	2	1	-	1	1	-	-	-	-	2	-	2	1	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0107	**SURVEYING LAB**	**L**	**T**	**P**
Credits: 1		**-**	**-**	**2**

Prerequisite: NIL

Course Objective: To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

List of Experiments:

1. Survey of an area by chain survey (closed traverse) & Plotting
2. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
3. Radiation method, intersection methods by plane Table survey
4. Fly leveling (differential leveling)
5. An exercise of L.S and C.S and plotting
6. Two exercises on contouring.
7. Measurement of horizontal angles by method of repetition and reiteration.
8. Heights and distance using Principles of tacheometric surveying (Two Exercises)
9. Stake-out using total station
10. Determine of area using total station
11. Determination of remote height using total station
12. Distance, gradient, Diff, height between to inaccessible points using total stations.

Course Outcomes

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

1. Discuss the relative precision expected from pacing, taping, and electronic distance measurementtechniques
2. Calculate the errors, standard deviations, standard errors of the mean, accuracy ratio or relativeprecision of a set of measurements in terms used by the surveyor
3. Determine the earth's curvature effect, by comparing the difference between a horizontal plane anda level (curved) surface on the earth
4. Distinguish between plan view, profile view and cross-sections as used in route surveying anddemonstrate understanding of cross-sectioning to attain earthwork data.
5. Determine latitudes and departures for all segments of a closed loop traverse check for closure error, and express the results in the form of the standard accuracy ratio, i.e. accuracy ratio.

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

	(Programme Outcomes POs)												PSOs		
COS	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	2				2	2		2	3		
CO2	3	3	3	1	2				2	2		2	3		
CO3	3	3	3	2	2				2	2		2	3		
CO4	3	3	3	3	2				2	2		2	3		
CO5	3	3	3	3	2				2	2		2	3		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0554	FUNDAMENTALS OF DATA STRUCTURES LAB (Common for CE, ME and Min.E.)	L	T	P
Credits: 2		-	1	2

Prerequisites: C Programming.

Course Objectives:

This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists,stacks, queues, trees and graphs along with the applications.

Software Requirements: C

List of Programs:

1 Write a program to create one dimensional array, with the following operations:
a) Insertion
b) Deletion
c) Display the elements
d) Count number of elements

2 Write a program to create a single linked list, with the following operations:
a) Insertion
b) Deletion
c) Display the elements
d) Count number of elements.

3 Write a program to create a circular linked list, with the following operations:
a) Insertion
b) Deletion
c) Display the elements
d) Count number of elements.

4 Write a program to create a double linked list, with the following operations:
a) Insertion
b) Deletion
c) Display the elements
d) Count number of elements.

5 Write a program to implements stack operations using:
a) Arrays
b) Linked list

6 Write a program to:
a) Evaluate Postfix expression.
b) Convert infix expression into postfix expression

7 Write a program to implements Linear Queue operations using:
a) Arrays
b) Linked list

8 Write a program to implements Circular Queue operations using Arrays

9 Write a program to implements Double-ended Queue operations using Arrays

10 Write a recursive program to create a Binary Tree of integers, traverse the tree in preorder, in orderand post order of the tree.

11 Write a program to create a Binary Search Tree (BST) and perform insert and search operations onit.

12 Write a program for implementing the following graph traversal algorithms:
a) Breadth First Search (BFS)
b) Depth First Search (DFS)

TEXTBOOKS

1. Jean Paul Tremblay, Paul G Sorenson, "**An Introduction to Data Structures with Applications**", TataMcGraw Hills, 2nd Edition, 1984.
2. Richard F. Gilberg, Behrouz A. Forouzan, "**Data Structures: A Pseudo code approach with C** ", Thomson(India), 2nd Edition, 2004.

REFERENCES

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, "**Fundamentals of Data Structure in C**",University Press (India), 2nd Edition, 2008..
2. A. K. Sharma, "**Data Structures using C**", Pearson, 2nd Edition, June, 2013.
3. R. Thareja, "**Data Structures using C**", Oxford University Press, 2nd Edition, 2014.

Course Outcomes:

At the end of the course, students will be able to
1. Identify the appropriate recursive algorithms and analyze the performance of algorithms.
2. Understand and implement single, double, and circular linked-lists.
3. Implement linear data structures such as Stacks and Queues using array and linked-list representations.
4. Implement non linear data structures such as trees and graphs.
5. linear data structures such as Stacks and Queues

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2										2	3	2
CO2	2	2	3										2	2	3
CO3		2	3											2	3
CO4		2	3											2	3
CO5	2	3	2										2	3	2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A00M2	ENVIRONMENTAL SCIENCES (Common for CE, ME and Min.E.)	L	T	P
Credits: NIL		2	-	-

Pre-requisite: Nil Course Objectives:

An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

MODULE I: Ecosystems

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.

Activity: Plantation.

MODULE II: Natural resources, Biodiversity and Biotic resources:

A) Natural Resources:

Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources–case studies. Energy resources: growing energy needs, introduction to renewable and non renewable energy sources.

B) Biodiversity and Biotic resources:

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation).

Activity: case studies.

MODULE III: Environmental pollution&control:

A) Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.

B) Soil Pollution, Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, Coastal pollution due to sewage and marine disposal of industrial effluents. E-waste and its management. Activity: Field visit.

MODULE IV: Global Environmental Problems and Global effects:
Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol and Montréal Protocol.
Activity: Poster Making.

MODULE V: Towards sustainable future:
Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

TEST BOOKS:
1. R.Rajagopalan,**"Environmental Studies from crisis to cure"**, Oxford University Press 2nd Edition, 2005.
2. Anubha Kaushik, C.P.Kaushik, **"Environmental studies"** New age International Publishers,4th Edition,2012

REFERENCE BOOKS:
1. Erach Bharucha,**"Environmental studies"** University Grants Commission, and University Press,IEdition, 2005.
2. M. Anji Reddy **"Text book of Environmental Science and Technology"** 3rd Edition, 2007
3. Richard T.Wright,**"Environmental Science: towards a sustainable future"** PHL Learning,Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P.Ela,**"Environmental Engineering and science"**, 3rd Edition,PHI Learning Pvt. Ltd.,2008.

E-RESOURCES:
(1) http://www.gdrc.org/uem/ait-terms.html (Glossary of Environmental terms).
(2) http://www.environmentalscience.org/ (Environmental sciences Lectures series).
(3) Journal of earth science and climatic change (OMICS International Journal).
(4) Journal of pollution effects & control (OMICS International Journal).
(5) nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
(6) http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html (NPTELonline video courses IIT lectures).

Course Outcomes:
After completion of the course, students will be able to:
1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.

2. To use natural resources more efficiently.
3. To make the students aware of the impacts of human actions on the environment, its effects andminimizing measures to mitigate them.
4. To educate the students regarding environmental issues and problems at local, national andinternational level.
5. To know more sustainable way of living

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3		1		1	2	1					
CO2	2	3	2	3	1	3		2				
CO3	3	3	2	3	2	2		1				
CO4	3	2	2	1	2	1						
CO5	2	1	1			1	3	3				

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0108	BUILDING MATERIALS CONSTRUCTION & PLANNING	L	T	P
Credits: 3		3	-	-

Prerequisite: NIL

Course Objective: To provide basic knowledge in engineering materials which includes role of materialsin civil engineering based on Physical, chemical and Mechanical properties which will be useful for all engineering works and enable the students to develop knowledge of material science and behavior of various building materials used in construction and to identify the construction materials required for the assigned work and to provide procedural Knowledge of the simple testing methods of cement, Lime, concrete etc. and Introduction to techniques of construction planning and green buildings.

MODULE I: Building Stones, Bricks and Tiles
Stone- Building stones, classification of building stones, quarrying procedures, dressing, and tools for dressing of stones. Bricks-Composition of brick earth, manufacturing of brick & Tests on brick. Tiles - Types of tiles, manufacturing of tiles.

MODULE II: Cement & Admixtures
Ingredients of cement – manufacture – field & lab tests, Admixtures – mineral & chemical admixtures – uses.

MODULE III: Building Components and Building Services
A. Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ;foundations – types ; Damp Proof Course; Joinery – doors – windows – materials – types.
B. Building Services: Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics, Fire protection & fire hazards.

MODULE IV: Masonry and Finishing Form Work
Masonry And Finishing: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick. Finishers: Plastering, Pointing, Painting.
Form Work: Requirements, Standards, Scaffolding, Shoring, Underpinning.

MODULE V: Green Building and Building Planning:
Introduction to green buildings, Green materials, Green Globes- Building Planning, Principles of Building Planning, Classification of buildings and Building by- laws

TEST BOOKS:

1. SK Duggal, **"Building Materials"**, New Age Publications 4th Edition, April, 2014.
2. BC Punmia, Ashok Kumar Jain and Arun Kumar Jain, **"Building Construction"**, Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2013.

REFERENCES:

1. Roy Chudley **"Construction Technology"** Vol. – 1 & 2, 2nd Edition, Longman, UK, 1987.
2. PC Varghese, **"Building Construction"**, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.

E RESOURCES:

1. http://www.dewa.gov.ae/images/greenbuilding_eng.pdf
2. http://Building materials and construction planning.pdf
3. http://www.wikipedia.org/wiki/Construction

Course Outcomes

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

1. To identify various building materials and select suitable type of building material for givensituation and to be aware of various traditional building materials and also the emerging materials inthe field of Civil Engineering construction.
2. List the grades of cement, the types of cement and the types of different admixtures.
3. To select suitable type of foundation and gain complete knowledge on plumbing works.
4. Visualization of different types of masonry construction and design suitable type of formwork
5. Create awareness about green building practice and apply the principles of planning and by-lawsused for building planning.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				1	1	2				2	3	1	2	
CO2	1				2	2	3					3	1	2	
CO3	1				2	3	2	2			2	3		3	
CO4	1					3	3					3	2		
CO5	1				2	3	3	3			3	3	2	3	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0109	STRENGTH OF MATERIALS – II	L	T	P
Credits: 4		3	1	-

Prerequisite: Strength of Materials

Course Objective: To provide the basic concepts of Columns and Struts and calculation of stresses and deformations under Direct, Bending Stresses and in beams subjected to unsymmetrical bending so that to apply the knowledge of solids on engineering applications and design problems.

MODULE I: Torsion, Shafts & Springs, Beams Curved in Plan

Torsion, Shafts & Spring: Torsion of circular and hollow shafts, Elastic Theory of torsion, Stresses and Deflection in circular solid and hollow shafts. Combined bending moment and torsion of shafts – Strain energy due to torsion- Modulus of Rupture – Power transmitted to shaft- shaft in series and parallel- Closed and open coiled helical springs- Leaf springs- Springs in series and parallel- Design of buffer springs.

Beams Curved in Plan: Introduction–circular beams loaded uniformly and supported on symmetrically placed columns –Semi-circular beam simply-supported on three equally spaced supports.

MODULE II: Direct and Bending Stresses

Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys, retaining walls and dams–conditions for stability– stresses due to direct loading and bending moment about both axis.

MODULE III: Thin Cylinders & Thick Cylinders

A: Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal andcircumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

B: Thick Cylinders: Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders

–Necessary difference of radii for shrinkage – Thick spherical shells.

MODULE IV: Columns and Struts

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

MODULE V: Unsymmetrical Bending and Shear Centre

Unsymmetrical Bending: Introduction–Centroidal principal axes of section–Graphical method for locating principal axes–Moments of inertia referred to any set of rectangular axes–Stresses in beams

subjected to unsymmetrical bending– Principal axes–Resolution of bending moment into two rectangular axe through the centroid–Location of neutral axis-Deflection of beams under unsymmetrical bending.

Shear Centre: Introduction-shear centre for symmetrical and unsymmetrical (Channel, I, T & L) Sections

TEXTBOOKS:

1. R.K.Bansal "**Strength of materials**" Laxmi Publications(P)ltd., 6th Edition 2015.
2. Basavarajaiah and Mahadevappa "**Strength of materials**" University press 3rd Edition, 2011

REFERENCES:

1. Ferdinandp Beer "**Mechanics of Solid**", TataMc.Grawhill Publications 1stEdition 2000.
2. S.Ramakrishna and R.Narayan "**Strength of Materials**" Dhanpat Rai publications., 1stEdition2015.
3. A.R.Basu,NaiSarah "**Strength of Materials**" DhanpatRai&Co., 2nd Edition , 2011.
4. L.S.Srinath "**Strength of Materials**" Macmillan IndiaLtd.,1st edition, 2014.

E RESOURCES:

1. http://www.aboutcivil.org/solid-mechanics.html
2. https://archive.org/details/atextbookoncivi01schogoog
3. https://link.springer.com/journal/11223
4. https://www.journals.elsevier.com/mechanics-of-materials
5. http://nptel.ac.in/courses/105105108/
6. http://nptel.ac.in/downloads/112106141/

Course Outcomes

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

1. Know the theory behind the Shafts and springs and their types.
2. Assess the resultant stresses in the case of chimneys, retaining walls and dams and checking their stability. Evaluate bulking loads of a given column when ends are either held in position or are restrained fully and their combinations
3. Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels and Design the thickness of the thin and thick cylinders subjected to internal pressure
4. Analyze slender, long columns subjected to axial loads.
5. Apply the different methods of unsymmetrical bending analysis. Design simple bars, beams, and circular shafts for allowable stresses and loads/demonstrate the significance and concept of shear centre

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	-	3	1	-	-	-	-	1	-	2	1	-
CO2	2	3	1	-	2	1	-	-	-	-	-	-	3	1	-
CO3	2	1	2	-	3	1	-	1	-	-	-	-	2	1	-
CO4	2	1	2	-	2	1	-	1	-	-	-	-	2	1	-
CO5	3	2	1	-	1	1	-	-	-	-	2	-	2	1	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0110	CONCRETE TECHNOLOGY	L	T	P
Credits: 3		3	-	-

Prerequisites: Building Materials, Construction & Planning

Course Objective: To provide the basic knowledge of science and engineering of concrete properties related to civil engineering problems. Going through the course one would develop adequate understanding on concrete production process and properties and uses of concrete as a modern material ofconstruction. The courses will enable one to make appropriate decision regarding ingredient selection anduse of concrete.

MODULE I: Cement & Admixtures
Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement –Tests on cement– Different grades of cement.
Admixtures: Types of admixtures – mineral and chemical admixtures – properties – dosages – effects – usage

MODULE II: Aggregates
Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

MODULE III: Fresh& Hardened Concrete
A: Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.
B: Hardened Concrete: Water / Cement ratio – Abram‘s Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength.

MODULE IV: Testing Of Hardened Concrete & Elasticity, Creep & Shrinkage
Testing Of Hardened Concrete: Compression tests – Tension tests: Flexure tests – Splitting tests – Pull-out test, Nondestructive testing methods – codal provisions for NDT
Elasticity, Creep & Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson‘s ratio
– Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep –Effects of creep – Shrinkage – types of shrinkage.

MODULE V: Mix Design & Special Concretes

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design with Admixtures as per IS:10262-2009

Special Concretes: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – High density concrete – Fiber reinforced concrete – Polymer concrete – Types of Polymer concrete – High performance concrete – Self compacting concrete-Self Curing Concrete.

TEST BOOKS:

1. M.S.Shetty "**Concrete Technology**" S.Chand & Co. Revised Edition; 2006
2. M.L. Gambhir. "**Concrete Technology**" 5th Edition 2013 – Tata Mc. Graw Hill Publishers, NewDelhi

REFERENCES:

1. A.M.Neville "**Properties of Concrete**" Low priced Edition – 5th Edition 2012
2. M.L. Gambhir. "**Concrete Technology**" 5th Edition 2013 – Tata Mc. Graw Hill Publishers,NewDelhi
3. A.R. Santha Kumar "**Concrete Technology**", Oxford university Press 2006, New Delhi
4. P.K.Mehta and J.M.Monteiro, "**Concrete: Micro structure, Properties and Materials**" –5thEdition 2014 Mc-Graw Hill Publishers.

E RESOURCES:

1. http://www.indianconcreteinstitute.org/
2. http://www.ncbindia.com/
3. www.icijournals.com
4. http://nptel.ac.in/courses/105102012/
5. http://nptel.ac.in/courses/105105104/

Course Outcomes

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

1. To understand various chemical and physical properties of ordinary Portland cement andadmixture
2. Acquire knowledge on physical, chemical, thermal and mechanical properties of aggregates
3. Gain knowledge on properties of both fresh and hardened concrete
4. Acquire knowledge on various tests conducted on hardened concrete like tension and compressionetc and also effect and factors influencing of elasticity, creep and shrinkage.
5. Design a concrete mix which fulfills the required properties of concrete by using BIS method anddevelopment of special concretes and different materials used in them.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2		2	1		2							2	2
CO2	3	2		2	2	1	2							2	2
CO3	3	3	3	3	3		1							3	2
CO4	3	3		3	2		3			2				2	2
CO5	3	2	3	3	3		2			3				3	2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0111	HYDRAULICS AND HYDRAULIC MACHINERY	L	T	P
Credits: 3		3	-	-

Prerequisite: Fluid Mechanics

Course Objective: To introduce the importance of study of open channel flow, fundamentals of flow in open channels and hydraulic design principles of channels. To get knowledge about hydraulic similitude using dimensional analysis of a prototype and model. To understand the application of momentum principle in impacts of jets on plane and curved surfaces. To impart the knowledge on pumps and turbines, their working principles, efficiencies, work done, specific speed and performance characteristics.

MODULE I: Open Channel Flow
Types of flows- Type of channels– Velocity distribution– Energy and momentum correction factors, Chezy's, Manning's and Bazin formulae for uniform flow– Most Economical sections, Specific energy,Criticalflow-criticaldepth–computationofcriticaldepth–critical,sub critical and super critical flows, Non uniform flow-Dynamic equation for G.V.F, Mild, Critical, Steep, horizontal and adverse slopes- surface profiles-direct step method- Rapidly varied flow-hydraulic jump -energy dissipation.

MODULE II: Hydraulic Similitude
Dimensional analysis- Rayleigh's method and Buckingham's pi theorem -study of Hydraulic models– Geometric, kinematic and dynamic similarities- Dimensionless numbers–model and prototype relations.

MODULE III: Basics of Turbo Machinery and Turbo Machinery
A. Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat vertical,inclined and curved vanes, jet striking centrally and at tip.
B: Turbo Machinery: Velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

MODULE IV: Hydraulic Turbines
Layout of a typical Hydropower installation – Heads and efficiencies- Classification of turbines-Pelton wheel- Francis turbine- Kaplan turbine– working principle, velocity diagram, work done and efficiency, hydraulic design, Governing of turbines, Differences between types of turbines, Draft tube– theory and function, efficiency, surge tanks, Specific speed of turbines- unit speed- unit quantity- unit power- performance characteristics- geometric similarity- cavitations. Run way speed.

MODULE V: Centrifugal-Pump and Hydropower Engineering
Centrifugal-Pump: Pump installation details- classification- work done- Manometric head-minimum starting speed- losses and efficiencies- specific speed multistage pumps- pumps in parallel- performance ofpumps- characteristic curves- NPSH- cavitations.

Hydropower Engineering: Classification of Hydropower plants– Definition of terms– load factor,utilization factor, capacity factor, estimation of hydro power potential.

TEST BOOKS:

1. Modi&Seth"**Fluid Mechanics, Hydraulic and Hydraulic Machines**", Standard book house. 20th Edition, 2015.
2. K,Subramanyam"**Open Channel flow**", Tata Mc.Grawhill Publishers,3rd Edition, 2009.
3. Narayanapillai "**Fluid Mechanics &Fluid machines**", Universities press, 3rd Edition, 2009.

REFERENCES:

1. R.K.Bansal "**A text of Fluid Mechanics and Hydraulic Machines**" Laxmi Publications (P)ltd.,New Delhi, 9th Edition, 2010.
2. RangaRaju, "**Elements of Open channel flow**" Tata Mc.GrawHill, Publications, 2nd Edition, 2001.

E-RESOURCES:

1. http:// nptel.ac.in/courses/105103096/
2. http:// nptel.ac.in/courses/105103082/

Course Outcomes

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

1. Apply the knowledge in addressing problems regarding open channels and possess skills to solveproblems in uniform, gradually and rapidly varied flows in steady state conditions.
2. Know the importance of studies of hydraulic similitude and build highly representative models forvarious real time prototypes by considering Geometric, kinematic and dynamic similarities.
3. Gain knowledge on impact of jets on the vanes and application of this knowledge in representingvelocity triangles at inlet and outlets and radial flow turbines.
4. Learn about different types of turbines, their working and various engineering characteristics.
5. Learn about different types of pumps, their working and various engineering characteristics alongwith the basic concepts related to hydropower plant.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	1	-	-	-	-	-	-	-	2	2	
CO2	3	3	3	1	1	-	-	-	-	-	-	-	2	2	
CO3	3	3	2	1	1	-	-	-	-	-	-	-	3	2	
CO4	3	3	1	1	1	-	-	-	-	-	-	-	2	2	
CO5	3	3	1	1	1	-	-	-	-	-	-	-	3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0112	WATER RESOURCES ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisites: Fluid mechanics, Hydraulics & Hydraulic machinery, Engineering Geology

Course Objective: To impart basic knowledge of hydrology, various components of hydrology and their applications and importance of surface and ground water resources and application of these principles to solve hydrologic problems and its significance in design of canals and mechanisms and pathways of water storage, transport and transformation in the landscape.

MODULE I: Surface Water Hydrology

A. Surface Water Hydrology Water Resources in India, Hydrology in water Resource Planning – Hydrological cycle -Precipitation– Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, consistency of rainfall record – Double mass curve, Infiltration: Definition Factors affecting and its determination, Evaporation and Evapo – Transpiration: Definition Factorsaffecting and its determination .

B. Runoff Factors affecting runoff, methods of determination of runoff, stream gauging, Hydrograph analysis: Base flow separation, unit hydrograph – Hydrograph of different durations, Applications of unit hydrograph: S-hydrograph, Flood Forecasting Techniques.

MODULE II: Ground Water Hydrology

Ground water hydrology: Definitions, sub surface distribution of water, ground water movement, Darcy's law–permeability.

Well hydraulics: Steady flow in different types of aquifers and wells – determination of hydraulic properties of aquifer, well losses, specific capacity of well, well efficiency, pumping test and recovery test methods for determination of well yield.

MODULE III: Irrigation

Irrigation Definition, Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils.

Soil-water-plant relationship Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors affecting duty, Determination of canal capacities for cropping patterns consumptive use, Methods of improving soil fertility –Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water, Irrigational efficiencies.

MODULE IV: Canal Systems

Classification of irrigation canals – canal alignment, Design of unlined canals, Regime theories – Kennedy's and Lacey's theories, Design problems.

MODULE V: Reservoir Planning:

Definition, Types of reservoir investigations for reservoir planning, selection of site for a reservoir, zones of storage in a reservoir, purpose of reservoir, reservoir yield, mass curve and demand curve, Determination of reservoir capacity, yield from a reservoir of given

capacity, Reservoir sedimentation, control of reservoir sedimentation, Life of reservoir..

TEST BOOKS:

1. P. Jayarami Reddy, "**A Text book of Hydrology"**, Laxmi Publication, Delhi, 14th Edition 2009.
2. B.C. Punmia and Pande B.B.Lal, "**Irrigation and Water Power Engineering"**., LaxmiPublications Pvt. Ltd., New Delhi, 18thEdition, 2009.

REFERENCES:

1. S.K. Garg, "**Irrigation Engineering and Hydrology Structures"**, Khanna Publishers, Delhi, 23rdEdition 2009
2. K. Subramanya, "**Engineering Hydrology"**, Tata-Mc Graw Hill Publishing, Delhi, 4th Edition,2013.
3. P.N.Modi, "**Irrigation, Water Resources and Water Power Engineering"**. Standard BookHouse, Delhi, 6th Edition, 2004.

E –RESOURCES

1. http://textofvideo.nptel.iitm.ac.in/1028/lec40.pdf
2. http://nptel.ac.in/courses/Webcourse
3. Contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m4l06.pdf

Course Outcomes:

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

1. Gain knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation and apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
2. Know the basics of ground water and hydraulics of subsurface flows.
3. Gain knowledge on irrigation and different methods of irrigation and understand the concept of soil-water-plant relationship and apply it to schedule irrigation.
4. Gain knowledge and skills on planning and design of canal systems.
5. Gain knowledge on zones of storage in a reservoir, steps for planning reservoir, reservoir sedimentation and its control.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3	3	1	2	2	2	1	-	-	-	3	3	1
CO2	3	3	3	3	1	2	2	2	1	-	-	-	3	3	-
CO3	3	3	3	2	1	2	2	1	-	-	1	2	3	2	1
CO4	3	3	3	2	1	3	2	1	-	-	1	1	3	3	-
CO5	3	3	3	3	1	2	2	2	1	-	2	-	3	2	1

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0113	COMPUTER AIDED DRAFTING OF BUILDINGS LAB	L	T	P
Credits: 1		-	-	2

Prerequisites: BMCP

Course Objective: To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements. To introduce the students to analysis and design the structural members using computer softwares.

List of Exercises:

1. Introduction to computer aided drafting software
2. Drawing of Single storeyed buildings plans of using CAD
3. Drawing of Multi storeyed buildings plans of using CAD
4. Developing sections and elevations for Single storyed buildings
5. Developing sections and elevations for Multi storyed buildings
6. Detailing of building components like Doors using CAD software‘s
7. Detailing of building components like Windows using CAD software‘s
8. Detailing of building components like Roof Trusses etc. using CAD software‘s

Course Outcomes:

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

1. The students will be able to draft the plan, elevation and sectional views of the buildings, Industrial structures, and framed buildings.
2. The students will be able to analyze and design the simple structural members using computersoftware’s.
3. Draw the plans as per Building Bye-Laws
4. Knowledge on comfortable permissible dimensions.
5. Know the brief knowledge on all types of building items like doors, windows, ventilators, chejjasand cupboards etc.,

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	3	2	2	2	3	2	3	3
CO2	2	2	3	2	3	1	3	1	3	2	2	3	3	2	2
CO3	2	2	3	2	1	3	1	3	2	1	1	3	2	0	2
CO4	3	3	2	3	3	1	3	3	1	3	2	3	3	3	3
CO5	3	3	3	3	2	3	3	3	1	1	2	3	2	2	3

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0114	MECHANICS OF FLUIDS & HYDRAULIC MACHINERYLAB	L	T	P
Credits: 1		-	-	2

Prerequisite: NIL

Course Objective: Understand the standard measurement techniques of fluid mechanics and their applications. Illustrate with the components and working principles of the different types of Turbines and Pumps.

List of Experiments:

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice / mouthpiece by constant headmethod.
3. Calibration of contracted Rectangular Notch and / Triangular Notch
4. Determination of Friction factor of a pipe.
5. Determination of Coefficient for minor losses.
6. Verification of Bernoulli's equation.
7. Impact of jet on Vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Performance characteristics of a Single stage/ multi-stage centrifugal pump.
12. Performance characteristics of a Reciprocating pump.

Course Outcomes

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

1. Calibrate various flow measuring devices in pipe and open channel flow.
2. Determine various losses and velocity in pipe flow in field.
3. Calibrate the performance characteristics of pumps and turbines.
4. Provide the students with a solid foundation in fluid flow principles.
5. Provide exposure to modern computational techniques in fluid dynamics

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	2	2	1		2	2	2		3	
CO2	3	2	3	3	1	2	1	1		2		1		3	
CO3	3	2	1	3	2	1	3	2		2		2		2	2
CO4	3	3	3	1	2			1		3	2		3	3	
CO5	3	3	3	2	2			1		3			1	3	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0115	**CONCRETE TECHNOLOGY LAB**	**L**	**T**	**P**
Credits: 1		**-**	**-**	**2**

Prerequisite: Concrete Technology

Course Objective: Enable to carry various experiments regarding compressive strength of concrete,tensile strength of concrete, workability test, design mix, modulus of rupture of concrete. All these experiments intended to determine the quality of concrete.

List of Exercise:

1. Normal Consistency and setting time of cement.
2. Fineness of cement
3. Specific gravity of cement and aggregates
4. Soundness of cement
5. Bulking of sand.
6. Water absorption test on coarse aggregate.
7. Compressive strength of cement.
8. Workability test on concrete by compaction factor, slump and Vee-bee.
9. Compressive strength of concrete.
10. Split tensile and Flexural Strength of concrete.
11. Concrete Mix design.
12. Non-Destructive testing on concrete

Course Outcome

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

1. Find the properties of cement.
2. Calculate the workability of fresh concrete.
3. Find out the strength of hardened concrete.
4. Do the concrete mix design.
5. Get good idea about the water cement ratio.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		3	2				2				3	3	
CO2	3	3		3	3	2	1		3				3	2	
CO3	3	3		3	3				2				3	2	
CO4	3	3	3	3			1		3				3	2	
CO5	3	3		3	2	2	1		2				3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0555	OBJECT ORIENTED PROGRAMMING LAB	L	T	P
Credits: 2		-	-	4

Prerequisites: NIL

Course Objectives:

This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java's exception handling mechanism, multithreading.

Software Requirements: Java

List of Programs:

1. Write a Java Program to implement
a) Default Constructor
b) Parameterized constructor

2. Write a Java Program to implement
a) Method overloading
b) Constructor overloading

3. Write a Java program to implement
a) Single Inheritance
b) Multilevel Inheritance
c) Hierarchical Inheritance

4. Write Java programs that uses the following keywords…
a) this
b) super

5. Write Java programs that uses the following keywords…
a) static
b) final

6. Write a Java program to implement
a) Method overriding.
b) Dynamic method dispatch.

7. Write a Java program to implement
a) abstract method
b) Interfaces

8. Write a Java program to create user defined packages.

9. Write a Java program to implement Exception Handling using
a) try-catch clause
b) Multiple Catch clauses
c) Nested try blocks

10. Write a Java program that
a) create user defined Thread by extending Thread class.
b) create user defined Thread by implementing Runnable Interface
c) create two user defined Threads i.e. Multi Threading using Thread

11. Write a Java program
a) checks whether a given string is a palindrome or not.
b) for sorting a given list of names in ascending order.
c) that reads a line if integers and then displays each integer and the sum of all integers
d) (use stringtokenizer class of java.util).

12. Write a Java program that
a) reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file inbytes.
b) reads a file and displays the file on the screen, with a line number before each line.

TEXT BOOKS:

1. Herbert Schildt, "**Java The complete reference**", TMH, 8th edition, 2011.
2. T. Budd, "**Understanding OOP with Java**", Pearson Education, updated edition, 1998.

REFERENCES:

1. P.J. Deitel and H.M. Deitel, "**Java for Programmers**", Pearson education.
2. P. Radha Krishna, "**Object Oriented Programming through Java**", Universities Press.
3. Bruce Eckel," **Programming in Java**", Pearson Education.
4. S. Malhotra and S. Choudhary," **Programming in Java**", Oxford Univ. Press.

Course Outcomes:

Course Outcomes:

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

1. Differentiate structured programming and object oriented programming and know the concepts ofclasses, objects, members of a class.
2. Apply object oriented programming features and concepts for solving given problems usinginheritance and will know how to organize files in packages and concept of interface.
3. Capable of handling run time errors using Exceptional Handling and exploring strings.
4. Develop applications for concurrent processing using Thread Concept.
5. Capable of handling IO operations using Files.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COs	**ProgrammeOutcomes(POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		2	3									
CO2			3		2							
CO3		2	2		2							
CO4			3		3							
CO5		2	2		3							

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. IV Semester		
Code: A00M1	GENDER SENSITIZATION (Common for CE, ME and Min.E.)	L	T	P
Credits: Nil		-	2	-

Course Objective:
To develop students' sensibility with regard to issues of gender in contemporary India.To providea critical perspective on the socialization of men and women.To introduce students to information about some key biological aspects of genders.To expose the students to debates on the politics and economics of work.To help students reflect critically on gender violence.To expose students to more egalitarian interactions between men and women.

MODULE -I:- UNDERSTANDING GENDER
Gender: Why Should We Study It? *(Towards a World of Equals:* Unit -1) Socialization: Making Women, Making Men *(Towards a World of Equals:* Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First Lessons in Caste. Different Masculinities.
Just Relationships: Being Together as Equals *(Towards* a *World of Equals:* Unit *-2)* Mary iKorn and Onler. Love and Acid just do not Mix. Love Letters. Mothers aniJ Fathers. Further Reading: Rosa Parks-The Brave Heart.

MODULE -II:- GENDER AND BIOLOGY
Missing Women: Sex Selection and Its Consequences *(Towards a World of Equals:* Unit -4)Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary *(Towards* a *World of Equals:* Unit -10)Two or Many? Struggles with Discrimination.
Additional Reading: Our Bodies, Our Health *(Towards a World of Equals:* Unit -13)

MODULE -III:- GENDER AND LABOUR
A: Housework: the Invisible Labour *(Towards a World* of *Equals:* Unit -3) "My Mother doesn't Work." "Share the I.oad."
B: Women's Work: Its Politics and Economics *(Towards a World of Equals:* Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

MODULE -IV:- ISSUES OF VIOLENCE
Sexual Harassment: Say Nol *(Towards a World of Equals:* Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:
"Chdpulum. Domestic Violence: Speaking Out *(Towards a World of Equals:* Unit -5)
Is Home a Safe Place? When Women Unite (Film" Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence *(Towards a World of Equals:* Unit -11) Blaming the Victim-1 Fought for my Life ... " - Further Reading: The Caste Face of Violence.

MODULE -V:- GENDER STUDIES
Knowledge: Through the Lens of Gender *(Towards a Work/ of Equals:* Unit -5)
Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged WomenArtists of Telangana.

Whose History? Questions for Historians and Others *(Towards a World of Equals:*Unit -9) Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern TelanganaHistory.

Essential Reading: All the Units In the Textbook, *"Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, VasudhaNagaraj, Mina Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thant
Note: Since it Is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in thisfield.

TEST BOOKS:-

1. Towards a World of Equals: A bilingual Textbook on Gender , A Suneetha -etall

REFERENCE BOOKS:-

1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. We *Were Making History...' Life Stories of Women in theToIrmgana People's Struggle.* New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by -the-numbers-where-Indan-womenworkP
3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada htto://harooreollins.co.in/BookDetailasp?FlookCndet,3732
4. Vimata. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the Present. Volume II:The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. Women's Work and its Impact on Child Health end Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were Making I listory ....' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.

E RESOURCES :-

- http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm (UNDERSTANDING GENDER)
- https://www.simplypsychology.org/gender-biology.html(GENDERAND BIOLOGY)
- http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/ (GENDER AND LABOUR)
- http://journals.sagepub.com/doi/abs/10.1177/1077801200006007004 (ISSUES OF VIOLENCE)
- http://www.nordiclabourjournal.org/emner/likestilling (GENDER AND BIOLOGY)

Course Outcomes:

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

1. Develop a better understanding of important issues related to gender in contemporary India.
2. Sensitize about the basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Acquire insight into the gendered division of labour and its relation to politics and economics.
5. Develop a sense of appreciation of women in all walks of life.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1						3		3	3		2	3			
CO2						3		3	3		2	3			
CO3						3		3	3		2	3			
CO4						3		3	3		2	3			
CO5						3		3	3		2	3			

20-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0H08	ENGINEERING ECONOMICS & ACCOUNTANCY (Common for CE, ME)	L	T	P
Credits: 3		3	-	-

Pre-requisites: NIL

Course Objective: EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

MODULE-I Business Environment and Managerial Economics

Business Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Latest trends in Business Environment (Entrepreneurship).

Managerial Economics: Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand, Types, Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

MODULE – II Theory of Production and Cost Analysis

Theory of Production: Production Function – ISOquants and ISOcosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

MODULE – III Market structures and Pricing Policies

Introduction to Markets & Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

Pricing Policies & Methods: Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods.

MODULE – IV Capital and Capital Budgeting

Capital: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Capital Budgeting : Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

MODULE – V Financial Accounting and Ratios

Financial Accounting: Introduction, Accounting principles, Accounting Cycle, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Financial Analysis Through Ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

Course outcomes:

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

1. Understand the concepts of managerial economics and their application in evaluating the demand.
2. Evaluate the production function and identifies the least cost combination to control the costs of production.
3. Understand the structures of various market types and their pricing policies.
4. Understand the types of business forms and also be able to evaluate the investments using capital budgeting techniques.
5. Understand the basic concepts of financial accounting and evaluation of company performance using ratio analysis.

TEST BOOKS:

1. Aryasri, **"Managerial Economics and Financial Analysis"**, TMH, 2nd edition, 2005.(UNITS I,II,III,IV,V).
2. Varshney & Maheswari, **"Managerial Economics"**, 5th edition Sultan Chand, 2003.(UNITS, I,II,III).

REFERENCE BOOKS:

1. H. Craig Peterson & W. Cris Lewis, **"Managerial Economics"**, PHI, 4 Ed.
2. Domnick Salvatore, **"Managerial Economics In a Global Economy"**, Thomson, 4th Edition.
3. Raghunatha Reddy & Narasimhachary, **"Managerial Economics & Financial Analysis"**, 4TH edition Scitech.
4. S.N.Maheswari & S.K. Maheswari, **"Financial Accounting"**, 6th edition Vikas.
5. Dwivedi, **"Managerial Economics"**, Vikas, 6th Edition.

E-RESOURCES:

1. http://www.learnerstv.com/Free-Economics-video-lecture-courses.htm
2. http://nptel.ac.in/courses/110105067/
3. http://nptel.ac.in/courses/110107073/
4. http://nptel.ac.in/courses/110101005/
5. http://nptel.ac.in/courses/109104073/

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		2							1		3				
CO2	3			2	1										
CO3		1			2						3				
CO4	2	1			3										
CO5		1			2						3				

20-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0116	STRUCTURAL ANALYSIS	L	T	P
Credits: 3		3	-	-

Prerequisites: Engineering Mechanics, Strength of Materials.

Course Objective: To provide a good knowledge in the analysis of beams and frames. The members of a structure are subjected to internal forces like axial forces, shearing forces, ending and torsional moments while transferring the loads acting on it. Structural analysis deals with analyzing these internal forces in the members of the structures.

MODULE I: Analysis of Frames and Energy Theorems

Analysis of Frames Static Indeterminacy and kinematic indeterminacy, Types of frames- Perfect and Imperfect pin jointed frames. Analysis of determinate pin jointed frames using method of joints and method of sections for vertical, horizontal and inclined loads.

Energy Theorems Introduction-Strain energy in linear elastic system, expression of strain energy due axial load, bending moment and shear forces- Castiglione's first theorem - Unit Load Method. Deflections of simple beams and pin jointed plane trusses.

MODULE II: Fixed and Continuous Beams

Propped cantilever and fixed beams-fixed end moments for propped cantilever and fixed beams subjected to concentrated loads and uniformly distributed load, triangular load – Clapeyron theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams for continuous beams.

MODULE III: Three Hinged Arch and Two Hinged Arch

A: Three Hinged Arch Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three Hinged- parabolic and circular arches – Settlement and temperature effects.

B: Two Hinged Arch Analysis of parabolic arches - effect of yielding of supports- - effect of temperature change.

MODULE IV: Slope Deflection Method

Application of the Method to Continuous beams with and without sinking of Support and rigid frame with and without Side Sway subjected to Point load, Uniformly distributed load on whole span, SFD and BMD

MODULE V: Moment Distribution Method

Introduction – Relative Stiffness, Carry over factor, Distribution factor Application of the Method to Continuous beams with and without sinking of Support and rigid frame with and without Side Sway subjected to Point load, Uniformly distributed load on whole span, SFD and BMD.

TEST BOOKS:

1. Vaidyanadhan, R and Perumal, P**, "Comprehensive Structural Analysis– Vol. 1&Vol. 2",** Laxmi Publications, New Delhi, 3rd Edition, 2014.
2. Bhavikatti, S.S, "**Structural Analysis – Vol. 1 & Vol. 2**", Vikas Publishing Pvt Ltd., New Delhi, 4th Edition, 2014.

REFERENCES:

1. S.B. Junnarkar "**Mechanics of structures**", charotar publishing house.31stedition (2014).
2. Pandit &Gupta "**Theory of structures**", Tata Mc. Graw –Hill Publishing co. Ltd., NewDelhi. 1st edition 1999.
3. B.C Punmia, Khanna "**Strength of materials**", Laxmi Publications, New Delhi 10th edition 2015.

E RESOURCES:

1. https://www.youtube.com/watch?v=s4CN6aVKhPo
2. http://ascelibrary.org/journal/jsendh
3. http://www.springer.com/engineering/civil+engineering/journal/40091
4. http://seekdl.org/journal_details.php?jourid=130
5. http://www.nptel.ac.in/downloads/105101085/

Course Outcomes:

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

1. Find the member forces on frames and to have a good idea on Energy theorems
2. Solve fixed beams, continuous beams and propped cantilever beams.
3. Analyze the three hinged and two hinged arches.
4. Draw the SFD and BMD for beams and trusses using slope deflection method.
5. Draw the SFD and BMD for beams and trusses using Moment distribution method.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	2				2	2		2	3		
CO2	3	3	3	1	2				2	2		2	3		
CO3	3	3	3	2	2				2	2		2	3		
CO4	3	3	3	3	2				2	2		2	3		
CO5	3	3	3	3	2				2	2		2	3		

20-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. V Semester	
Code: A0117	STRUCTURAL ENGINEERING - I (RCC)	L	T	P
Credits: 3		3	-	-

Prerequisite: Strength of Materials

Course Objective: To give procedural knowledge to design a system, component or process as per needs and specifications of R C elements such as beams, slabs, columns and footings subjected to various load combinations with different boundary conditions and also the show the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to wrong design, use of poor quality of materials and faulty construction methods.

MODULE I: Concepts of RCC Design & Beams

Design Philosophies

Design philosophies – Working Stress Method (WSM), Ultimate Load Method (ULM), and Limit State Method (LSM) – Material- Stress- Strain Curves – Safety factors – characteristic values. Stress Block parameters (generalized, rectangular, parabolic) – IS-456-2000 codal provisions

Limit State of Collapse (Flexure):

Limit state design of singly reinforced, doubly reinforced, Flanged sections – T and L beam sections.

MODULE II: Limit State of Collapse in Shear, Torsion and Bond Shear Torsion and Bond:

Limit state design of section for shear and torsion. Concept of bond, anchorage and development length, I.S. code provisions

Limit State Design for Serviceability

Limit State Design for Serviceability for deflection, cracking and codal provision. Design examples in simply supported and continuous beams.

MODULE III: Slabs

A: Types of slabs-one way, two way - simply supported rectangular slabs subjected to only uniformly distributed loads. IS Code Method.

B: Continuous rectangular slabs subjected to only uniformly distributed loads. IS Code Method, Detailing of reinforcement in slabs.

MODULE IV: Columns

Design of axially loaded circular, square and rectangular columns; Uniaxial and biaxial bending of columns - interaction diagrams. Design of columns subjected to axial load and bending.

MODULE V: Stairs and Footings

Stairs: Design and detailing of dog legged stairs, - Analysis and Design of Footings Design of Isolated Square, rectangular and Circular footings as per IS code

TEST BOOKS:

1. P. C. Varghese **—Limit state designed of reinforced concrete** Prentice Hall of India, New Delhi, 2 Edition, 2008.
2. N. Krishna Raju and R.N. Pranesh **— Reinforced concrete design**, New age International Publishers, New Delhi, 3rd Edition, 2009.

REFERENCES:

1. M. L. Gambhir **—Fundamentals of Reinforced concrete design**, Printice Hall of India Private Ltd., New Delhi, 3rd Edition, 2006.
2. P. Purushotham**—Reinforced concrete structural elements – behaviour, Analysis and design**, Tata Mc. Graw-Hill, 3 Edition, 2014.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar **—Reinforced concrete structures**, Vol.1, Laxmi publications Pvt. Ltd., 3rd Edition,2011.
4. S. Unnikrishna Pillai & Devdas Menon, **—Reinforced concrete design** Tata Mc. Graw Hill, NewDelhi,3rd Edition, 2009.

E RESOURCES:

1. https://en.wikipedia.org/wiki/Reinforced_concrete
2. http://www.bd.gov.hk/english/documents/code/CoP_SUC2013e.pdf
3. http://www.sturdystructural.com/reinforced-concrete.html
4. http://engineeringvideolectures.com/course/294
5. http://www.nptel.ac.in/courses/105105105/
6. http://www.nptel.ac.in/courses/105105104/

Course Outcomes:

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

1. Know the needs and mode of the design philosophies like Working Stress Method (WSM), Ultimate Load Method (ULM), Limit State Method (LSM).
2. Have an idea on flexure, shear, torsion, Bond, anchorage length and to check the Design for Serviceability.
3. To inculcate the design methodology for various slabs using IS Codal Provisions and Detailing of Reinforcement for torsion.
4. To know about compression members like columns and design procedure for various types of columns using IS Code-456-2000.
5. To familiarize about Foundations and their Design.

CO – PO – PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	1		1	2	1	3		1		2	3	1	
CO2	1	2	3	2		2	1	3		1	2	2	3	2	
CO3	3	2	2	3		2	2	3		1	3	1	3	2	
CO4	1	2	3	1		2	2	3		1	2	1	3	2	
CO5	3	2	3	3		2	1	3		1	2	2	3	2	

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0118	GEOTECHNICAL ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisite: NIL

Course Objective: To understand the formation of soils, their classification. To analyze the in-situ soil and stresses developed due to loads or surcharge in the soil at any depth and its practical significance. Also to predict the bearing capacities and possible settlements of structures founded on various soils.

MODULE I: Introduction and Index Properties of Soils

Introduction Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship – Relative density.

Index Properties of Soils Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils and unified soil classification

MODULE II: Permeability and Effective Stress & Seepage through Soils Permeability Soil water – capillary rise – flow of water through soils – Darcy's law- Permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered Soils.

Effective Stress & Seepage through Soils Total, neutral and effective stress – principle of effective stress -Variation of Effective Stress with Water Table - quick sand condition - Preventive Measures for Piping Failures– Seepage through soils – Effect of Seepage on Effective Stress (Various Conditions) – Flownets: Characteristics and Uses.

MODULE III: Stress Distribution in Soil and Compaction

A: Stress Distribution in Soil Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

B: Compaction Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

MODULE IV: Consolidation

Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre consolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods-computation of total settlement and time rate of settlement.

MODULE V: Shear Strength of Soils

Importance of shear strength – Mohr's– Coulomb Failure theories – Types of Laboratory tests for Shear Strength Parameters– strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – Critical Void Ratio – Liquefaction- shear strength of clays.

TEST BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi. 6th Edition,2014
2. Principals of Geotechnical Engineering by Braja M.Das, Cengag e Learning Publishers, 7th Edition,2014
3. Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering by VNS Murthy, Taylor & Francis Group,13thEdition,2015

REFERENCES:

1. Geotechnical Engineering by C. Venkataramiah, New age InternationalPvt. Ltd, 7th Edition, 2013.
2. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi, 12th Edition,2013.
3. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi., 12thEdition,2012
4. Soil Mechanics and Foundation by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi,13th Edition,2015

E RESOURCES

1. http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf
2. http://www.alljntuworld.in/wp-content/uploads/2015/12/GTE-Lecture-Notes.pdf
3. http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf
4. http://www.nptel.ac.in/courses/105105105/
5. http://www.nptel.ac.in/courses/105105104/

Course Outcomes:

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

1. Gain a general understanding on the nature of soil and the classification and evaluation of engineering properties of soil.
2. Recognize the Permeability characteristics of soils and Seepage through Soils
3. Compute the vertical stress at any depth by deferent methods and also understands the compaction characters.
4. Understand the stress distribution and settlement characteristics of soil when it is subjected to the application of external loads.
5. Evaluate the shear strength characteristics of soil.

CO-PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	3	1	1	3	1	1	2	1	3	2		
CO2	2	2	3	3	1	1	3	1		2	1	3		1	
CO3	3	3	3	3	1	2	2	3	2	2	1	1	3	2	
CO4	2	3	3	3	1	1	3	3	2	2	3	3	3	2	
CO5	3	2	3	3	1	2	3	3		2	3	3	3	2	

20-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0119	DISASTER MANAGEMENT & MITIGATION (PROFESSIONAL ELECTIVE)	L	T	P
Credits: 3		3	-	-

Prerequisite: NIL

Course Objectives: This course provides the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences along with International Strategy for Disaster Reduction. It also has the potential to make the student design and implement disaster mitigation measures.

MODULE I:

Concept of Hazards and Disasters Environmental Hazards & Disasters: Concept of Environmental Hazards, Environmental Stress & Environmental Disasters. Different Approaches & relation with human Ecology – Landscape, Ecosystem and Perception Approach - Human Ecology & its application in geographical researches.

Types of Environmental Hazards & Disasters: Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra-Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards.

MODULE II:

Classification of Hazards Endogenous Hazards Volcanoes: Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes – Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions. Earthquake Hazards/ Disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake. Landslides: causes and impacts. Avalanches -causes and impacts.

Exogenous Hazards Infrequent events: Cyclones – Lightning – Hailstorms, Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation), Cumulative atmospheric hazards/ disasters : Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards in India- Flood control measures [Human adjustment, perception & mitigation], Droughts: Impacts of droughts- Drought hazards in India- Drought control measures, Extra Planetary Hazards/ Disasters-Man induced Hazards /Disasters- Physical hazards/ Disasters- Soil Erosion Soil Erosion: Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical hazards/ disasters: Release of toxic chemicals, nuclear explosion- Sedimentation processes, Sedimentation processes: Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation, Biological hazards/ disasters: Population Explosion.

MODULE III:

Approaches and Measures in Disaster Management

A: Emerging Approaches Three Stages: Pre-disaster stage (preparedness), Emergency Stage, Post Disaster stage (Rehabilitation)

B: Natural Disaster Reduction & Management Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

MODULE IV: Disaster Management

An integrated approach for disaster preparedness, mitigation & awareness. Mitigation-Institutions- discuss the work of following Institution.

a. Meteorological Observatory
b. Seismological Observatory
c. Volcanological Institution
d. Hydrology Laboratory
e. Industrial Safety Inspectorate
f. Institution of Urban & Regional Planners
g. Chambers of Architects
h. Engineering Council
i. National Standards Committee

Integrated Planning- Contingency Management Preparedness –

a] Education on disasters b] Community involvement

c] The adjustment of Human Population to Natural Hazards & Disasters Role of Media

Monitoring Management- Discuss the programme of disaster research & mitigation of disaster of following organizations.

a] International Council for Scientific Unions [ICSU]- Scientific Committee on Problems of the Environment [SCOPE], International Geosphere- Biosphere programme [IGBP]

b] World Federation of Engineering Organizations [WFED]

c] National Academy of Sciences

d] World Meteorological Organizations [WMO]

e] Geographical Information System [GIS]

f] International Association of Seismology & Physics of Earth's Interior [IASPEI]

g] Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

MODULE V: Disaster Management in India

A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India

Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters-Role of Panchayats in Disaster mitigations **C:** Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & Training.

TEXT BOOKS:

1. Jagbir Singh, "Disaster Management–Future Challenges and Opportunities", I. K. International Publishing House, 1st Edition, 2005.
2. Coppala P Damon, **"**Introduction to International Disaster Management"**,** ABD Publishers**,** 2007**.**

REFERENCES:

1. R.B.Singh [Ed], "Environmental Geography", Heritage Publishers, New Delhi, 1st Edition, 1990.
2. Kates,B.I & White. G.F, "The Environment as Hazards", oxford publishers, 5th Edition, New York, 1978.
3. R.B. Singh [Ed] – Disaster Management, Rawat Publication, New Delhi, 1st Edition, 2000.

E RESOURCES:

1. http://www.wcpt.org/disaster-management/what-is-disaster-management.
2. http://study.com/academy/lesson/what-are-cyclones-types-causes-effects.html.

Course Outcomes:

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

1. Analyze, evaluate and manage the environmental, social, cultural, economical, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
2. Assess the different public health aspects at local and global levels as a result of Disaster and can plan well to mitigate them.
3. Gain knowledge in various emerging approaches and measure in disaster management.
4. Understand the role of disaster management through Meteorological Observatory, Seismological Observatory, Volcanological Institution, etc.,
5. Acquire the information about Disaster Management, Ecological planning and sustainable development and Environmental policies, Disaster Reduction programs in India.

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

COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				2	3	2	3	2	2				
CO2	3	2				2	3	2	3	2	2				
CO3	3	2				2	3	2	3	2	2				
CO4	3	2				2	3	2	3	2	2				
CO5	3	2				2	3	2	3	2	2				

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0122	IRRIGATION STRUCTURES AND WATER POWER ENGINEERING	L	T	P
Credits:3		3	-	-

Prerequisites: Foundation Engineering, Hydraulics & Hydraulic machinery, Engineering Geology, Water resources engineering.

Course Objective: Design of multi-purpose water retaining structures, to develop skills in the mathematical modeling of both natural and engineered water resource systems that are used to analyze system components.

MODULE I: Gravity Dams

Definition of Dam, Types of Dams, Introduction to Gravity Dam, Forces acting on a gravity dam, causes of failure of a gravity dam. Elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

MODULE II: Earth Dams and Spillways

Earth Dams: Introduction to Earth dams, Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam- graphical method, measures for control of seepage

Spillways: Introduction and significance of Spillways, Types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins - USBR and Indian types of Stilling Basins. Significance of Jump Height Curve and Tail Water Rating Curve.

MODULE III: Diversion Head Works and Weirs on Permeable Foundations

A: Diversion Head Works: Introduction to Diversion works, Types of Diversion head works- weirs and barrages, layout of diversion head work, Components. Silt Ejectors and Silt Excluders, Causes and failure of Weirs and Barrages on permeable foundations.

B: Weirs on Permeable Foundations: Creep Theories, Bligh‘s, Lane‘s and Khosla‘s theories, Determination of uplift pressure various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles.

MODULE IV: Canal Falls, Cross Drainage Works

Canal Falls: Definition of canal fall/drop, Types of falls and their location, Design principles of Notch Fall and Sarda type fall. Canal regulation works, design principles of distributory and head regulators, Canal Cross Regulators, canal outlets, types of canal modules, proportionality, sensitivity and flexibility.

Cross Drainage Works: Introduction and significance of cross drainage works, Types, selection of site, Design principles of aqueduct, siphon aqueduct and super passage. Design of Type II Aqueduct (Under Tunnel)

MODULE V: **Water Power Engineering**

Development of hydro power in India, assessment of available power, Utilization factor, load factor, diversity factor, storage and pondage, types of hydro power schemes, Components of hydel schemes – fore bay, intake structure, trash rack water hammer, surge tanks, substructure and super structure of power house .

TEST BOOKS:

1. S.K. Garg, "**Irrigation Engineering and Hydrology Structures**", Khanna Publishers, Delhi, 23rd Edition, 2009.
2. K.R.Arora, "**Irrigation, Water Power and Water Resources Engineering**" 3rd Edition, Standard Publishers Distributors, 2010.

REFERENCES:

1. P.N.Modi, "Irrigation, Water Resources and Water Power Engineering", Standard Book House, Delhi-6, 6th Edition 2004.
2. B.C. Punmia and Pande B.B.Lal "Irrigation and Water Power Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 18th Edition, 2006.
3. R.S.Varshney, S.C. Gupta, and R.L. Gupta, "Theory & Design of Irrigation Structures" Vol.II, Nem Chand & Bros., Roorkee, 6th Edition, 1993.
4. S. K. Garg, "Water Supply Engineering: "Environmental Engineering"
5. Vol.I Khanna Publications, 2010, New Delhi.

E RESOURCES:

1. http://nptel.tvm.ernet.in/Syllabus.php?syl=Civil_Eng/WaterResEngg.php&sub=civil&semSemester%207.
2. http://ww.slb.com›...›WaterServices›WaterResources›Engineering.
3. http://Hyd.uod.ac/material/CE404_02_Seepage_Theories.pdf.

Course Outcomes:

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

1. Understand the need and mode of irrigation by designing the gravity dams and ability to handle and plan any type of irrigation project.
2. Design hydraulic structures such as earth dams and spillways and water flow controlling and management devices.
3. Gain knowledge about creep theories and design of structures on permeable foundations and their management.
4. Understand Design of man-made water carrying structures and their regulatory works.
5. Acquire knowledge about hydel power.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	-	-	-	-	2	3	
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	
CO3	3	2	3	3	-	-	-	-	-	-	-	-	2	3	
CO4	3	3	3	2	-	-	-	-	-	-	-	-	3	3	
CO5	3	2	2	-	-	-	-	-	-	-	-	-	3	3	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:A0123	WATER RESOURCE SYSTEM ANALYSIS	L	T	P
Credits: 3		3	-	-

Pre Requisites: Fluid mechanics, Hydraulics & Hydraulic machinery, water resources engineering.

Course Objective: To apply an appropriate system approach to optimally operate and design water resources system. The water resources planning and management by the concept of mathematical approaches such as optimization and simulation.

MODULE I: System Concepts [10 Periods]
Definition, classification, and characteristics of systems - Scope and steps in systems engineering - Need for systems approach to water resources and irrigation.

MODULE II: Linear Programming and Application [10 Periods]
Linear Programming: Introduction to Operations research - Linear programming, problem formulation, graphical solution, solution by simplex method - Sensitivity analysis. **Application:** To design and operation of reservoir, single and multipurpose development plans - Case studies.

MODULE III: Dynamic Programming and Application [10 Periods]
A: Dynamic Programming: Bellman's optimality criteria, problem formulation and solutions
B: Application: To design and operation of reservoirs, Single and multipurpose reservoir development plans – Case studies.

MODULE IV: Simulation [09 Periods]
Basic principles and concepts - Random variant and random process - Monte Carlo techniques, Model development - Inputs and outputs - Single and multipurpose reservoir simulation models - Case studies.

MODULE V: Advanced Optimization Techniques [09 Periods]
Integer and parametric linear programming - Goal programming models with applications discrete differential dynamic programming and incremental dynamic programming Linear decision rule models with application - Stochastic dynamic programming models.

TEXT BOOKS:
1. Vedula & Mujumdar "**Water Resources System Modelling Techniques and analysis",** Tata Mc.Graw Hill Company Ltd. 5th reprint, New Delhi, 2010.
2. James & Lee **"Water Resources Economics"**, Oxford Publishers, 1st Edition, 2005.

REFERENCES:
1. Hiller F.S and Liebermann G.J., "**Operations Research",** CBS Publications and distributions. New Delhi, 10th Edition, 2015.
2. Chaturvedi. M.C., "**Water Resources Systems Planning and Management"**. Tata McGraw Hill, New Delhi, 1st Edition, 1997.

3. Mays L.W., and Tung YK, "**Hydro systems Engineering and Management"**. McGraw Hill Inc., New York, 1st Edition, 2002.
4. Goodman Alvin S., "**Principles of Water Resources Planning",** Prentice Hall Inc., Englewood Cliffs, New Jersey, 1st Edition, 1995.

E RESOURCES:

*1. http://*www.elsevier.com/.../analysis...water-resource-systems/.../978-0-444-989.
2. http://www.eolss.net/Sample-Chapters/C07/E2-16-03-01.pdf.
3. http://www.sciencedirect.com/sience/book/.

Course Outcomes:

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

1. Understand the fundamentals and need for systems approaches in water resources management.
2. Design and solve optimization models of water systems and students can able to conduct model-based analysis of integrated water resource systems.
3. Understand criteria, problem formulation and solution with design aspects along with dynamic programming.
4. Gains knowledge in optimization and simulation modeling and applications of water resources problems.
5. Design and solve optimization models and to conduct model-based analysis of integrated water resources system.

CO-PO
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	1	1			1	2	2	2	1	2
CO2	2	2	3	3	1	2	2				3	2	3	2	2
CO3	3	3	3	3	1	1	2					1	3		1
CO4	3	3	2	3	3		2					1	3	1	2
CO5	3	3	3	3	2	2	3	1		1		1	3		1

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:A0124	ADVANCED FLUID MECHANICS	L	T	P
Credits: 3		3	-	-

Pre Requisites: Fluid Mechanics

Course Objective: To introduce students to concepts of fluid mechanics from both theoretical and applications perspective.

UNIT I INTRODUCTION & BACKGROUND

Continuum hypothesis, fluid properties, basic thermodynamic relations, perfect gas, scalars and vectors, cartesian tensors, Gauss's theorem, Stokes theorem. Lagrangian and Eulerian description, material derivative and stream function.

UNIT II CONSERVATION LAWS AND DIMENSIONAL ANALYSIS

Control volume concepts, Reynolds transport theorem, conservation of mass, momentum and energy, Navier-Stokes equation, non-dimensional parameters determined from differential equations, Buckingham's Pi theorem, similitude and model testing.

UNIT III IDEAL FLUID FLOW

Stream function and velocity potential, Laplace equation, application of complex variables, flow at a wall angle, source, sink, doublet, flow past Rankine half-body, flow past a circular cylinder with circulation, source near a wall, method of images, conformal mapping and applications.

UNIT IV REAL FLUID FLOW

Laminar flow, analogy between heat and vorticity diffusion, steady flow between parallel plates, steady flow between concentric cylinders, impulsively started plate, high and low Reynold's number flows, creeping flow around a sphere, Hele-Shaw flow. Boundary layers, Blasius solution, von-Karman momentum integral equation, boundary layer separation and control.

UNIT V INSTABILITY AND TURBULENCE

Method of normal modes, thermal instability, Kelvin-Helmholtz instability, Orr-Sommerfield equation, inviscid instability of parallel flows, turbulence, averages, correlations and spectra, averaged equation of motion, kinetic energy budget of mean flow, kinetic energy budget of turbulent flow, turbulence production and cascade, wall shear flows, eddy viscosity and mixing length hypothesis, turbulence closure.

Text book(s):

1. Kundu P.K. and Cohen I.M. "Fluid Mechanics" 2 nd edition Academic Press, Elsevier Science India 2002.
2. Schlichting H. and Gersten K. "Boundary Layer Theory", 8th edition. Springer-Verlag 2004, ISBN 81-8128-121-7
3. Yuan S.W. "Foundations of Fluid Mechanics" (SI unit edition) Prentice Hall of India 1970

Reference(s):

1. Vallentine H.R. "Applied Hydrodynamics" Butterworths London 1959
2. White F.M. "Viscous Fluid Flow", 3rd edition McGraw Hill, New York, ISBN:007124493X
3. Tennekes H. and Lumley J.L. A First Course in Turbulence MIT Press 1972 ISBN 0 262 20019 8

Course Outcomes

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

1. Apply the knowledge in addressing problems regarding open channels and possess skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
2. Know the importance of studies of hydraulic similitude and build highly representative models forvarious real time prototypes by considering Geometric, kinematic and dynamic similarities.
3. Gain knowledge on impact of jets on the vanes and application of this knowledge in representingvelocity triangles at inlet and outlets and radial flow turbines.
4. Learn about different types of turbines, their working and various engineering characteristics.
5. Learn about different types of pumps, their working and various engineering characteristics alongwith the basic concepts related to hydropower plant.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	-	-	-	-	-	-	-	2	2	
CO2	3	3	3	1	1	-	-	-	-	-	-	-	2	2	
CO3	3	3	2	1	1	-	-	-	-	-	-	-	3	2	
CO4	3	3	1	1	1	-	-	-	-	-	-	-	2	2	
CO5	3	3	1	1	1	-	-	-	-	-	-	-	3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0125	RIVER ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisites: Hydraulics & Hydraulic machinery, Engineering Geology, Water resources engineering.

Course Objective: To understand theoretical concepts of complex behavior of water and sediment movements in rivers. Knowledge on hydraulics of river and to understand the modeling of river hydraulics and river management skills.

MODULE I: River Functions
Introduction to River Functions: Primary function of a river – River uses and measures – Water and Sediment loads of river – Rivers in India, Himalaya and Peninsular.

MODULE II: River Hydraulics
A: Steady Flow in Rivers
Introduction to River hydraulics, Types of flows, Physical Properties and Equations: Steady flow in rivers, uniform and non uniform, Turbulence and velocity profiles, resistance coefficients and back waters.
B: Unsteady Flow in Rivers
Propagative of surface waves – Characteristics, flood waves – kinematic and diffusion analogy – velocity of propagation of flood waves – Maximum Flood wave.

MODULE III: River Mechanics and River Dynamics
A: River Mechanics: River Equilibrium: Stability of Channel, river bend equilibrium – hydraulic geometry of downstream, Bars and meandering
B: River Dynamics: Degradation and aggradations of river bed, Confluences and branches, River Data base.

MODULE IV: **River Surveys and Model**
Mapping, Stage and Discharge Measurements, Sediments, Bed and suspended load, Rigid and mobile bed, Mathematical, Finite one dimensional, Water Quality and ecological model.

MODULE V: **River Management**
River training works and river regulation works, Floodplain management, waves and tides in Estuaries, Interlinking of rivers, River Stabilization.

TEXT BOOKS:

1. Janson PL.Ph., Lvan BendegamJvanden Berg, Mdevries A. Zanen [Eds], "**Principles of River Engineering – The non tidal alluvial rivers"** Pitman, 1st Edition, 1994.
2. P. Jaya Rami Reddy, "**Hydrology**", Laximi Publications, New Delhi, 12th Edition, 2004.

REFERENCES:

1. Warren Viessman, et al., "**Introduction to hydrology**", Thomas Y.Crowell, New York, 5th

Edition, 2002.
2. Ven Te chow [eds], "**Handbook of applied hydrology**", McGraw Hill Book company, 1st Edition, 1964.
3. Subramanya K., "**Hydrology**", Tata McGraw Hill Co., New Delhi, 1st Edition, 1994.
4. Patra.K.C, "**Hydrology and Water Resources Engineering**", Narosa Publications, 2nd Edition, New Delhi 2008.

E RESOURCES:

1. http://www.iihr.uiowa.edu/riverflow2016/.
2. http://www.rivergauges.com/.

Course Outcomes:

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

1. Recognize the complex behavior of rivers.
2. Gain the skills to take up research activities in river engineering.
3. Gain knowledge in river mechanics and dynamics.
4. Understand the significance of River survey and model
5. Developing the skill of River management.

CO-PO Mapping (3/2/1indicates strength of correlation)3-Strong,2-Medium,1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3		1		1	2	1					3	3		
CO2	2	3	2	3	1	3	3	2	3	2		3	2		
CO3	3	3	2	3	2	2	3	1	3	3		3	2		
CO4	3	2	2	1	2	1	3		2	2		3	2		
CO5	2	1	1			1	3	3	2	2		3	2		

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0126	CONSTRUCTION PROJECT MANAGEMENT (PROFESSIONAL ELECTIVE)	L	T	P
Credits:3		3	-	-

Pre requisite: BMCP

Course Objective: To understand the principles of management, safety measures, labour welfare measures and the planning tools of CPM, PERT, etc.

MODULE I: Principles of Management

Definition - Importance – Functions of Management - Relevance to government and Quasi Government departments - Private Contractors - Contracting firms - Organizational structure. Construction safety measures

MODULE II: Construction Planning and Labour Welfare

Collection of field data - Preliminary estimates - Approval and sanction of estimates - Budget provisions - Relationships between management and labour - Problems - Labour legislations - Minimum Wages act - Industrial Psychology - Safety procedures in construction.

MODULE III: PROJECTS & NETWORK

A: Project Tendering - Arbitration - International projects - Detailed Project Reports (DPR) / Build Own Operate (BOO) / Build Own Operate Transfer (BOOT) Projects / Build Operate and Transfer (BOT)

B: Network: Introduction - Event - Activity - Dummy - Network rules - Graphical guidelines for network - Common partial situations in network - Numbering the events - Cycles Problems - Planning for network construction - Modes of network construction - Work breakdown structure Hierarchies.

MODULE IV: CPM

Introduction - Slack - Critical Path - Example problem - Activity time estimate - Earliest event time - Latest allowable occurrence time - Combined tabular computations for TE and TL - Start and finish time of activity - Float - Critical activity and Critical path - Problems.

MODULE V: PERT

Introduction - Use of PERT - Time estimate - Frequency distribution - Mean, Variance and standard deviation - Probability distribution - Expected time problem - Example problems.

TEXT BOOKS:

1. Chitkara, K. K "Construction Project Management Plan, Se (English) 2nd Edition, Tata Mcgraw Hill Education Private Limited, 2010.
2. Sharma, J. L, "Construction Management and accounts" Satya Publications, 2013.

REFERENCE BOOKS:

1. Prasad, L.M "Principles of Management", Sultan Chand & sons, New Delhi, 2012.
2. Stephen Robbins, "Organizational Behavior", Pearson Education, New Delhi, 2011.

E-RESOURCES:

1. https://www.coursera.org/learn/construction-project-management

2. https://hbr.org/1963/09/the-abcs-of-the-critical-path-method
3. https://www.wrike.com/blog/critical-path-is-easy-as-123/
4. https://www.tutorialspoint.com/management_concepts/critical_path_method.htm
5. https://acqnotes.com/acqnote/tasks/pert-analysis#:~:text=Program%20Evaluation%20and%20Review%20Technique,time%20to%20complete%20a%20project.
6. https://en.wikipedia.org/wiki/Program_evaluation_and_review_technique

COURSE OUTCOME:

Upon completion of this course, the student will able to

1. Explain the principles of management and construction safety measures.
2. Discuss the behavioral aspects of projects in terms of project manager and choose the Labour Welfare measures.
3. Explain the case studies of International projects, select project management practices to meet the needs of stakeholders and construct network diagram for activities involved in the construction project.
4. Compute critical path and floats for a given network diagram using CPM Method.
5. Analyze the uncertainties in the project network using PERT method.

CO-PO Mapping
(3/2/1indicates strength of correlation)3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			3	2				2	3		1		
CO2	2	1			3	3		2	3	1	3	2	3		
CO3	2	1	2		3	3		3	3	3	3	3	3	3	
CO4	3	3	3	3	3			3	3		3	3	3	3	
CO5	3	3	3	3	3			3	3			3	3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0127	URBAN PLANNING (PROFESSIONAL ELECTIVE)	L	T	P
Credits:3		3	-	-

Pre-requisite: NIL

Course Objective:

To introduce the various steps involved in Urban Planning, house development schemes, managing to different infrastructure facilities in the city, importance of public transport and protecting the environment and natural resources.

MODULE I: INTRODUCTION

Definitions and Objectives of Planning - Examples of planned and unplanned cities - Retrofitting medieval towns and existing cities - Healthy city planning.

MODULE II: BASIC PLANNING METHODS

Base map preparation - survey techniques - Analytical methods - region classification - Demographic methods - population forecasting.

MODULE III: Housing Development & INFRASTRUCTURE

A: Housing Development: Policies and schemes - Housing typologies - Housing for the poor and elderly - Housing finance options –under privileged population management.

B: Infrastructure: Planning and management of local streets, water supply, storm water drainage, municipal solidwaste management systems- New possibilities for recycling.

MODULE IV: Transport And Mobility

Costs of congestion - Public and Para-transit modes (taxis and autos) - Feeder systems for the use of public transport - Non-motorized transport facilities - cycling and walking infrastructure – Integrated public transport

MODULE V: SMART CITIES

Smart city developments across the world - Specific priorities for Smart Cities in India – Leveraging recent technologies in enhancing urban living: internet of things (IoT) - Recreation –Renewable energy - Green corridors, green space and green buildings - Safety and security of urban population.

Text Book:

1. Peter Hall, Mark Tewdwr-Jones, Urban and Regional Planning. Taylor & Francis, (2010)
2. S.C.Rangwala, B.Dalal, Town Planning, Charotor Publishing House, 28th Edition. (2015).

Reference Books:

1. Peter Hall, Cities of Tomorrow: An Intellectual History of Urban Planning and Design Since1880. 4th Edition, Wiley-Blackwell, (2014).
2. Randall Crane and Rachel Weber, The Oxford Handbook of Urban Planning. Oxford University Press, (2012).
3. Ian Bracken, Urban Planning Methods: Research and Policy Analysis. Routledge, Taylor &Francis, (2009).

4. Joy Sen., Sustainable Urban Planning. The Energy and Resources Institute, New Delhi,India, (2013).

E-Resources:

1. http://www.faadooengineers.com/online-study/post/ce/principals-of-town-planning-and-architecture/1544/introduction-and-principles-of-town-planning
2. https://mohua.gov.in/cms/smart-cities.php#:~:text=The%20Government%20of%20India%20has,Mission%20on%2025%20June%202015.&text=The%20objective%20is%20to%20promote,application%20of%20'Smart'%20Solutions.
3. https://smartcities.gov.in/

Course Outcomes:

Upon completion of this course, the student will be able to

1. Describe the importance of proper urban planning for a healthy city.
2. Explain the steps involved in planning of a city.
3. Describe housing development schemes and Plan and manage different infrastructure facilities in a city.
4. Design public transport and non-motorized transport facilities for a city.
5. Describe smart city developments in India and abroad and its various elements.

CO-PO Mapping (3/2/1indicates strength of correlation)3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3			1		3	3		1		2	2	2		
CO2	3			2		3	3	2	1	2	2	2	2	3	
CO3	3			2		3	3	2	1	2	2	2	2	3	
CO4	3			2		3	3	2	1	2	2	2	2	3	
CO5	3			2		3	3	2	1	2	2	2	2		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0128	ARCHITECTURE AND TOWN PLANNING (PROFESSIONAL ELECTIVE)	L	T	P
Credits:3		3	-	-

Pre-requisite : NIL

Course Objective: To learn the Architectural aspects and to understand the history of Romans, Greek, Indian Architecture and to improve communicative skills. Interpretation of idea through study, planning of workable efficiency of town and city.

MODULE I: Basics of Architecture

Principles of architectural composition – unity, balance, proportion, scale, contrast, harmony, accentuation, restraint, definition, repose, vitality, strength - with the help of illustrations of buildings. Use of different materials - Styles in architecture - Anthropometrics, furniture layout - circulation - lighting and ventilation for spaces.

MODULE II: Architecture in Timeline

Understanding the construction methods and materials through study of Egyptian, Greek, Roman, European, Indian Architectural History - Modern Architecture - Contemporary Architectural Practice.

MODULE III: Interior Design in Buildings and Town Planning

A: Interior Planning and treatment – Use of natural and synthetic building materials – Thermal and Acoustical materials – Furniture and Fittings.

B: Town Planning : Human Settlements - Planned and organic - typologies of cities like Capital, Port, Rural etc- Elements of human settlements.

MODULE IV: Town Planning Principles

Planning ideologies – Importance of Climate topography, drainage and water supply in the selection of site for the development – Residential – Commercial – Industrial – Public – Transportation, Utility and services – Agriculture.

MODULE V: Environment And Public Health

Environmental Quality - Sanitation - Physical and mental health challenges in urban and sub-urban areas - Vulnerable population - Conserving natural resources

Text Books:

1. De Charia & Callender, Architecture, Mc. Graw Hill, (2012)
2. Praavin R.Minde, Rajani Deshmukh, Architecture and Town Planning, Nirali Prakashan (2018).
3. S.C.Rangwala, B.Dalal, Town Planning, Charotor Publishing House, 28th Edition. (2015).

Reference Books:

1. Gallion, Urban pattern City planning and design, Charotar Publishing House, (2010).
2. Modak & Ambedkar, Town and Country Planning and Housing, (2001).

E-Resources:

1. https://en.wikipedia.org/wiki/History_of_architecture

2. https://www.britannica.com/topic/architecture/Theory-of-architecture
3. https://en.wikipedia.org/wiki/Interior_design
4. http://www.architecture-student.com/architecture/principles-of-town-planning/
5. http://www.faadooengineers.com/online-study/post/ce/principals-of-town-planning-and-architecture/1544/introduction-and-principles-of-town-planning

Course Outcome:

Upon completion of this course, the student will be able to

1. Understand the creative process to improve the user-friendly experience in space.
2. Improve communicative skills and emotional strength in presenting ideas
3. Get knowledge on interior design and to comprehend the past, follows present, ascendance the future.
4. Interpretation of idea through study and planning of workable efficiency of town and city.
5. Describe the importance of environment and natural resources in urban planning

CO-PO Mapping (3/2/1indicates strength of correlation)3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3			1		3	3		1		2	2	2		
CO2	3			2		3	3	2	1	2	2	2	2	3	
CO3	3			2		3	3	2	1	2	2	2	2	3	
CO4	3			2		3	3	2	1	2	2	2	2	3	
CO5	3			2		3	3	2	1	2	2	2	2		

2020-21 Onwards MR20	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:A0129	ENERGY EFFICIENT ARCHITECTURE	L	T	P
Credits: 3		3	1	-

OBJECTIVES:

• To inform the need to use alternative sources of energy in view of the depleting resources and climate change.

• To familiarise the students with simple and passive design considerations

• To inform about the importance of day lighting and natural ventilation in building design

Module 1 : Passive Design

Significance of Energy Efficiency on the contemporary context, Simple passive design considerations involving site conditions, building orientation, Plan form and building envelope – Heat transfer and Thermal Performance of walls and Roofs.

Module II: Advanced passive Architecture-Passive Heating

Direct Gain Thermal Storage of wall and Roof – Roof Radiation Trap- Solarium – Isolated Gain

Module III: Passive Cooling

A: Evoporative cooling – Nocturnal radiation cooling – Passive desiccant cooling
B: Induced Ventilation – Earth Sheltering – Wind tower – Earth Air Tunnels.

Module IV: Day Light and Natural Ventilation

Daylight factor – Daylight Analysis – Daylight and shading Devices – Types of Ventilation – Ventilation and Building Design.

Module V: Contemporary and Future Trends

Areas for innovation in improving energy efficiency such as photo voltaic cells, battery technology, thermal energy storage, recycled and reusable building materials, nano technology, smart materials and the future of built environment, energy conservation building code.

Text Books:

1. Manual on Solar Passive Architecture, IIT Mumbai and Mines, New Delhi, 1999.
2. Aravind Krishnan & Others, "Climate Responsive Architecture" A Design handbook for Energy Efficient Buildings, Tata McGraw Hill Publishing Company Limited, New Delhi, 2001.

Reference Book:

1. Majumdar M, "Energy Efficient Buildings in India" TERI Press, 2000
2. Givoni.B, "Passive and Low Energy Cooling of Buildings", Van Nostrand Reinhold, New York, 1994.

Course Outcome:

Upon completion of this course, the student will be able to

1. Understand the concept of passive energy efficiency.
2. Understand the ideas of thermal storage from roof.
3. Get knowledge on passive cooling and ventilation
4. Understand the ideas of Day Light and natural Ventilation.
5. Understand the knowledge on recyclable building materials.

CO-PO Mapping (3/2/1indicates strength of correlation)3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3			1		3	3		1		2	2	2		
CO2	3			2		3	3	2	1	2	2	2	2	3	
CO3	3			2		3	3	2	1	2	2	2	2	3	
CO4	3			2		3	3	2	1	2	2	2	2	3	
CO5	3			2		3	3	2	1	2	2	2	2		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:A0132	SOLID AND HAZARDOUS WASTE MANAGEMENT (PROFESSIONAL ELECTIVE)	L	T	P
Credits: 3		3	-	-

Pre-requisites: Environmental Studies

Course Objectives:

The main objective of this course is to provide in-depth knowledge about handling of solid waste from cradle to grave. It also provides the knowledge of designing and constructing the solid waste treatment systems.

MODULE I: Introduction to Municipal Solid Waste

Definition -Sources and Impacts of solid waste on environment, Classification of solid waste-composition and its determinants of Solid waste - factors influencing generation-quantity assessment of solid wastes.

MODULE II: Integrated Solid Waste Management

Collection: Collection of Solid waste, equipment's, time and frequency of collection, factors affecting collection, analysis of collection system, collection routes.

Transfer and Transport: Need for transfer operation, transfer stations –types –transport means and methods – location of transport stations Transfer stations & design requirements.

MODULE III: Hazardous Waste Management

A: Introduction to Hazardous Waste

Definition, Identification, Characteristics and Classification, Sources, Collection and Transport.

B: Hazardous waste Treatment

Physical & chemical Treatment: Solidification and Stabilization, Thermal: Incineration, Pyrolysis, Biological: Aerobic, Anaerobic and Biochemical. Deep Well disposal, Ocean barging and secured landfills.

MODULE IV: Waste to Energy options

Introduction- Five WtE Technologies, Composting, principles of composting, factors affecting composting, vermi composting, Landfill technique, and design and operating procedure of landfill. Incineration, pyrolysis, plasma arc pyrolysis.

MODULE V: Solid & Hazardous Waste Management Legislations

Solid waste management Hierarchy, waste avoidance /waste prevention, Definition of source Reduction, waste reduction at source using 5R's Technique, Solid and Hazardous waste management rules and regulations.

TESTBOOKS:

1. Jimmy Alexander Faria Albanese, M.Pilar Ruiz, **"Solid Waste as a Renewable Resource: Methodologies"**, Apple Academic Press, 1st edition, 2015.
2. Sunil Kumar, "**Municipal Solid Waste Management in Developing Countries",** CRC Press,1st edition, 2016.

REFERENCE BOOKS:

1. P. Jayarama Reddy, **"Municipal Solid Waste Management: Processing -Energy Recovery- Global Examples",**CRC Press - BS Publications 1st edition,2015.
2. Elena Cristina Rada, "**Solid Waste Management: Policy and Planning for a Sustainable Society",**Apple Academic Press,1st edition, 2016.
3. SyedaAzeemUnnisa,S.Bhupatthi Rav,"**Sustainable Solid Waste Management",** Apple Academic Press,1st edition,2012.

E RESOURCES

1. http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf
2. http://www.slideshare.net/ebchandar/solid-waste-management-5942441
3. http://www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.pdf

Course Outcomes:

After completion of this course, students will be able to:

1. Understands the classification, composition and characterization of solid wastes, assesses their quantity and methods of sampling and characterization.
2. Applies the solid waste collection and transport method sand designs them as per requirements.
3. Understands the classification, characteristics, collection, transport and treatment methods of Hazardous wastes.
4. Applies theWaste to Energy technologies, for design and operation of land fills and for waste disposal.
5. Understands solid waste management techniques, Legislations, Rules and Regulations.

CO-PO Mapping
(3/2/1 Indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	2	2	1	1	2	1	1	2	2	2
CO2	2	2	3	1	1	2	3	2	2	2	2	0	2	1	3
CO3	3	0	3	3	2	2	3	1	2	2	1	0	3	3	3
CO4	3	2	2	2	2	2	3	2	2	2	2	0	2	2	2
CO5	1	1	2	1	0	2	2	2	1	2	2	2	0	1	0

20-21 Onwards (MR 20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. V Semester		
Code:A0H03	ENGLISH COMMUNICATION AND PRESENTATION SKILLS LAB	L	T	P
Credits: 1	(Common for CE, ME and Min.E.)	-	-	2

Course Objective:
The learners need to be aware of the characteristics of technical communication in their workplaces; as a result, they are exposed to different channels of technical communication. Hence the acquired skills make the learners effective communicators using persuasive language. Besides the above said, one of the major objectives is to maintain objectivity in writing documents and to produce professional quality documents using different components of the language.

Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

MODULE – I: Oral Presentations
Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations– Nuances of Presentation.
*This particular MODULE is for internal evaluation purpose(s).

MODULE – II: E - Correspondence and Social Media Etiquette
Common web mail services, yahoo, gmail etc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock , Highlight, The 'KISS' strategy (Keep It Simple and Short,)Points to remember while signing off, Introduction to Technical Vocabulary, Cultural Differences

- This MODULE is purely for internal assessment/evaluation

MODULE – III: Group Discussion
Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Non verbal communication -eye contact, voice characters, posture, gestures, do's and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

MODULE – IV: Interview Skills & Office Etiquette
Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do's and don'ts, greetings and meetings, speaking to seniors and handshakes, offering and taking

visiting cards, Asking questions and Seeking Clarifications.

MODULE – V: Career Progression

Job Hunt Process-SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume', types of resume's -electronic, video and printed resume's

- Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

REFERENCE BOOKS:

1. Chrissie: **Handbook of Practical Communication Skills**: Jaico Publishing house, 1999.
2. Daniels, Aubrey: **Bringing Out the Best in People**: Tata McGraw-Hill: New York, 2003.
3. Wright, Goulstone, Mark: **Just Listen: Discover the Secret to getting through to absolutely anything** : American Management Association, 2010.
4. Leslie. T. Giblin: **Skill with people** Publication details not known
5. Lewis, Norman: **Word Power Made Easy**: Goyal Publications: New Delhi, 2009.
6. Murthy, A.G, Krishna,: **Ten Much** : Tata McGraw-Hill :New Delhi, 2010.

E-RESOURCES:

1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

Course Outcomes:

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

1. Give Oral Presentations Confidently.
2. Draft appropriate Resume in accordance with the context.
3. Participate and present their view and ideas logically and confidently.
4. Understand the importance of communication in various settings.
5. Utilize the technology for career advancement.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					1					2		2		3	3
CO2										1		2		3	2
CO3		1		1						2		2		3	2
CO4					1	1			1	2		2		3	2
CO5				1	1				1	2		2		3	2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0120	GEOTECHNICAL ENGINEERING LAB	L	T	P
Credits: 1		-	-	2

Prerequisite: NIL

Course Objective: Students will gain familiarity with laboratory procedures for assessing the index and engineering properties of soil by conducting appropriate tests and interpretation of experimental results.

List of Experiments:

1. Specific gravity and Grain size analysis (Sieve analysis)
2. Atterberg's Limits (LL &PL)
3. Field density-core cutter and sand replacement method
4. Permeability of soil, constant and variable head test
5. Compaction test (Standard Proctor Test)
6. CBR Test
7. Determination of Coefficient of Consolidation (square root time fitting method)
8. Unconfined compression test
9. Direct shear test.
10. Vane shear test
11. Differential free swell index (DFSI) test.

Course Outcomes:

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

1. Understand the soil behavior and classify the soil sample
2. Determine analyses and assess the In-situ density.
3. Understand the engineering behavior of soil and assess the engineering properties with Index properties.
4. Calculate consolidation settlements and suggest foundation width and depth.
5. Understand the concept of shear behavior of soils.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		2	3		1	1			2	2		3	1
CO2	3	3	1	1	3								1	3	3
CO3	3	1	2		3	1	1	1	1		1	3		3	2
CO4	3		1	2	3						2	1	1	3	1
CO5	3	2	2	1	3	1	1		1		2	2	1	3	

20-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:A0121	STRUCTURAL ANALYSIS LAB	L	T	P
Credits: 1		-	-	2

Prerequisites: Structural Analysis-I & II
Course Objective: To impart knowledge on testing of beams, columns, trusses and frames.

List of Experiments:
1. Determination of Flexural Rigidity (EI) of a given beam.
2. Verification of Maxwell- Betti's Law.
3. Experiment on three hinged arch.
4. Experiment on two hinged arch.
5. Verification of moment area theorem for slope and deflection of a given beam.
6. Deflection of a statically determinate pin jointed truss.
7. Forces in members of redundant frames.
8. To find deflection of curved members.
9. Unsymmetrical bending of a cantilever beam.
10. Deflection of fixed beam and influence line for reactions.
11. Deflection studies for a continuous beam and influence line for reactions.
12. Study of behavior of columns and struts with different end conditions.

Course Outcomes:
At the end of the course, students will be able to
1. Understand the concept of Maxwell Theorem and its application.
2. Analyze two hinged and three hinged arches.
3. Analyze trusses and beams curved in plan.
4. Calculate the deflection of fixed and continuous beams due to various types of loading.
5. Study the behavior of columns and struts.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	3	2			3	3	1	3	3		
CO2	3	3	1	2	3	2			3	3	1	3	3		
CO3	3	3	1	2	3	2			3	3	1	3	3		
CO4	3	3	1	2	3	2			3	3	1	3	3		
CO5	3	3	1	2	3	2			3	3	1	3	3		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0H10	INDUSTRIAL MANAGEMENT (Common for CE, ME and Min.E.)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objective:

Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization and Industrial Management.

MODULE – I Introduction to Management

Introduction to Management: Entrepreneurship and organization, Concepts of Management, nature, importance and Functions of Management, Taylor's Scientific Management Theory, Systems Approach to Management, Fayol's Principles of Management, Mayo's Hawthorne Experiments.

Management Theories: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Leadership Styles, Corporate Social responsibility.

MODULE – II Organizational Structures and Types

A. Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization

B. Types of Organizations: Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

MODULE – III Operations Management

A. Operations Management: Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison.

B. Plant layout: Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

MODULE – IV Work Study and Statistical Quality Control

Work Study: Introduction, definition, objectives, steps in work study, Method study, definition, objectives, and steps of method study. Work Measurement, purpose, types of study, stop watch methods, steps, key rating, allowances, standard time calculations, work sampling.

Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), acceptance Sampling- Single sampling- Double sampling plans-OC curves, Deming's contribution to quality.

MODULE – V Project Management and contemporary practices

A. Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

B. Contemporary Management Practices: Basic concepts of ERP, Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma, Capability Maturity Model (CMM), Bench marking, Balanced Score card.

TEST BOOKS:

1. Aryasri: ***Management Science,*** 4th edition, TMH, 2004.(UNITS I,II,III,IV,V)
2. Stoner, Freeman, Gilbert, ***Management,*** **6th** Ed, Pearson Education, New Delhi, 2004. (UNITS I,II)

REFERENCE BOOKS*:*

1. Kotler Philip & Keller Kevin Lane, **"Marketing Management"**, PHI, 12th edition, 2005
2. Koontz & Weihrich, **"Essentials of Management"**, TMH, 6th edition, 2005.
3. Panneerselvam **" Production and Operations Management"** PHI,2012.
4. Memoria & S.V. Gauker, **"Personnel Management"**, Himalaya, 25th edition, 2005
5. Samuel C. Certo, **"Modern Management"**, PHI, 9th edition, 2005.

E RESOURCES:

1. http://www.learnerstv.com/Free-Management-Video-lectures-ltv656-age1.htm
2. http://www.learnerstv.com/Free-Management-Video-lectures-ltv728-age1.htm
3. http://freevideolectures.com/Course/2371/Project-and-Production-management

b) Concerned Journals/Magazines links

Journals: Journal of Management, Asia Pacific Journal of research in Business management Journal of Management Development, Journal of Management and Organization.

1. http://nptel.ac.in/courses/110106044/
2. https://www.youtube.com/watch?v=obzp6biyAN0

Course Outcomes:

They should be able to

1. Understand the various concepts, principles and theories of management.
2. Design the structure of an organization through understanding various structures of organizations.
3. Understand the basic concepts and processes of operations management.
4. Understand the concept of work study and Statistical Quality Control
5. Understand the basics of project management and also learns various contemporary management practices.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1									2	3	1				
CO2		3							2		1				
CO3		3								2	1				
CO4		3		2	1										
CO5				2			3				1				

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0133	STRUCTURAL ENGINEERING - II (STEEL)	L	T	P
Credits: 3		3	1	-

Prerequisite: Structural Analysis

Course Objective: To provide basic knowledge in the areas of limit state method and the concept of design of structural steel elements. Identify, formulate and solve engineering problems in steel structural elements subjected to tension, compression and flexure loads for steel elements such as beams, tension members, compression members, bolted and welded connections subjected to various load combinations.

MODULE I: Introduction and Connections

Introduction Materials – Making of iron and steel – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads and load combinations - local buckling behavior of steel. Concepts of limit State Design – Limit States of Strength/collapse – Limit state of Collapse serviceability.

Connections Types of connections- Bolted connections– IS – 800 – 2007 - specifications – Design strengths – efficiency of joint – prying action. Welded connections – Types of welded joints – specifications - Design strengths & requirements.

MODULE II: Tension Members

Design of tension members– Design strength – Design procedure of splice - lug angle.

MODULE III: Compression Members

A: Design of compression members – Buckling class – slenderness ratio / design strength – laced – battened columns

B: column splice – column bases.

MODULE IV: Beams

Design of Beams – Plastic moment – Bending and shear strength / buckling – Built-up sections – laterally supported beams. Design of eccentric connections in both bolted & welded–Design of bolted and welded beam connections– [Framed/un-stiffened / Stiffened seat connection].

MODULE V: Roof Truss

Design of roof trusses – Types of roof trusses, loads on trusses – Purlin design – Truss design.

TEST BOOKS:

1. S.K. Duggal , **"Limit State Design of steel structures",** Tata McGraw-Hill, 2nd Edition-2010
2. S.S. Bhavikatti , **"Design of steel structures",** IK international Publication House, New Delhi, 2nd Edition-2010.

REFERENCE BOOKS:

1. Edwin H. Gaylord, Jr. Charles N. Gaylord , **"Design of Steel Structures"** 3rd Edition 1991
2. Ramchandra, **"Design of Steel Structures" Vol. 1 & 2** –Standard Publications, 1st Edition1992

3. N. Subramanian, **"Design of steel structures"** –, Oxford University Press – 2nd Edition 2009.

REFERENCE CODES:

1. IS Code 800-2007
2. IS Code 875 Part 1-5
3. IS Code 808- Steel Tables

E RESOURCES:

1. http://elearning.vtu.ac.in/13/ENotes/DSS/MCN%2006CV72%20VTU%20notes.pdf
2. http://www.aboutcivil.org/steel-structure-lectures-class-notes.h
3. https://www.journals.elsevier.com/journal-of-constructional-steel-research
4. http://nptel.ac.in/courses/105106112/
5. http://nptel.ac.in/courses/105106113/

Course Outcomes:

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

1. Apply the basic requirements of the IS: 800-2007 design specifications for steel structural elements.
2. Analyze the behavior of bolted connections and welded connections and design them for both axial and eccentric forces
3. Design of steel members subjected to compression and tension members using simple and built-up sections
4. Design of Beams and Plate Girders subjected to Loadings.
5. Design of Roof Truss and its joints, end bearings.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	2	-	-	3	2	1	1	-	2		1	1	-
CO2	1	3	2	-	3	1	-	1	-	-	1	-	3	2	1
CO3	1	1	2	-	3	-	-	1	-	-	1	-	3	1	1
CO4	1	1	2	-	3	-	-	1	-	-	1	-	3	1	1
CO5	1	1	1	-	2	-	-	1	-	-	1	-	3	1	2

20-21 Onwards (MR-20)	MALLAREDDYENGINEERINGCOLLEGE (Autonomous)	B.Tech. VI Semester		
Code:A0134	ENVIRONMENTAL ENGINEERING	L	T	P
Credits:3		3	-	-

Prerequisite: Environmental Sciences

Course Objective: To create awareness inWater supply engineering, providing knowledge about the importance of potable water, treatment methods and the mode of distribution to the public. Explain about sewerage system, its appurtenances, treatment methods and disposal techniques with designs aspects.

MODULEI: Introduction and Sources of Water

Introduction: Water borne diseases, need for protected water supply, Population forecasting methods, design period, Water demand: Types of demand– factors affecting – fluctuations – fire demand in detail – storage capacity, water quality and testing, drinking water standards.

Unit operations and Processes: Basics of water quality standards – Physical, chemical and biological parameters; Water quality index; Unit processes and operations; Water requirement; Water distribution system; Drinking water treatment

MODULEII: Sedimentation and Filtration & Disinfection Sedimentation: Sedimentation: Types of sedimentation, principles, uniform settling velocity, design of sedimentation tank, Coagulation- flocculation Definition and principles, Types of coagulants, feeding arrangements. Optimum dosage of coagulant- Jar test

Filtration& Disinfection: Filtration theory/ Principles, Construction and working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation, comparison of filters, Disinfection – Types of disinfection - Theory of chlorination-chlorine demand, Residual chlorine test.

MODULE III: Distribution Systems and Joints and Valves

Distribution Systems: Distribution systems, Requirements, methods and Types oflayouts, Design aspects of distribution systems, Equivalent pipe methods and Hardy Cross method, Service reservoirs.

Joints and Valves: Types of Joints, Types of Valves such as sluice valves, airvalves, scour valves and check valves, water meters, laying and testing of pipelines.

MODULE IV: **Conservancy and Water Carriage System**

Definition of sewage, characteristics of sewage, Decomposition of sewage, cycles of decay examination of sewage – B.O.D, – C.O.D equations. Sewage and storm waterestimation – time of concentration – storm water overflows, combined flow, Sewersshapes and materials, Design of Sewer, Sewer appurtenances: Manholes – Invertedsiphon – Catch basins – Flushing tanks – Ejectors, pumps and pump houses, house drainage – components requirements, sanitary fittings-traps, one pipe and two pipes ystems of plumbing.

MODULE V: **Waste Water Effluent Treatment methods and disposal:**
Sewerage system design, primary and secondary treatment:
Lay out of Waste Water Effluent Treatment plant, Primary treatment: Types and classification of screens, grit chambers, skimming tanks, sedimentation tanks, principles and design of biological treatment: Trickling filters, standard, high rate Trickling filter and Activated sludge process. Septic tanks, working principles and design, soak pits, design of oxidation ponds. Reuse of treated sewage for different applications. Ultimate disposal of sewage, sewage farming dilution, Sludge digestion tanks–factors affecting–design of Digestion tank Sludge disposal; Sludge disposal by drying

TEST BOOKS:
1. G. S. Birdi "**Water supply and sanitary Engineeringy"**, Dhanpat Rai & Sons Publishers 2010.
2. Dr. **B. C.Punmia, Ashok Jain** & **Arun** Kumar **Jain**, "**Water Supply Engineering**", Vol. I "**Waste water Engineering**", Vol. II, Laxmi Publications Pvt. Ltd, New Delhi 2nd **Edition**2016.
3. **S. K. Garg, "Water Supply Engineering: Environmental Engineering"** Vol.I Khanna Publications, 2010, New Delhi.

REFERENCES:
1. **"Waterand Waste Water Technology"** by Metcalf and Eddy2004.
2. Mark J**.** Hammer**,** Sr**.**Mark J**.**Hammer **"Water and Wastewater Technology**", 6thEdition**,** HDR Engineering**,** Inc.©2008**;**
3. S. C. Rangwala**,** revised by K**.** S**.** Rangwala & P.S**.**Rangwala "**Water Supply** and **Sanitary Engineering**" 14thedition, 2014.

Course Outcomes
At the end of the course, students will be able to
1. Recognize the importance of protected water supply, water demand and water quality.
2. Acquire knowledge about different treatment methods.
3. Identify a source of water for water supply to a town or city with respect to quality and quantity of water through distribution system.
4. Understand the sources of sewerage, Estimation and design of sewers and its appurtenances.
5. Identify the techniques of disposal methods of waste water and sludge.

CO-PO-PSOMapping (3/2/1indicatesstrength ofcorrelation)3-Strong,2-Medium,1-Weak															
COS	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3
CO2	3	3	3	3	0	3	3	0	0	0	0	3	3	3	0
CO3	2	2	2	2	3	3	3	2	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:A0135	FOUNDATION ENGINEERING [Professional Elective-III]	L	T	P
Credits: 3		3	-	-

Prerequisite: Geotechnical Engineering

Course Objective: To understand the significance of investigation of soil in the field. To design retaining walls, analyze and predict the possible instability of slopes. Design of shallow foundations and deep foundations.

MODULE I: Soil Exploration
Need – Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Plate load test – Pressure meter – Planning of Programme and preparation of soil investigation report.

MODULE II: Slope Stability
Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.

MODULE III: Earth Pressure Theories and Retaining Walls
Earth Pressure Theories Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method.
Retaining Walls Types of retaining walls – stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill.

MODULE IV:
A: Shallow Foundations - Bearing Capacity Criteria Types - choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi, and IS Code Methods
B: Shallow Foundations - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

MODULE V: Pile Foundation
Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups- negative skin friction- Introduction to Well Foundations

TEST BOOKS:
1. Gopal Ranjan & ASR Rao. "**Basic and Applied Soil Mechanics**" by NewAge International Pvt. Ltd, revised 2nd edition, 2006.

2. VNS Murthy. "**Geotechnical Engineering: Principles and practices of soilmechanics and foundation Engineering"**- 7th Edition,2007.

REFERENCES:

1. Swami Saran, "**Analysis and Design of Substructures**" –Oxford and IBH Publishing company Pvt Ltd, 1st Edition,1998.
2. S. K.Gulhati & Manoj Datta "**Geotechnical Engineering**" Tata Mc.Graw Hill Publishing company New Delhi, 1st Edition,2005.
3. K.R. Arora, "**Soil Mechanics and Foundation Engineering**", Standard Publishers and Distributors, Delhi. 1st Edition,2000.
4. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "**Soil Mechanics and Foundation**" Laxmi publications Pvt. Ltd., New Delhi, 1st Edition,2000.
5. Das, B.M. **Principles of Foundation Engineering** –6th Edition [Indianedition]-2007

E RESOURCES

1. https://drive.google.com/file/d/0B5_-VqecjfqpdnN5c2huVk1JN1k/view
2. https://www.researchgate.net/journal/00380741_Soil_Mechanics_and_Foundation_Engineering
3. http://www.nptel.ac.in/courses/105105105/
4. http://www.nptel.ac.in/courses/105105104/

Course Outcomes:

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

1. understand the principles and methods of Geotechnical Exploration
2. Analyze the suitability of soils and check the stability of slopes
3. Evaluate the Lateral Earth Pressure and Analyze the Stability of Retaining Wall
4. Evaluate the Bearing Capacity & Settlements of Shallow Foundations.
5. Evaluate the Load Carrying Capacity & Settlement of Pile Foundation

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1		3	1	1	3	1		3	3	2	3	1	3
CO2	3	3	3	3	1	2	3	3		3	3	3	3	3	
CO3	3	2	3	3	2	1	1	3		3	3	3	3	2	2
CO4	3	2	3	3	1	3	3	3		3	3	3	3	1	
CO5	3	3	3	3	1	1	3			1			3		2

2020-22 Onwards (MR-20)	MALLAREDDYENGINEERINGCOLLEGE (Autonomous)	B.Tech. VI Semester		
Code:A0136	GROUND IMPROVEMENT TECHNIQUES [Professional Elective-III]	L	T	P
Credits:3		3	-	-

Prerequisite: Geotechnical Engineering and Foundation Engineering

Course Objective: Student is expected to identify basic deficiencies of various soil deposits. Student will be in a position to decide various ways and means of improving the soil and implementing techniques of improvement.

MODULEI:

Dewatering Objectives and techniques -Methods of de-watering- sumps and interceptor ditches- single, multistage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains-Design of dewatering system – criteria for selection of fill material around drains–Electro-osmosis – Electro –kinetic dewatering.

GroutingObjectivesofgrouting-groutsandtheirproperties-groutingmethodsascending, descending and stage grouting- hydraulic fracturing in soils and rocks post, grout test.

MODULEII:

In – Situ Densification Methods in Granular Soils Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth, blasting, vibro compaction, compaction piles.

In–Situ Densification Methods in Cohesive Soils Preloading or dewatering, Vertical drains – Sand Drains, Sand wick geo drains – Stone and lime columns –thermal methods.

MODULEIII: Geosynthetics and Geo environmental Application

A: Geosynthetics Description, properties, functions and applications of Geosynthetics

B: Geoenvironmental Application of Geosynthetics Geomembranes for landfills and ponds, Geosynthetic clay liner, designing with GCLs, Filtration, Erosion control, slope protection

MODULEIV: Reinforced Earth Principles

Components of reinforced earth–factors governing design of reinforced earth walls–design principles of reinforced earth walls, ground anchors, rock bolting and soil nailing.

MODULEV: Stabilization

Methods of stabilization-mechanical-cement- lime-bituminous chemical stabilization with calcium chloride, sodium silicate and gypsum. Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

TESTBOOKS:

1. Purushotham Raj. "**Ground Improvement Techniques**", Laxmi Publications,New Delhi,2nd Edition, 2016.
2. Nihar Ranjan Patra. **"Ground Improvement Techniques**", Vikas Publications 1st Edition, 2012.

REFERENCES:

1. Moseley M.P, "Ground Improvement", Blackie Academic and Professional, Boca Taton,Florida,USA.1st Edition,1993.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A "Ground Control and Improvement", John Wiley and Sons, New York, USA. 1stEdition,1993.
3. Robert M.Koerner, "Designing with Geosynthetics", Prentice Hall New Jercy, USA, 1stEdition, 1993.
4. Hausmann M.R., "Engineering Principles of Ground Modification", McGraw-Hill International, 1stEdition,1990

ERESOURCES

1. https://www.slideshare.net/SravanMuguda/ground-improvement-techniques
2. http://www.powershow.com/view/43702bZmRmZ/Ground_Improvement_Techniques For_Highways_powerpoint_ppt_presentation
3. https://www.smartzworld.com/downloads/download/gd-complete-chapter-pdf-notes/
4. https://forumfreak4.files.wordpress.com/2013/06/ground-improvement-techniques-by-purushothama-raj.pdf
5. http://nptel.ac.in/courses/105104034/lecture_pdf/lec1.pdf

Course Outcomes:

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

1. Understand various methods of dewatering and grouting.
2. Recognize and classify different In–Situ densification methods in granular and Cohesive Soils.
3. Apply Geoenvironmental application of geosynthetics.
4. Understand the design principles of reinforced earth.
5. Classify the methods of stabilization and apply them to different types of soils.

CO-PO-PSO Mapping
(3/2/1indicatesstrength of correlation)3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1		3	2	1	3	3	3	3	2	
CO2	2	2	3	3		2	3		2	3	2	3	3		
CO3	3	3	3	3			2	1		1	3	3			
CO4	2	1	3	3		1	2			1	3	1	1	1	
CO5	1	3	1	1	1	2	1		1	2	3	3	1		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0137	SOIL STRUCTURE INTERACTION [Professional Elective-III]	L	T	P
Credits: 3		3	-	-

Prerequisites: Geotechnical Engineering

Course Objective: Focus is on idealization of soil response to closely represent continuum behavior and interaction analysis between the soil-structure with reference to relative stiffness of beams, slabs and piles under different loading conditions.

MODULE I Soil Response Models of Interaction Analysis

Introduction to soil – Foundation interaction problems, Soil behavior, Foundation behavior, Interface behavior, soil-foundation interaction analysis, soil response models, Elastic continuum, Winkler, Two parameter elastic models, Elastic – plastic behavior, Time dependent behavior.

MODULE II Infinite and Finite Beams on Elastic Foundations

Infinite beam, General solution of the elastic line – concentrated and distributed loads on beams – Idealization of semi-infinite and finite beams. Classification of finite beams, different end conditions and loads – solutions by general method, finite difference and application packages.

MODULE III Plate on Elastic Medium

PART A -Infinite plate, elastic continuum, Winkler, Two parameters, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, simple solution, ACI method.

PART B- Numerical analysis of finite plates, Analysis of highway and airfield pavements – Application packages.

MODULE IV Analysis of Pile and Pile Groups

Elastic analysis of single pile – Methods of analysis for settlement of pile – Solutions for settlement and load distribution in pile – Pile tip load – settlement of pile groups – Analysis – Interaction between piles – end bearing and floating piles – Effect of pile cap – Piled raft – Application packages.

MODULE V Laterally Loaded Pile

Load - deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, pile raft system, solutions through influence charts and Application packages.

TEST BOOKS:

1. Salgado,R., **"The Engineering of Foundations",** Tata McGraw Hill Education Private Limited, New Delhi, 2011.
2. Murthy, V.N.S., **"Advanced Foundation Engineering",** CBS Publishers, New Delhi, 2007. 3. Saran, S, **"Analysis and Design of Substructures",** Taylor & Francis Publishers, 2006

REFERENCE BOOKS:

1. McCarthy, D.F. **"Essentials of Soil Mechanics and Foundations",** Basic Geotechnics, Sixth Edition, Prenticce Hall, 2002.
2. Hemsley, J.A, **"Elastic Analysis of Raft Foundations",** Thomas Telford, 1998.
3. Selvadurai, A.P.S., **"Elastic Analysis of Soil Foundation Interaction",** Elsevier 1979.
4. Kurien, N.P., **"Design of Foundation Systems: Principles and Practices**" Narosa Publishing House, New Delhi, 1999.

E RESOURCES

1. https://nptel.ac.in/courses/105101004/6
2. https://nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf
3. https://nptel.ac.in/courses/114106025/31

Course Outcomes:

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

1. Gain a general understanding on the nature of soil and the classification and evaluation of engineering properties of soil.
2. Recognize the Permeability characteristics of soils and seepage through soils
3. Compute the vertical stress at any depth by deferent methods and also understands the compaction characters.
4. Understand the stress distribution and settlement characteristics of soil when it is subjected to the application of external loads.
5. Evaluate the shear strength characteristics of soil.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		1	2	1						3	3	
CO2	2	3	2	3	1	3	3	2	3	2			3	2	
CO3	3	3	2	3	2	2	3	1	3	3			3	2	
CO4	3	2	2	1	2	1	3		2	2			3	2	
CO5	2	1	1			1	3	3	2	2			3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0138	DYNAMICS OF SOIL AND FOUNDATION [Professional Elective-III]	L	T	P
Credits: 3		3	-	-

Prerequisites: Geotechnical Engineering

COURSE OBJECTIVE: To understand the basics of dynamics – dynamic behaviour of soils – effects of dynamic loads and the various design methods.

MODULE I THEORY OF VIBRATION

Introduction – Nature of dynamic loads – vibrations of single degree freedom system – free vibrations of spring – mass systems – forced vibrations – viscous damping, Transmissibility – Principles of vibration measuring instruments effect of Transient and Pulsating loads – vibrations of multi degree freedom system.

MODULE II DYNAMIC SOIL PROPERTIES AND BEHAVIOUR

Dynamic stress – strain characteristics – principles of measuring dynamic properties – Laboratory Techniques – Field tests – Factors affecting dynamic properties - Typical values- Dynamic bearing capacity – Dynamic earth pressure.

MODULE III FOUNDATIONS FOR RECIPROCATING MACHINES

Types of Machines and Foundations – General requirements – Modes of vibration of a rigid foundation, block method of analysis – Linear Elastic weightless spring method – Elastic half – space method – Analog models ; Design of Block foundation -- Codal Provisions

MODULE IV FOUNDATION FOR IMPACT AND ROTARY MACHINES

Dynamic analysis of impact type machines – Design of Hammer foundations – use of vibrator Absorbers – design – Codal recommendation. Special consideration for Rotary machines – Design criteria – Loads on Turbo Generator Foundation – method of analysis – Design; Dynamic soil – structure – Interaction, Codal Provisions.

MODULE V INFLUENCE OF VIBRATION AND REMEDIATION

Mechanism of Liquefaction–Influencing factors--Evaluation of Liquefaction potential based on SPT-Force Isolation – Motion Isolation – use of spring and damping materials – vibration control of existing machine foundation – screening of vibration – open trenches – Pile Barriers – salient construction aspects of machine Foundations.

TEXT BOOKS:

1. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, NewDelhi, 1998.
2. Kameswara Rao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing , NewDelhi, 2000.
3. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice hall, International Series, Pearson Education (Singapore) Pvt. Ltd., 2004.

REFERENCE:

1. Moore, P.J., "Analysis & Design of Foundations for Vibrations", Oxford & IBH, 2006.
2. Prakash, S and Puri, V.K., Foundations for machines, McGraw Hill, 1987.

3. Swami Saran, "Soil Dynamics and Machine Foundation", Galgotia publications Pvt. Ltd., New Delhi 1999.

E RESOURCES

1. https://nptel.ac.in/courses/105101004/6
2. https://nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf
3. https://nptel.ac.in/courses/114106025/31

Course Outcomes:

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

1. Gain a general understanding on the nature of soil and the classification and evaluation of engineering properties of soil.
2. Recognize the Permeability characteristics of soils and seepage through soils
3. Compute the vertical stress at any depth by deferent methods and also understands the compaction characters.
4. Understand the stress distribution and settlement characteristics of soil when it is subjected to the application of external loads.
5. Evaluate the shear strength characteristics of soil.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		1	2	1						3	3	
CO2	2	3	2	3	1	3	3	2	3	2			3	2	
CO3	3	3	2	3	2	2	3	1	3	3			3	2	
CO4	3	2	2	1	2	1	3		2	2			3	2	
CO5	2	1	1			1	3	3	2	2			3	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0139	SUBSURFACE INVESTIGATION AND INSTRUMENTATION [Professional Elective-III]	L	T	P
Credits: 3		3	-	-

Prerequisites: Geotechnical Engineering

Course Objective: Students are expected to understand the importance of site investigation, planning of sub soil investigation, interpretation of investigated data to design suitable foundation system.

MODULE I PLANNING OF EXPLORATION AND GEOPHYSICAL METHODS

Scope and objectives, planning an exploration program, methods of exploration, exploration for preliminary and detailed design, spacing and depth of bores, data presentation. Geophysical exploration and interpretation, seismic method, Multichannel Analysis of Surface Waves (MASW) method and electrical methods, cross bore hole, single bore hole – up hole - down hole methods.

MODULE II EXPLORATION TECHNIQUES

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

MODULE III SOIL SAMPLING

Sampling Techniques – quality of samples – factors influencing sample quality - disturbed and undisturbed soil sampling advanced sampling techniques, offshore sampling, shallow penetration samplers, preservation and handling of samples.

MODULE IV FIELD TESTING IN SOIL EXPLORATION

Field tests, penetration tests, Field vane shear, In-situ shear and bore hole shear test, pressure meter test, dilatometer test - plate load test–monotonic and cyclic; field permeability tests – block vibration test. Procedure, limitations, correction and data interpretation of all methods.

MODULE V INSTRUMENTATION

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

TEXT BOOK:

1. Alam Singh and Chowdhary, G.R., Soil Engineering in Theory and Practice, Volume-2, Geotechnical testing and instrumentation, CBS Publishers and Distributors, New Delhi, 2006.
2. Bowles, J.E., Foundation Analysis and Design, Fifth Edition, The McGraw-Hill companies, Inc., New York, 1995.
3. Clayton C. R. I., Matthews M. C. and Simons N. E., Site Investigation, Second Edition Halsted Press, 1982
4. Day, R.N., Geotechnical and Foundation Engineering, Design and Construction, McGraw- Hill, 1999.

REFERENCE:

1. Dunnicliff, J., and Green, G.E., Geotechnical Instrumentation for Monitoring Field Performance, John Wiley, 1993.
2. Hanna, T.H., Field Instrumentation in Geotechnical Engineering, Trans Tech., 1985.
3. Hunt, R.E., Geotechnical Engineering Investigation Manual, McGraw Hill,1984.
4. Nair, R.J. and Wood, P.M., Pressure meter Testing Methods and Interpretation, Butter-worths, 1987.
5. Winterkorn, H.F. and Fang, H.Y., Foundation Engineering Hand Book, a Nostrand Reinhold 1994.

E RESOURCES

1. https://nptel.ac.in/courses/105101004/6
2. https://nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf
3. https://nptel.ac.in/courses/114106025/31

Course Outcomes:

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

1. Gain a general understanding on the nature of soil and the classification and evaluation of engineering properties of soil.
2. Recognize the Permeability characteristics of soils and seepage through soils
3. Compute the vertical stress at any depth by deferent methods and also understands the compaction characters.
4. Understand the stress distribution and settlement characteristics of soil when it is subjected to the application of external loads.
5. Evaluate the shear strength characteristics of soil.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		1	2	1						3	3	
CO2	2	3	2	3	1	3	3	2	3	2			3	2	
CO3	3	3	2	3	2	2	3	1	3	3			3	2	
CO4	3	2	2	1	2	1	3		2	2			3	2	
CO5	2	1	1			1	3	3	2	2			3	2	

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:A0140	**REHABILITATION AND RETROFITTING OF STRUCTURES** [Professional Elective-IV]	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisites: Concrete Technology

Course Objective: To get the knowledge on causes of deterioration, assessment of distressed structures, repairing of structure and provides knowledge of Development of other advanced structural materials and technologies for execution for providing durable repairs and strengthening is the need of the day.

MODULE I: Deterioration & Damage of Structures
Introduction– Deterioration of Structures – Distress in Structures – Causes and Prevention- Mechanism of Damage – Types of Damage.

MODULE II: Corrosion of Steel Reinforcement
Corrosion of Steel Reinforcement– Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation – Case Studies.

MODULE III: Inspection and Testing & Damage Assessment
A: Inspection: Symptoms and Diagnosis of Distress
B: Testing & Damage assessment: Evaluation Models –Damage Testing Methods – NDT – Core Samples.

MODULE IV: Rehabilitation Methods and Repair of Structure Rehabilitation
Methods – Grouting – Detailing – Imbalance of Structural Stability – Case Studies, **Repair of Structure** – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – ShotCrete – Underpinning – Epoxy - Cement Mortar Injection- Crack Ceiling.

MODULE V: Strengthening of Structures
Strengthening of Structures– Strengthening Methods – Retrofitting – Jacketing - Health Monitoring of Structures – Use of Sensors – Building Instrumentation – Bridge Repairs – Seismic Strengthening.

TEST BOOKS:

1. W. H. Ranso, "**Concrete Repair and Maintenance Illustrated"**, RS Means Company Inc 1st Edition, 1981.
2. B.L. Gupta and Amit Gupta, **—**"**Maintenance and Repair of Civil Structures"**, Standard Publications New Delhi, 2nd Edition,2007.

REFERENCES:

1. A.R. Shantakumar, —"**Concrete Technology**", Oxford University press, 2nd Edition, 2006.
2. Bungey, —"**Non-Destructive Evaluation of Concrete Structures**", 2nd edition, 2003
3. Bt. A. Richardson —"**Building Failures: Diagnosis and Avoidance**", EF & N Spon, London, 3rd Ediion,1991.

E RESOURCES:

1. http://cpwd.gov.in/Units/handbook.pdf
2. https://www.smartzworld.com/notes/rehabilitation-retrofitting-structures-notespdf-rrs/
3. http://www.smrcorissa.org/
4. http://getreport.in/idea/rehabilitation-and-retrofitting-of-structures-nptel
5. http://getreport.in/idea/rehabilitation-and-retrofitting-of-structures-notes-nptel
6. https://www.youtube.com/watch?v=fikRPFpbgVo

Course Outcomes:

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

1. Understand the causes and prevention of deterioration in structures, interpret the types of damages and understand their mechanisms..
2. Analyze the causes and prevention mechanisms of corrosion in steel reinforcement and fire induced damages
3. Able to Analyze and Examine to inspect and assess the structures using techniques of visual inspection and NDT
4. Evaluate and Estimate the structural damage and recommend suitable repair and strengthening methods.
5. Understand to Make use of the latest health monitoring and building instrumentation methods

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	-	-	-	-	-	2	2	-	-	-
CO2	2	3	3	-	2	-	-	1	-	-	2	2	-	-	-
CO3	3	3	3	-	3	-	-	2	-	3	2	2	3	3	3
CO4	3	3	3	-	3	-	2	2	-	-	2	2	3	3	3
CO5	3	-	3	3	2	-	2	-	-	-	2	2	3	3	3

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code:A0141	OFFSHORE STRUCTURES [PROFESSIONAL ELECTIVE-IV]	L	T	P
Credits: 3		3	-	-

Pre Requisites: Nil

Course Objectives:
To impart knowledge on the behavior of offshore structures which are subjected to hydrodynamic loads, different analysis procedure for different offshore structures and wave structure interaction.

MODULE I: Introduction
Types of Offshore structures – Types of Offshore Platforms – Functions of offshore structures – Components of a typical offshore structure.

MODULE II: Loads on Offshore Structures
Gravity Loads – Wind Loads – Offshore Loads – Fatigue Load – Seismic Loads.

MODULE III: Concept of Fixed Platform Jacket and Deck
A: Jacket concept - redundant framing arrangement – Launch and Lift jackets
B: Simple Deck configurations for Lift and Float – Over Installations – In-service and Pre-service loads and analysis.

MODULE IV: Wave Theories
Wave generation and propagation – Small and finite amplitude wave theories – Wave energy and pressure distribution.

MODULE V: Wave force on Offshore Structures
Slender vertical cylindrical members – Linearization of Nonlinear wave drag force – Wave force on arbitrarily oriented cylindrical members – Wave force on large diameter structures.

Text Books:

1. D.V.Reddy, A.S.J.Swamidas(2014) Essentials of Offshore Structures, CRC Press, Taylor & Francis Group

Reference Books

1. Mohamed A. El-Reedy (2012), Offshore Structure, Design, Construction and Maintenance, Gulf Professional Publishing.
2. API (2014), Recommended Practice for Planning, designing and Construction, Fixed offshore platform, American Petroleum Institute publication, RP2A, Dallas, Texas.

E-Resourses
1. https://nptel.ac.in/courses/114/106/114106011/
2. http://www.fkm.utm.my/~koh/smk4122/Day1AM-new.pdf
3. https://www.coursehero.com/file/12350730/Module-1-Lecture-1-Introduction/
4. https://www.fossen.biz/wiley/ed1/Ch7.pdf

5. https://repository.tudelft.nl/islandora/object/uuid%3A43b1de50-ec4b-4ec9-9ff1-d5d5c209e7f7

Course Outcomes:

Upon completion of this course, the student will be able to

1. Understand the types and functions of offshore structure
2. Evaluate the loads experienced by offshore structure
3. Understand the concept of fixed offshore structures
4. Understand the wave hydrodynamics
5. Evaluate the wave forces on offshore structures

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3	2	3	2	2	3	-	2	-	2	3	3	3
CO2	3	-	-	2	-	2	2	3	1	-	-	1	3	2	3
CO3	3	2	-	2	3	3	2	3	-	2	2	2	3	3	3
CO4	3	-	-	2	-	-	2	3	1	-	-	1	3	2	3
CO5	3	-	-	2	-	-	2	3	1	-	-	1	3	2	3

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: A0142	PREFABRICATED STRUCTURES [PROFESSIONAL ELECTIVE-IV]	L	T	P
Credits: 3		3	-	-

Pre Requisites: Structural Engineering-I, Structural Engineering-II

Course Objectives:
To impart knowledge on the design principles, analysis and design of elements.

MODULE I: Design Principles
General Civil engineering requirements - specific requirements for planning and layout of prefabrication plant - IS code specifications. Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and code provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

MODULE II: Reinforced Concrete
Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, -Connections – Beam to column and column to column.

MODULE III: Floors, Stairs and Roofs
A. Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements,
B. Description of joints between elements, their behaviour and reinforcement requirements, Deflection control for short term and long term loads, Ultimate strength calculations in shear and flexure.

MODULE IV: Walls
Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, Design Curves, types of wall joints, their behaviour and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.

MODULE V: Industrial Buildings and Shell Roofs
Components of single-storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design. Cylindrical, Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, hand book based design.

TEXT BOOKS
1. R Ganesan and A Latha, "**Prefabricated Structures**", Sri Kamalamani Publications, 2014.

REFERENCES
1. Laszlo Mokk, "**Prefabricated Concrete for Industrial and Public Structures**", Akademiai Kiado, Budapest, 2007.

2. Lewicki.B, "**Building with Large Prefabricates**", Elsevier Publishing Company, Amsterdam/ London/New York, 1998.
3. "**Structural Design Manual**", Precast Concrete Connection Details, Society for the Studies in the use of Precase Concrete, Netherland Betor Verlag, 2009.

E – RESOURCES

1. https://civildigital.com/prefabricated-structures-prefabrication-concept-components-advantages-ppt/
2. http://nptel.ac.in/syllabus/105102088/
3. https://www.svce.ac.in/departments/cve/downloads/Prefabricated%20Structures/UNIT%20II%20copy.pdf

Course Outcomes:

After the completion of the course students will be able to:

1. Understand the requirements for planning the requirements for a prefabrication unit.
2. Understand the different methods of connecting beam to column and column to column.
3. Know the different types of floors, stairs and roofs.
4. Know the different types of wall panels and its connections.
5. Understand the erection and jointing of prefabricated members.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	-	-	-	-	-	2	2	-	-	-
CO2	2	3	3	-	2	-	-	1	-	-	2	2	-	-	-
CO3	3	3	3	-	3	-	-	2	-	3	2	2	3	3	3
CO4	3	3	3	-	3	-	2	2	-	-	2	2	3	3	3
CO5	3	-	3	3	2	-	2	-	-	-	2	2	3	3	3

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code:A0143	ADVANCED CONCRETE TECHNOLOGY [PROFESSIONAL ELECTIVE-IV]	L	T	P
Credits: 3		3	-	-

Course Objectives:

To impart knowledge on concrete making materials, concrete mix design for proportioning and their testing.

MODULE I:

Concrete Making Materials: Cement – Bogue's compounds – Hydration Process– Types of cement – Aggregates – Gradation Charts – Combined aggregate-Alkali Silica Reaction - Admixtures – Chemical and Mineral admixtures.

MODULE II:

Fresh Concrete: Fresh Concrete – workability tests on Concrete Setting times of Fresh Concrete – Segregation and bleeding.Hardened Concrete: Abram's law – Gel space ratios, Maturity Concept – Stress Behaviour – Creep and Shrinkage – Durability tests on concrete – Non destructive testing of concrete.

MODULE III:

A. High Strength Concrete and durability of concrete – Micro structure – Manufacturing and Properties – Design of– Ultra High Strength Concrete-Durability of concrete,-Parameters of durability of concrete,-chemical attack on concrete

B. High Performance Concrete – Requirements and properties of High Performance Concrete – Design Considerations.

MODULE IV:

Special Concrete: Self Compacting concrete – Polymer concrete – Fiber reinforced concrete – Reactive Powder concrete – Requirements and Guidelines – Advantages and Applications – Light weight concrete.Concrete mix design: Quality Control – Quality assurance – Quality audit – Mix Design method – BIS method, ACI method, DOE method.

MODULE V:

Form work – materials – structural requirements – form work systems – connections – specifications – design of form work – shores – removal for forms – reshoring – failure of form work.

TEXT BOOKS

1. A. M. Neville, "**Properties of Concrete**", Prentice Hall, 5th Edition.
2. A. R. Santhakumar, "**Concrete Technology**", Oxford University Press.
3. M. S. Shetty, "**Concrete Technology (Theory and Practice)**", S. Chand Publishing.

REFERENCES

1. P. K. Mehta, "**Concrete: Micro Structure, Properties and Materials**", Tata McGraw Hill Publishing House Pvt. Ltd.
2. Rafat Siddique, "**Special Structural concretes**", Galgotia Publications.
3. N. Krishna Raju, "**Design of Concrete Mixes**", CBS Publications.

E – RESOURCES

1. https://en.wikipedia.org/wiki/Properties_of_concrete
2. http://civil-resources.blogspot.in/2010/06/high-performance-concrete.html
3. www.cee.mtu.edu/~llsutter/classes/cet1141/present/hvalue.ppt
4. http://www.nbmcw.com/concrete/26923-high-performance-concrete.html
5. http://nptel.ac.in/courses/105102012/
6. https://onlinecourses.nptel.ac.in/noc16_ce10/preview

Course Outcomes:

After the completion of the course students will be able to:

1. Acquire good knowledge in concrete making materials.
2. Determine the properties of fresh and hardened concrete.
3. Understand the properties and performance of high strength concrete and high performance concrete.
4. Identify the application of special concrete and able to do the mix design as per codes
5. Acquire deep knowledge in form work and structural requirements.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	2	-	-	-	-	-	-	-	2	2	-	-	-
CO2	2	3	3	-	2	-	-	1	-	-	2	2	-	-	-
CO3	3	3	3	-	3	-	-	2	-	3	2	2	3	3	3
CO4	3	3	3	-	3	-	2	2	-	-	2	2	3	3	3
CO5	3	-	3	3	2	-	2	-	-	-	2	2	3	3	3

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code:A0144	PRINCIPLES OF BRIDGE ENGINEERING [PROFESSIONAL ELECTIVE-IV]	L	T	P
Credits: 3		3	1	-

Prerequisite: DRCS, PSC

Course Objective: Develop an understanding of basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality intuitive feeling about the sizing of bridge elements. Understand the load flow mechanism and identify loads on bridges.

MODULE I: Introduction to Concrete Bridges
Introduction- History of Bridges – Types of Bridges, Components of Bridge and its definitions- Classification of Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. -Economic span length

MODULE II: Loads on Bridges
Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads Lateral loads-Longitudinal forces-Seismic loads-Frictional resistance of expansion bearings, IRC bridge loading standards, Load combinations for different working state and limit state designs

MODULE III: Stresses and design requirements
A: Secondary Stresses-Temperature Effect- Erection Forces and effects
B: Width of road way and footway-General Design Requirements of bridges

MODULE IV: Solid Slab Bridges
Introduction-Method of Analysis and Design-Box Culverts, Pipe Culverts

MODULE V: Girder Bridges
Introduction-Method of Analysis and Design- Tee Beam Bridge- Courbon's Theory, Grillage analogy

TESTBOOKS:
1. Victor D J, essentials of Bridge Engineering, Oxford & IBH,2007
2. Raju N K, Design of Bridges, Oxford & IBH,2009

REFERENCE:
1. Concrete Bridge Design and Practice by V.K.Raina. 3rd edition Ponnuswamy.S ‖,Bridge Engineering, TataMc-Grawhill.2008.
2. Jagadeesh.T.R.& Jayaram.M.A, Design of bridge structures, ―Prentice hall of India. 2nd edition 2009.

E RESOURCES:
1. http://teaching.ust.hk/~civl603c/

2. http://www.structuremag.org/?p=10561
3. http://nptel.ac.in/syllabus/105999906/
4. http://nptel.ac.in/syllabus/syllabus_pdf/105102011.pdf
5. http://nptel.ac.in/courses/105106113/9_bridges/1_introduction.pdf

Course Outcomes:

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

1. To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
2. Understand the different types of loads on bridges.
3. Understand the different types of stresses acting on bridges.
4. To carry out a design of Solid Slab bridge starting from conceptual design with geometry to sizing of its elements.
5. To carry out a design of Girder bridge starting from conceptual design with geometry to sizing of its elements

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	2	-	-	-	-	-	-	-	2	2	-	-	-
CO2	2	3	3	-	2	-	-	1	-	-	2	2	-	-	-
CO3	3	3	3	-	3	-	-	2	-	3	2	2	3	3	3
CO4	3	3	3	-	3	-	2	2	-	-	2	2	3	3	3
CO5	3	-	3	3	2	-	2	-	-	-	2	2	3	3	3

20-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:A0130	ENVIRONMENTAL ENGINEERING LAB	L	T	P
Credits:1		-	-	2

Pre requisite: NIL

Course Objective: This course deals with the experiments conducted for characterization of water and municipal sewage.

LISTOFEXPERIMENTS:

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids (Organic and Inorganic)
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides and Fluoride
5. Determination of Iron and Nitrates
6. Determination of Dissolved Oxygen.
7. Determination of Total Hardness and sulphates
8. Determination of B.O.D
9. Determination of C.O.D
10. Determination of Optimum coagulant dose.
11. Determination of Chlorine demand.
12. Presumptive Coliform test.

Course Outcomes:

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

1. Develop an understanding of the procedure for quantifying quality parameters pH, turbidity and hardness.
2. Learn the procedure for quantifying quality parameter chlorides and importance of chlorides, sulphate, and Total hardness in the field water supply.
3. Understand the procedure for quantifying quality parameter of biochemical oxygen demand and chemical oxygen demand and to infer on the strength of wastewater.
4. Learn the Procedure for the treatment of water
5. Understand the procedure of microbiological analysis of water

CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	1	-	1	0	0	3	2	2
CO2	3	3	3	3	3	2	3	1	-	1	0	0	3	2	2
CO3	3	3	3	3	0	0	2	0	-	1	-	-	1	3	
CO4	1	3	3	3	1	3	3	1	0	3	3		3	3	0
CO5	3	3	3	3	0	3	3	0	0	3	0	0	1	0	0

2020-21 Onwards (MR-20)	MALLAREDDYENGINEERINGCOLLEGE (Autonomous)	B. Tech. VI Semester		
Code: A0131	STRUCTURAL DESIGN LAB	L	T	P
Credits:1		-	-	2

Prerequisite: NIL

Course Objective: Upon completion of this course, the student will be able to Analyse and Design problem solving in civil engineering disciplines using various design software programs such as AutoCAD, Sketch Up, and Revit.

LIST OF EXPERIMENTS:

1. Introduction of structural analysis & Design software (STAAD. Pro)
2. Analysis of a Fixed Beam using STAAD
3. Analysis of a Propped cantilever beam using STAAD
4. Analysis of a Continuous beam using STAAD
5. Analysis of a single storied 2D Portal Frame using STAAD
6. Analysis of a Double storied 2D portal Frame using STAAD
7. Analysis of a 2DTrusses
8. Analysis of a 3DTrusses

Structural Detailing drawings of the following

1. Autocad Drawing :Foundation
2. Autocad Drawing: Stairs
3. Autocad Drawing: RCC Slabs
4. Autocad Drawing :Beams
5. Autocad Drawing: Residential Building

Course Outcomes:

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

1. Gain a knowledge on software's like Autocad, Staad Pro, MS office Excel and also on different kinds of plans like floor, elevation, sectional plans.
2. The students will be able to draft the plan, elevation and sectional views of the buildings, Industrial structures, and framed buildings.
3. The students will be able to analyze and design the simple structural members using computer software's.
4. The students will be able to get the knowledge on shear force diagram, bending moment diagrams, reactions and its values.
5. Gain the knowledge on reinforcement design and its placing, alignments and representation through plans.

CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	0	2	0	0	0	0	2	2	1	3
CO2	1	0	1	2	3	1	3	0	0	0	0	0	3	2	3
CO3	3	2	1	3	3	0	3	0	0	0	0	0	3	0	3
CO4	3	3	0	3	3	0	0	0	0	0	0	0	3	0	3
CO5	3	1	2	2	3	0	0	0	0	2	0	0	3	0	3

2020-21 Onwards (MR-20)	MALLAREDDYENGINEERINGCOLLEGE (Autonomous)	B. Tech. VI Semester		
Code: A0562	Fundamentals of Database Management Systems Lab (Common for CE, EEE, ME, ECE, MiE)	L	T	P
Credits:2		-	1	2

Prerequisites: NIL

Course Objectives: This course enables the students to practice the concepts learnt in the subject DBMS by developing a database for an example project. The student is expected to practice the querying a relational database i.e., "Mysql" with various functionalities of SQL and PL/SQL statements using a sample database.

Sample Database: Railway Reservation System -(Redesigning IRCTC database)

Train (train Number, name, source, destination, start_time, reach_time, travel time, distance, class, days, type)

Ticket (PNR No, Transaction id, from_station, To_station, date_of_journey, class date_of_booking, total_ticket_fare, train number)

Passenger (PNR No, Serial no, Name, Age, Reservation_status)

Train_Route(Train_No, route_no, station_code, name, arrival_time, depart_time, distance, day) **Train_Ticket_fare**(Train_No, class, base_fare, reservation_charge, superfast_charge, other_charge, tatkal_charge, service_tax)

List of experiments:

1. SQL Data Definition Language Commands: Create all the tables specified above. Make underlined columns as primary key. (use number, number(m,n), varchar(n), date, time, timestamp data types appropriately) Insert at least 5 rows to each table. (Check www.irctc.co.in website for actual data)
2. SQL Data Manipulation Language Commands:
    1. Change the name of the Passenger table to Passenger_Details.
    2. List all train details.
    3. List all passenger details.
    4. Give a list of trains in ascending order of number.
    5. List the senior citizen passengers details.
    6. List the station names where code starts with 'M'.
    7. List the trains details within a range of numbers.
    8. Change the super fast charge value in train fare as zero, if it is null.
    9. List the passenger names whose tickets are not confirmed.
    10. Remove all the rows from Passenger table permanently.
3. Create (Alter table to add constraint) the necessary foreign keys by identifying the relationships in the table. 1) Add a suitable constraint to train table to always have train no in the range 10001 to 99999. 2) Add a suitable constraint for the column of station name, so that does not take duplicates. 3) Change the data type of arrival time, depart time (date -> timestamp or timestamp to date), and do the necessary process for updating the table with new values. 4) Add a suitable constraint for the class column that it should take values only as 3 1A, 2A, 3A, SL, C. 5) Add a not null constraint for the column distance in train_route.
4. Designing Employee Database with MySQL (Create and insert data in EMP table, DEPT table and SALGRADE table)

5. Multi row functions, GROUP By clause, HAVING clause, ORDER BY clause in SQL on sample database.

6. Use Join Query
    1. Find the train names that stop in 'Katpadi'.
    2. Find the train names that are superfast and the service tax is zero.
    3. Find the Passenger name (and train name) who have booked for the train that starts from 'Chennai'.
    4. Display the trains names, each type of class and the total fare for each type of class.
    5. Display all the train details and the ticket details (if booked any).
7. Use Nested Query(in Operators)
    1. Find the train names that stop in 'Warangal'.
    2. Find the train names that are superfast and the service tax is zero.
    3. Find the Passenger name who have booked for the train that starts from 'Secunderabad'.
    4. Find the trains names that have all the AC coaches and the base fare is less than 3000 for each case.
8. Create sample Views and practice basic operation
9. Write a PL/SQL procedures to practice Conditional Statements
10. Write a PL/SQL procedures to practice Iterative Statements
11. Implementing simple trigger
12. Implementing simple cursor

Textbooks:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

References:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Edition.
2. SQL The Complete Reference, James R. Groff, Paul N. Weinberg, 3rd Edition,
3. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
4. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0145	ESTIMATION AND QUANTITY SURVEYING	L	T	P
Credits: 3		3	1	-

Prerequisites: Building Materials, Construction and Planning

Course Objective: To provide student with ability to estimate the quantities of item of works involved in building, water supply and sanitary works and irrigation works and students with the ability to do rate analysis, Tender, valuation of properties and preparation of reports for estimation of various items

MODULE I:
General Items of Work in Building – Standard Units Principles of Working out Quantities for Detailed and Abstract Estimates – Approximate Method of Estimating, Detailed Estimates of RCC Buildings, Various types of Arches, Calculation of Brick work and RCC works in Arches

MODULE II:
A: Reinforcement bar bending and bar requirement schedules of Beams- Lintel cum Sunshade, slabs and Column Footings. B: Rate Analysis – Working out data for various items of work over head and contingent charges.

MODULE III:
A: Contracts: Types of contracts – Contract Documents – Conditions of contract. Valuation of buildings.
B. Standard specifications: Specifications for different items of building construction. Tender, Tender forms, Tender notice, Tender Documents, E tender, Work order

MODULE IV:
Estimate of other structures - Estimating of septic tank, soak pit- sanitary and water supply installations-water supply pipe line-sewer line-tube well- open well- estimate of bituminous and cement concrete roads- estimate of retaining walls- estimate of culverts-estimation of irrigation works

MODULE V:
Valuation- basics of value Engineering- capitalized value- Depreciation – Escalation-Value of Building- Calculation of standard rent- Mortgage-Lease
Report Preparation –principles of report preparation –report on estimate of residential building- report preparation of culverts – report preparation of roads

TEST BOOKS:
1. B.N. Dutta, "**Estimating and Costing''** UBS publishers, 28th Edition 2016.
2. G.S.Birdie," **Estimating and Costing''** Dhanapati rai Publications.

REFERENCES:

1. Standard Schedule of rates and standard data book by public works department.
2. I.S.1200 [Parts to XXV–1993 method of measurement of building and Civil Engineering works–B.I.S.]
3. National Building codes.

ERESOURCES:

1. www.costeng-solutions.com/detailed_estimating.htm
2. study.com/academy/.../contract-law-terms-definitions-contract-types.html
3. http://ascelibrary.org/doi/abs
4. www.bv-solutions.co.uk/building...validation/building-claims-validation
5. http://nptel.ac.in/courses/108105059/

Course Outcomes:

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

1. Gain knowledge on various Building items, their standard units and principles.
2. Estimate quantity of each item for RCC buildings by different methods of estimation.
3. Evaluate various types of contracts, valuations, tenders and specifications.
4. Estimate septic tank and water supply installations
5. Value of Building and Report Preparation of roads, culverts, buildings

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

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		3	3	2	2	2	3	3	2	
CO2	3	2	2	1	3		3	3		3	3	3	3	3	
CO3	3	3	3	3	3	3	3	3		3	1		3	3	
CO4	3	2	2		3		3			2	2	2	3	2	
CO5	3	3	3	2	3	3	3	3		3	1	3	3	3	

2020-22 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0146	TRANSPORTATION ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objective: To provide the students with basic knowledge of history of roads and planning stages for highways and cross section elements along with the geometric features of highways and drainage problems and remedial measures for construction of safe, durable pavements and traffic signs, signals, markings to control the traffic and for safe flow of vehicles without accidents.

MODULE I: Highway Development and Planning and

Highway Development and Planning: Highway development in India – Necessity for Highway Planning- Different Road Development Plans.

Highway Planning: Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports, Road Projects initiation need based planning.

MODULE II: Highway Geometic Design

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment-Gradients-Vertical curves. Typical cross sections fordifferent types of roads.

MODULE III: Highway Materials and Testing

A: Highway Materials and Testing

Desirable properties and testing of highway materials: road aggregates, bituminousmaterials and subgrade soil.

B: Highway Construction & Maintenance

Construction of earth roads, WBM roads, stabilized roads, bituminous pavements, cement concrete roads and joints in cement concrete roads – Maintenance of flexible & rigid pavements - Types and causes of distress.

(Removed :- Concept of BOT and BOOT module -3)

MODULE IV: Railway Engineering and Geometric Design of Railway Track

Introduction to Railway Engineering Permanent way components – Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Ageing of Sleepers- Sleeper density. Geometric Design of Railway Track Gradients- Grade Compensation- Cant and Negative Super elevation- CantDeficiency – Degree of Curve – Crossings and Turn outs.

MODULE V: Traffic Engineering

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies-

Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures-Accident Data Recording – Condition Diagram and Collision Diagrams.Traffic, infrastructural and safety audits.

TEST BOOKS:

1. S.K.Khanna, C.E.G.Justo, A.Veeraragavan. ―Highway Engineering, Nem Chand and Brothers, Roorkee, 10th Edition, 2015.
2. Dr.L.R.Kadyali, ―Traffic Engineering & Transportation Planning – Khanna publications – 6th Edition 1997

REFERENCES:

1. Partha Chakraborty and Animesh das, Principles of Transportation Engineering, Prentice Hall, India– 6th Edition 1997
2. Flaherty, C.A.O. ―Highway Engineering, Edward Arnold,London, – 6th Edition,1986
3. Mannering, ―Principles of Highway Engineering & Traffic Analysis, Wiley Publishers, New Delhi. , 5th Edition, 1998.
4. Sharma, S.K. ―Principles, Practice& Design of Highway Engineering, S. Chand & Company Ltd., New Delhi, 5th Edition, 1985.

E RESOURCES

1. http://teacher.buet.ac.bd/cfc/CE353/Lec1_Intro_web.pdf
2. https://drive.google.com/file/d/0B-IbNSAhk4D2LXpSc2w2cFh1TGM/view
3. http://www.sciencedirect.com/science/journal/20957564
4. http://www.civilenggforall.com/2016/12/highway-engineering-by-s.k.khanna-and-c.e.g.justo-free-download-pdf-civilenggforall.com.html
5. http://nptel.ac.in/downloads/105101087/
6. http://nptel.ac.in/courses/105105107/

Course Outcomes:

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

1. Understand different modes of transportation and planning stages for highways
2. Design various highway geometric elements using the knowledge of mechanics and applying the principles of equilibrium conditions.
3. Characterize highway materials and understand the various types of highway construction
4. Design various geometric elements of railway track
5. Carryout various traffic engineering studies for traffic data collection

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

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		3	3	2	2	2	3	3	2	
CO2	3	2	2	1	3		3	3		3	3	3	3	3	
CO3	3	3	3	3	3	3	3	3		3	1		3	3	
CO4	3	2	2		3		3			2	2	2	3	2	
CO5	3	3	3	2	3	3	3	3		3	1	3	3	3	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0147	ADVANCED REINFORCED CONCRETE DESIGN [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Prerequisite: DRCS (SE-1)

Course Objectives:

To study the fundamentals of designing advanced RCC structure like Deep beam, Corbel, Curved beam, Domes and Multi storied buildings.

MODULE I: Design of RC Deep Beams and Corbels

Introduction, Minimum thickness, Steps of Designing, Design by IS456 method, checking for Local Failures, Detailing, Design of corbel, Analysis for design forces, Determination of reinforcement

MODULE II: Design of Beams Curved in Plan

Introduction, Circular beam symmetrically supported, Semi-circular beam supported on three equally spaced columns.

MODULE III: Redistribution of Moments in RC beams

A. Introduction, Redistribution of moments in a fixed beam, Position of points of contra flexures, conditions for moment redistribution, Final shape of redistributed bending moment diagram.

B. Moment redistribution for a two span continuous beam, Advantages and disadvantages of moment redistribution, Modification of clear distance between bars in beams (for limiting crack width) with redistribution.

MODULE IV: Design of Domes

Introduction, Stresses in domes, Formulae for forces in spherical domes, Design of a spherical dome

MODULE V: Design of Multi-Storey Buildings

Introduction, Example frame, Structural layout, Estimation of loads, Load combinations, Analysis, Design of elements of frames, Use of computer software for analysis and design, Design example.

TEST BOOKS

1. Dr. H. J. Shah, "**Reinforced Concrete**", Vol-1 and Vol-2, Charter, 8th Edition – 2009 and 6th Edition – 2012 respectively.
2. P.C Varghese "**Advanced Reinforced Concrete Design**" -. Prentice Hall of India –2004.

REFERENCES

1. N. Krishna Raju "**Advanced Reinforced Concrete Design**", 2nd edition, CBS Publishers and Distributors.-2009.
2. M.L.Gambhir, "**Design of Reinforced Concrete Structures**", PHI Pvt. Ltd, New Delhi, 2008 4. IS456, SP16,SP34

E – RESOURCES

1. http://nptel.ac.in/courses/105105105/
2. http://nptel.ac.in/noc/individual_course.php?id=noc17-ce23
3. http://www.darshan.ac.in/DIET/CI/137/advanced-design-of-concrete-structures/SubjectDetail

Course Outcomes:

After the completion of the course students will be able to:

1. Understand the concept of designing a deep beam.
2. Design beams curved in plan.
3. Idealize the concept of moment redistribution.
4. Analyze and design a spherical dome.
5. Analyze and design a multistoried building.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	3	1	-	-	-	-	-	-	-	2	3
CO2	3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	2	3	3	-	-	-	-	-	-	-	-	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO5	3	3	2	2	-	-	-	-	-	-	-	-	-	3	3

20-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0148	PRESTRESSED CONCRETE STRUCTURES	L	T	P
Credits: 3	[Professional Elective]	3	-	-

Prerequisites: Concrete Technology, DRCS

Course Objective: To understand types, systems and loss of prestressing. Design the flexural members for shear, bond and torsion and design the end blocks. Using the concept of linear transformation and cable profile. Analysis of composite section and their application in design of prestressed concrete bridges. To understand short term and long term deflections and their determination.

MODULE I: Introduction
Historic development – General principles of prestressing pre tensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel and their characteristics.
Methods and Systems of Prestressing: Pre tensioning and post tensioning methods and systems of pre stressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System, Lee McCall system,

MODULE II:
Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons. Stress diagrams - Elastic design of simple PSC slabs and beams of rectangular and I-sections-kern line-cable profile and cable layout
Loss of Prestress: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

MODULE III: Shear
Shear: General considerations- principal tension and compression- improving shear resistance of concerete by horizontal and vertical pre stressing and by using inclined or parabolic cables- Analysis of rectangular and I-beams for shear- Design of shear reinforcement- I.S.Code Provisions.

MODULE IV: Transfer of Prestress in Pre Tensioned Members Transmission of pre stressing force by bond-transmission length- flexural bond stresses- IS code provisions-Anchorage zone stresses in post tensioned members- stress distribution in end block-Analysis by Guyon's, Magnel methods-Anchorage zone reinforcement- I.S.Code provisions.

MODULE V: Composite Beams and Deflections
Composite Beams: Different types- propped and unpropped – stress distribution-Differential shrinkage – Analysis of composite beams-General designs considerations.
Deflections: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked member's prediction of long term deflections-I.S.Code provisions.

TEST BOOKS:
1. Prestressed Concrete by Krishna Raju, - Tata Mc.Graw Hill Publications, 5th Edition,

2012

2. Prestressed Concrete by N.Rajasekharan, Narosa publications, 3rd Edition,2009

REFERENCES:

1. Prestressed Concrete by Ramamrutham, Dhanpatrai Publications, 4th Edition 2013.
2. Design of Prestressed concrete structures by T.Y. Lin & Ned 3rd Edition,2010.

REFERENCE CODES:

1. BIS code on prestressed concrete, IS1343-2012

E RESOURCES:

1. https://en.wikipedia.org/wiki/Prestressed_concrete
2. https://www.pci.org/
3. http://nptel.ac.in/courses/105105105/
4. http://nptel.ac.in/courses/105106118/
5. http://www.nptel.ac.in/courses/105106117/

Course Outcomes:

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

1. Understand the materials used in pre stressed concrete & general principles of prestressing pre tensioning and post tensioning.
2. Analyse the behavior of pre tensioned and post-tensioned in pre stressed concrete structures & losses of pre stress in pre tensioned and post-tensioned members due to various causes..
3. Analysis and Design of section for the flexural and shear beams of pre tensioned and post- tensioned of pre stressed concrete.
4. Transfer of pre stress in pre tensioned member and post tensioned member and stress distribution in end block by various method.
5. Analysis and Design of composite beams and computation of short term & long term deflection in pre stressed concrete member.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	3	1			1		2	3		1
CO2	3	3	1	2	2	2	1			1		2	3		2
CO3	3	3	2	2	1	3	1			1		2	2		1
CO4	3	3	2	2	2	3	1			1		2	3		2
CO5	3	3	2	2	1	1	1			1		2	2		1

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0149	SEISMIC DESIGN OF STRUCTURES [Professional Elective-V]	L	T	P
Credits:3		3	-	-

Pre-requisite: Structural Design I & II

Course Objectives: To introduce the basics of dynamics, engineering seismology, building geometrics & characteristics and earthquake engineering.

MODULE I: Dynamics of Structures
Theory of vibrations – free and forced vibrations – single and multi-degree of freedom systems – computations of dynamic response to time dependent forces.

MODULE II: Seismology and Earthquake
Internal structure of the earth - discontinuity and nature of the material - continental drift and plate tectonics - Faults - Elastic rebound theory - seismic waves and characteristics - earthquake size - seismic zoning map of India.

MODULE III: Principles of Earthquake Resistant Design
A: Importance of Earthquake Resistant Design - Seismic Forces - modes of propagation – Factors influencing seismic vulnerability - Characteristics of earthquake.
B: Earthquake response of structures - Application of response spectrum theory in seismic design - Concept of earthquake resistance design - Codal provisions for seismic design of structures – IS 1893 and IS 4326.

MODULE IV: Seismic Analysis of Moment Resisting Frames
Seismic design philosophy, determination of design lateral forces as per IS: 1893 - equivalent static force and dynamic analysis procedure - Effect of infill stiffness on analysis of frames – equivalent diagonal strut.

MODULE V: Design of Beam Column Junctions
Elastic and Inelastic deformations of structures - ductility of the composite system - design of axial and flexural members - beam column junction detailing - strong column weak beam effects as per IS: 13920.

Text Books:

1. Pankaj Agarwal and Manish Shrikhande, Earthquake resistant design of structures, Prentice Hall India Pvt. Ltd., 2012.
2. Duggal, S. K, "Earthquake Resistant Design of Structures", Oxford university press, 2007.

Reference Book:

1. Park, R & Paulay, "Design of Reinforced Concrete Structure Elements", John Wiley & sons, 2009.
2. 2. Kramer. S. L, "Geotechnical Earthquake Engineering", Prentice-Hall India Pvt. Ltd., 2010.

3. 3. IS: 1893 (Part 1) 2002, Criteria for earthquake resistant design of structures, BIS, New Delhi.
4. 4. IS: 13920-1993, Ductile detailing of reinforced concrete structures subjected to seismic forces, BIS, New Delhi.

E-Resources:

1. https://www.nicee.org/EQTips.php
2. https://www.nicee.org/iaee/E_Chapter3.pdf 3.
3. http://www.iitk.ac.in/nicee/wcee/article/10_vol7_3659.pdf 4.
4. http://www.nzsee.org.nz/db/Bulletin/Archive/04(2)0222.pdf 5.
5. http://nptel.ac.in/courses/105101004/
6. http://nptel.ac.in/courses/105105104/pdf/m16l39.pdf

Reference Codes:

1. IS: 1893 (Part-1) -2002. "Criteria for Earthquake Resistant – Design of structures." B.I.S., New Delhi.
2. IS: 4326-1993, "Earthquake Resistant Design and Construction of Building", Code of Practice B.I.S., New Delhi.
3. IS: 13920-1993, "Ductile detailing of concrete structures subjected to seismic force" – Guidelines, B.I.S., New Delhi.

Course Outcomes:

After the completion of the course students will be able to:

1. Obtain the knowledge on the dynamic behavior of the structures.
2. Understand earthquake phenomenon cause of earthquakes, faults, plate tectonics, seismic waves and terms associated with earthquake and measuring instruments.
3. Study the functional planning, continuous load path, simplicity and symmetry and learn design earthquake loads, basic load combinations.
4. Understand the principles of earthquake resistant design of RC members, structural seismic design and the behavior of building and lateral load on buildings.
5. Understands the strategies of structural design and detailing of various types of system.

CO-PO Mapping (3/2/1indicates strength of correlation)3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO 3**
CO1	3	3	3	3	2								3		
CO2	3	3	3	3	2	3		3					3		
CO3	3	3	3	3	3	3		3	3			3	3		
CO4	3	3	3	3	1	2		3	2		2	3	3	2	2
CO5	3	3	1	1	3	2		2					3	2	1

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0150	ADVANCED STRUCTURAL ANALYSIS [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Prerequisites: Engineering Mechanics, Strength of Materials, Structural Analysis.

Course Objective: This course is an advanced method and in continuation of Structural Analysis; Matrix method and Plastic analysis are covered to identify, formulate and solve problems in Structural analysis.

MODULE I: Kani's Method
Analysis of continuous beams including settlement of supports, Analysis of frames including side sway.

MODULE II: Moving Loads and Influence Lines
Introduction: Variable Loadings, Influence lines for reactions, shear force and bending moment for statically determinate beams – Influence lines for member's forces in pin-jointed frames.

MODULE III: Approximate Method of Analysis
A: Application to multistory frames by Portal frame method
B: Application to multistory frames by Cantilever method

MODULE IV: Flexibility Method
Introduction: Flexibility Method, Determinate vs. Indeterminate structures – Indeterminacy – Compatibility conditions – Analysis of indeterminate Pin–jointed plane frames, Rigid jointed plane frames [with redundancy restricted to two] and Continuous beams.

MODULE V: Stiffness Matrix Method
Introduction: Stiffness Matrix Method, Analysis of Continuous beam and Plane trusses using system approach, Analysis of simple orthogonal rigid frames using System approach.

TEST BOOKS:

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol.1 & Vol.2", Laxmi Publications, New Delhi, 3rd Edition, 2019.
2. BhaviKatti,S.S, "Structural Analysis – Vol.1 & Vol.2", Vikas Publishing Pvt Ltd., New Delhi, 5th Edition, 2021.

REFERENCES:

1. H.J. Shan and S.B. Junnarkar "Mechanics of structures – Vol.1", Charotar publishing house. 32nd edition 2016.
2. Pandit & Gupta "Theory of structures", Tata Mc.Graw – Hill Publishing co. Ltd., NewDelhi. 1st edition 2017.
3. B.C Punmia, Ashok Kumar Jain and Arun Kumar Jain "Theory of Structures", Laxmi Publications, NewDelhi.13th edition 2017.

E-RESOURCES:

1. http://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf
2. http://web.iitd.ac.in/~sbhalla/cel717.pdf
3. https://link.springer.com/journal/40091
4. http://journals.azad.ac.ir/ijase/
5. http://textofvideo.nptel.iitm.ac.in/105101086/lec4.pdf

Course Outcomes:

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

1. Draw the SFD and BMD using Kani's method of analysis.
2. Get good knowledge on Moving loads and Influence lines.
3. Solve the structure using approximate method of analysis.
4. Analyze the structure using Flexibility method.
5. Analyze the structure using Stiffness Matrix method.

CO-PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	3	3	3	2	2	2	3	3	2	3
CO2	3	2	3	3	3	1	3	3		3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3		3	1		3	3	3
CO4	3	3	1	3	3		3			2	2	2	3	2	3
CO5	3	3	3	3	3	3	3	3		3	1	3	3	3	3

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VII Semester		
Code: A0151	ADVANCED STEEL DESIGN [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Course Objectives:
To design the simple, eccentric connections and design of industrial buildings and steel bunkers.

MODULE I: Simple Connections – Riveted, Bolted Pinned and Welded Connection
Riveted connections – Bolted Connections – Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip – Critical Connections – Praying Action – Combined Shear and Tension for Slip – Critical Connections. Design of Groove welds – Design of Fillet Welds – Design of Intermittent fillet welds – Failure of Welds.

MODULE II: Eccentric and Moment Connections
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.

MODULE III: Analysis and Design of Industrial Buildings
A. 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.
B. Design of purlins for roofs, design of built up purlins, Design of knee braced trusses and stanchions. Design of bracings.

MODULE IV: Design of Steel Truss Girder Bridges
Types of truss bridges, component parts of a truss bridge, economic proportions of trusses, 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; sway bracing.

MODULE V: Design of Steel Bunkers and Soils
Introduction – Janseen's Theory – Airy's Theory – Design of Parameters – Design Criteria – Analysis of Bins – Hopper Bottom – Design of Bins.

TEXT BOOKS

1. Subramaniam N., "**Design of Steel Structures**", Oxford University Press.
2. Dayaratnam P., "**Design of Steel Structures**", S. Chand & Company.

REFERENCES

1. S. S. Bhavikatti, "**Design of Steel Structures – by Limit State Method as per IS:800-2007**", I K International Publishing House Pvt. Ltd., 4th Edition.

2. Dr. Ramachandra & Virendra Gehlot, "**Design Steel Structures Volume – II**", Scientific Publishers.
3. S. K. Duggal, "**Limit State Design of Steel Structures**", Tata McGraw Hill Education Private Ltd., 2nd Edition.
4. Indian Standard Code IS:800-2007.

E – RESOURCES

1. http://steel.fsv.cvut.cz/suscos/PP/1C03-12-Footbridges.pdf
2. http://gala.gre.ac.uk/6974/1/WCA091230.pdf
3. http://nptel.ac.in/courses/105106113/2_industrial_building/1_introduction.pdf
4. http://nptel.ac.in/courses/105106112/
5. http://www.nptelvideos.in/2012/11/design-of-steel-structures.html
6. http://nptel.ac.in/courses/105106113/

Course Outcomes:

After the completion of the course students will be able to:

1. Analyze the behavior of simple connections like bolted, riveted, pinned welded and design them for axial forces.
2. Analyze the behavior of bolted, welded connections and design them for eccentric and moment connections.
3. Analyze and design of industrial buildings for various loads and load combinations.
4. Design of steel truss bridges and other components.
5. Carry out wind load calculations for tall structures and design of steel chimneys.

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

COS	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	2	1	1		1		3			
CO2	3	2	3	1	1	1	1			1		3			
CO3	3	3	3	2		1		1		2		2			
CO4	3	2	3	2	1	1	1	1		2	1	2			
CO5	3	1	3	2	1	1	1	1		2	1	1			

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0152	TRAFFIC ENGINEERING ANDMANAGEMENT [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

MODULE I: Traffic Characteristics
Scope of traffic Engineering, Traffic Characteristics, Functions of traffic Engineer, Road Characteristics – Road user characteristics – Human factors affecting transportation – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problemsin India – Highway capacity and Level of service - Types and factors affecting LOS.

MODULE II: Traffic measurement and analysis
Traffic Flow Parameters - Categories of Traffic flow- Analysis of speed, flow and density relationship - Volume Studies - Objectives, Methods, Speed studies - Objectives: Definition of Spot Speed, time mean speed and space mean speed, Methods of conducting speed studies. Presentation of speed study data; Headways and Gaps, Gap acceptance studies.

MODULE III:
A: Road safety and Accidents:
Road safety issues, safety measures, road safety audit, safety tips for pedestrians- Accident studies and analysis, Causes of accidents - Engineering, Enforcement and Education measures for the prevention of accidents.
B: Traffic Control measures:
Traffic Signs, Road Markings, Design of pretimed traffic signals and Signal Co- ordination, Traffic control Aids and Street Furniture.

MODULE IV: Design of Traffic engineering facilities
Introduction, Types of intersections, Design considerations, Traffic control devices, Conflict areas at intersections, Types of Intersection controls. Types of interchanges. Design of Rotary - Bus stop location and bus bay design - Street lighting- Planning and design of pedestrian facilities.

MODULE V: Traffic Management and Environmental Impacts
Traffic Management- Transportation System Management (TSM) and Travel Demand Management (TDM), Restrictions on Turning Movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal Flow Operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS). Factors affecting air pollution from road traffic, Objectives of Environmental impact assessment (EIA), advantages and limitations of EIA.

TEST BOOKS:

1. Kadiyali.L.R. "**Traffic Engineering and Transport Planning**", KhannaPublishers, Delhi, 7th Edition, 2013.
2. Jotin Khisty, S.C. and Kent Lall, B., Transportation Engineering – An Introduction, Prentice-Hall, NJ
3. Indian Roads Congress (IRC) Specifications: Guidelines and SpecialPublications on Traffic Planning and Management.

REFERENCES

1. Patha Chakraborty and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India, 2nd Edition, 2005.
2. S.C. Saxena Traffic Planning And Design .Dhanpat Rai Pub, NewDelhi
3. Roger P.Roess, Elena S.Prassas and William R.Mcshane, Traffic Engineering,4th Edition, Prentice Hall, 2010.
4. Papacostas, C.S., Fundamentals of Transportation System Analysis, PHI

E-RESOURCES

1. http://nptel.ac.in/downloads/105101008/
2. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Transportation%20Engg%20I/TOC.htm
3. http://textofvideo.nptel.iitm.ac.in/1054/lec2.pdf

Course Outcomes:

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

1. Understand the various road user and vehicular characteristics
2. Understand the Conduction of various traffic surveys for collecting traffic data.
3. Understand the road safety measures and traffic control measures.
4. Understand the principles of design of various traffic engineering facilities.
5. Recognize various methods of traffic management and certain aspects ofvehicular pollution

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3		1		1	2	1					3	3		
CO2	2	3	2	3	1	3	3	2	3	2		3	2		
CO3	3	3	2	3	2	2	3	1	3	3		3	2		
CO4	3	2	2	1	2	1	3		2	2		3	2		
CO5	2	1	1			1	3	3	2	2		3	2		

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0153	PAVEMENT DESIGN [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: To develop an understanding of types of pavements, stresses in flexible and rigid pavements and design them.

MODULE I:
Pavement Types & Factors Affecting Pavement Design
Types and component parts of pavements, Highway pavements. Variables considered in pavement design; classification of axle types, standard and legal axle loads, Tyre pressure, Contact pressure, ESWL, EWLF, and EAL concepts; Traffic analysis: ADT, AADT, Truck factor, Growth factor, Lane distribution factor, Directional distribution factor, and Vehicle damage factor.

MODULE II:
Stresses in Flexible Pavements
Stress Inducing Factors in Flexible pavements, Layered system concepts; stress solution for one, two, and three-layered systems; fundamental design concepts; stress analysis in flexible pavements.

MODULE III:
Stresses in Rigid Pavements:
Stress Inducing Factors in Rigid pavements, Westergaard's theory and assumptions; joints in rigid pavements; stresses due to curling, stresses, and deflections due to loading, frictional stresses; stresses in dowel bars and tie bars, dowel group action; stress analysis in rigid pavements.

MODULE IV:
Design of Flexible Pavements:
IRC method of flexible pavement design; Asphalt Institute's design methods with HMA and other base combinations; AASHTO method of flexible pavement design; design of flexible pavement shoulders; introduction to mechanistic-empirical pavement design guide.

MODULE V:
Design of Rigid Pavements:
IRC method of plain jointed, jointed reinforced, continuously reinforced rigid pavement design; design of conventional and thin whitetopping; AASHTO method of rigid pavement design; design of rigid pavement shoulders.

TEXT BOOKS:

1. Pavement Analysis and Design, Huang, Y.H., Dorling Kindersley (India) Pvt. Ltd., New Delhi, India, 2008, Second Edition.
2. Principles of Pavement Design, Yoder, E.J., and Witczak, M.W., Wiley India Pvt. Ltd., New Delhi, India, 2012, Second Edition.

REFERENCES:

1. Guidelines for Conventional and Thin Whitetopping, IRC: SP76, Indian Roads Congress, New Delhi, India, 2015, First Revision.
2. Guidelines for Design and Construction of Continuously Reinforced Concrete Pavement, IRC: 118, Indian Roads Congress, New Delhi, India, 2015.
3 Guidelines for the Design of Flexible Pavements, IRC: 37, Indian Roads Congress, New Delhi, India, 2018, Fourth Revision.
4. Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, IRC: 58, Indian Roads Congress, New Delhi, India, 2015, Fourth Revision.

REFERENCE CODES:

1. IRC: 37-2018. Guidelines for the Design of. FlexiblePavements
2. IRC: 58-2015. Guidelines for the Design of. RigidPavements

E-RESOURCES

1 . http://onlinepubs.trb.org/onlinepubs/archive/mepdg/guide.htm
2 . http://www.trb.org/Pavements/TRBPublications.aspx
3. https://link.springer.com/article/10.1007/BF033257494
4 . https://pavementinteractive.org/

Course Outcomes:

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

1. Identify various types of pavements and the factors affecting Pavement Design.
2. Analyze the stresses in Flexible pavements.
3. Analyze the stresses in Rigid pavements.
4. Design of Flexible pavements.
5. Design of Rigid pavements.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3				3	3	3	3	3
CO2	3	3	3	3	3	3	3				3	1	3	3	3
CO3	3	3	3	3	3	3	3				3	1	3	3	3
CO4	3	3	3	3	3	3	3				3	3	3	3	3
CO5	3	3	3	3	3	3	3				3	3	3	3	3

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0154	PUBLIC TRANSPORTATION [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: Student will understand and apply basic concepts and methods of urban transportation planning in the India.

MODULE I: Introduction

Role of transportation in the economic development of nations, overview of transport modes, growth trends, National Transport Policy of India – Case studies, transportation planning in the developing world; and comparative international transportation policies; Fundamentals of transportation , Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

MODULE II: Data Collection and Inventories

Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle OwnerShip.

MODULE III: Travel Demand Issues

A: Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes.

B: Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

MODULE -IV: Demand Analysis and Supply Analysis Planning

Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management , Urban travel and transportation system characteristics - a systems perspective, Data management and use in decision making, Demand analysis, Urban activity analysis, Supply analysis; Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

MODULE -V: Metropolitan Cities

Design issues in urban mobility, integrating land use and transport planning; , Overview of urbanization process, city structure and urban activity and infrastructure systems, Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion, Economic Impacts of Transport Policy.

TEST BOOKS:

1. Dr.L.R.Kadyali, "Traffic Engineering & Transportation Planning" –Khanna Publications – 6th Edition1997
2. M.J.Bruton" Introduction To Transportation Planning", Hutchinson Of London Ltd, 7th Edition2000.

REFERENCES:

1. Partha Chakraborty and Animesh das, "Principles of Transportation Engineering", Prentice Hall, India– 6th Edition 1997
2. Flaherty, C.A.O. "Highway Engineering", Edward Arnold, London, – 6th Editions 1986.

E RESOURCES

1. http://tripp.iitd.ernet.in/delhibrts/metro/Metro/public%20trpt%20systm%20 %2 review.pdf
2. http://www.vtpi.org/tranben.pdf
3. http://www.ncsl.org/Portals/1/Documents/transportation/P3_State_Statutes.pdf
4. http://nptel.ac.in/courses/105106058/
5. http://nptel.ac.in/courses/105107067/

Course Outcomes:

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

1. Design and conduct surveys to provide the data required for transportation planning. Learn and understand zonal demand generation and attraction regression models.
2. Learn and understand demand distribution models (gravity models) and modal split models for mode choice analysis.
3. Develop and calibrate trip generation rates for specific types of land use developments.
4. Make final decisions among planning alternatives that best integrate multiple objectives such as technical feasibility and cost minimization.
5. Understand land use and planning issues related to metropolitan Cities.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3				3	3	3	3	3
CO2	3	3	3	3	3	3	3				3	1	3	3	3
CO3	3	3	3	3	3	3	3				3	1	3	3	3
CO4	3	3	3	3	3	3	3				3	3	3	3	3
CO5	3	3	3	3	3	3	3				3	3	3	3	3

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0155	REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Prerequisite: Surveying

Course Objective: To understand the principles, applications, trends and pertinent issues of geographical information systems and sciences, including remote sensing [RS], photogrammetry, cartography, and global positioning system [GPS] in data and information acquisition, extraction, management and analysis; spatial and statistical modeling; mapping and visualization and apply vector and raster spatial data, particularly with regard to local/ state/national issues, emphasizing lands in and nearit.

MODULE I: Photogrammetry

Basic Concepts of Photogrammetry-History & Classification, Aerial Photography- Types of aerial photography, flight planning, photographic scale, relief displacement, Stereoscopy, Ground Control Points, Map Vs Mosaic, parallax measurements for height determinations.

MODULE II: Remote Sensing

Basic concepts of Remote Sensing – elements involved in remote sensing, electromagnetic spectrum, Energy sources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite, basic elements involved in visual image interpretation, interpretation of terrain features on a map, spectral properties of water bodies, introduction to digital data analysis.

MODULE III: Geographical Information Systems and Data Representation

A: Geographical Information Systems: Introduction, Components of GIS, Fundamental operations of GIS, A theoretical framework for GIS.

B. Data Representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Data representation-Raster Model & Vector Model, Types of Data in GIS-Attribute data & Spatial Data, Spatial data approaches- layer based GIS& Feature based GIS.

MODULE IV: GIS Spatial Analysis

Spatial Analysis: Introduction, Significance, Errors in Spatial Analysis, Types of Spatial analysis in GIS, Computational analysis methods [CAM], Visual analysis method, data storage- vector data storage, attribute data storage, overview of data manipulation and analysis, integrated analysis of spatial and attribute data.

MODULE V: Applications of GIS

Application of GIS in Land Use Planning (LUP), Solid Waste Management, Disaster Management, Land use/ land cover in water resources, flood and drought impact assessment and monitoring, watershed management for sustainable development and watershed characteristics, ground water targeting, identification of sites for artificial recharge structures, drainage morphometry, inland water quality survey and management, water depth estimation and bathymetry.

TEST BOOKS:

1. LRA Narayana., "**Remote sensing and its applications"**, University Press, 1st Editon, 2014.
2. Peter A Burrough and Rachael A. Mc Donnell, "**Principals of Geo physical information systems"** Oxford Publishers, 1st Editon, 2004.

REFERENCES:

1. C.P.Lo Albert, K.W. Yonng, "**Concepts & Techniques of GIS"**, Prentice Hall [India] Publications, 1st Editon, 2002.
2. M. Anji Reddy, "**Remote sensing and GIS"**, B.S.Publications, JNTU Hyderabad 1st Editon, 2001.
3. S.Kumar, "**Basics of Remote sensing and GIS"**, Laxmi publications, 1stEditon, 2005.

E RESOURCES:

1. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf.
2. http://www.pasda.psu.edu/tutorials/gisbasics.asp.
3. http://www.crisp.nus.edu.sg/~research/tutorial/intro.htm.

Course Outcomes:

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

1. Analyse the principles and components of photogrammetry and remote sensing, gain skills in image analysis and interpretation in preparing thematic maps.
2. Acquire skills in handling instruments, tools, techniques and modelling while using Remote sensing Technology.
3. Explain the concepts and fundamentals of GIS.
4. Understand the data models and data structures used for spatial data and ableto perform geospatial analysis and network analysis.
5. Acquire knowledge about the application of Remote Sensing & GIS in Civil Engineering.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	1	3	1	3	1	3	3	3
CO3	3	3	3	3	3	2	3	1	3	2	3	2	3	2	3
CO4	1	3	3	3	3	1	3	1	2	0	3	1	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:A0156	ROAD SAFETY SYSTEM [Professional Elective-VI]	L	T	P
Credits:3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: Helps in identifying the reasons for road accidents and scientific Investigation. Provides knowledge on safety audit and its methodology.

UNIT I DESCRIPTION OF PROBLEMS
Causes of accidents – Human factors – Vehicles – Road and its condition – Environmental Studies

UNIT II ACCIDENT ANALYSIS TECHNIQUES
Collision Diagram – Preparation, Spatial Analysis of Accidents – Methods and GIS in Accident Analysis - Black Spot, Black Route and Area Identification

UNIT III BEFORE AND AFTER STUDIES
Part A: Accident Prediction Models – Development
Part B: Empirical Bayees Approach – Before and After Evaluation – Case Studies

UNIT IV SAFETY AUDIT
Need for Safety Audit – Concept and Elements of Safety Audit – Safety Audit for existing roads – Legal requirements – Provisions of Motor Vehicle Act and role of NGO‟s in prevention of accidents.

UNIT V ACCIDENT STUDIES AND INVESTIGATION
Road Accidents: Causes, scientific investigations and data collection, Analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of Road accident statistics, Accident data – Identification of Accident Prone Location – Prioritisation – Investigation – Problems and Remedies

TEXT BOOKS:

1. Khanna S.K. and Justo C.E.G, "Highway Engineering", Nem Chand and Brothers, Roorkee, 2001
2. Robert F. Baker, "Hand Book of Highway Engineering", Van Nonstrant Keinhold Company, New York, 1975.
3. Evans S.K., Traffic Engineering Handbook, Institute of Traffic Engineers, USA 2.
4. Wohl M., Martin B.V., Traffic system analysis of Engineers & Planners, McGraw Hill, New York.
5. Babkov V.F., Road conditions & Traffic Safety, MIR Publishers, Moscow, 1975.
6. Indian Roads Congress, Highway Safety Code, IRC: SP-44:1996.
7. Indian Roads Congress, Road Safety Audit Manual, IRC:SP-88-2010 9.

REFERENCES:

1. Ministry of Surface Transport, "Accident Investigation and Prevention Manual for Highway Engineers in India, Government of India, 2001
2. Robert F.Baker, "The Highway Risk Problem – Policy Issues in Highway Safety", John Wiley and Son.

E-RESOURCES

1. http://nptel.ac.in/downloads/105101008/
2. Road Safety Audit NPTEL course: https://nptel.ac.in/courses/105101008/582_Accident/point20/point.html
3. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Transportation%20Engg%20I/TOC.htm
4. http://textofvideo.nptel.iitm.ac.in/1054/lec2.pdf

Course Outcomes:

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

1. Understand the various road user and vehicular characteristics
2. Understand the Conduction of various traffic surveys for collecting traffic data.
3. Understand the road safety measures and traffic control measures.
4. Understandtheprinciplesofdesignofvarioustrafficengineeringfacilities.
5. Recognize various methods of traffic management and certain aspects of vehicular pollution

CO-PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	3	1	1	2	1				1	3	3		
CO2	3	2	2	3	1	3	3	2	3	2	1	3	2		
CO3	3	3	2	3	2	2	3	1	3	3	1	3	2		
CO4	2	2	2	1	2	1	3	1	2	2	1	3	2		
CO5	2	1	3	1	2	1	3	3	2	2	1	3	2		

2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0157	**TRANSPORTATION ENGINEERING LAB**	**L**	**T**	**P**
Credits: 2		**-**	**-**	**2**

Pre Requisite: Transportation engineering

Course Objective: The ability to know the characteristics of road aggregates and properties of the paving bitumen

List of Experiments

I. Road Aggregates

1. Aggregate Crushing Value.
2. Aggregate Impact Value.
3. Specific Gravity and Water Absorption.
4. Devals Attrition test.
5. Los Angels Abrasion test.
6. Shape test

II. Bituminous Materials

1. Penetration test.
2. Ductility test.
3. Softening Point test.
4. Flash and Fire point test.
5. Viscosity test on Bitumen test.
6. Bitumen Extraction test.

Course Outcomes:

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

1. Evaluate crushing value and impact value of the aggregates.
2. Determine the specific gravity, water absorption, flakiness index and elongation index of aggregates.
3. Evaluate Devals attrition value and Los Angels abrasion value of aggregates.
4. Determine the penetration value, ductility value, softening point value, viscosity value and flash and fire point values of the bitumen.
5. Determine the bitumen extraction value of bitumen.

CO POPSO Mapping
(3/2/1 indicates strength of correlation) 3Strong, 2Medium, 1Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		3	2				2				3	3	
CO2	3	3		3	3	2	1		3				3	2	
CO3	3	3		3	3				2				3	2	
CO4	3	3	3	3			1		3				3	2	
CO5	3	3		3	2	2	1		2				3	2	

2021-22 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0158	REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM LAB	L	T	P
Credits: 1		-	-	2

Prerequisites: NIL

Course Objective: Identify different objects and components present in a remote sensing image using visual image interpretation technique. Understand the basic concepts and components of QGIS. Acquire knowledge on Geo referencing and creation of data. Usage of Geo processing tools for query and analysis.

List of Experiments:

REMOTE SENSING:

1. Visual Image Interpretation
2. Interpretation of terrain features on a map

GIS:

1. Introduction to QGIS - File formats for QGIS
2. Geo referencing in QGIS
3. Creation of Vector Data – Point features, Line features, Polygon features
4. Identification of errors in maps using Topology Checker
5. Data Editing-Removal of errors – Overshoot and Undershoot, Snapping
6. Spatial and Attribute query
7. Buffering techniques
8. Geo processing Tools - Clip, Dissolve, Intersection and Union
9. Introduction to Google Earth
10. Interchange the data between Google Earth and QGIS

Course Outcomes:

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

1. Identify and interpret the features visually on an image.
2. Identify and interpret the terrain features on a map
3. Geo reference an image in QGIS
4. Perform Query and analysis using Geo processing tools.
5. Acquire knowledge to interchange the data between QGIS and Google Earth.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			1									2	3
CO2	1		2	1										3	3
CO3	1	2		2	1									2	3
CO4	2		2	1										3	3
CO5	1	2			1	2	1							3	3

2021-22 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A00P1	MINI PROJECT	L	T	P
Credits: 2		-	-	2

Course Objectives: To utilize science and engineering to make product/process using innovative techniques, predict the results and prepare technical documents.

Course Outcomes:

At the end of the course, students should be able to

1. Identify project goals, constraints, deliverables, performance criteria, control needs and requirements.
2. Implement concepts, tools and techniques to do quality projects.
3. Adapt projects in response to issues that arise internally and externally.
4. Interact with team and stakeholders in a professional manner, respecting differences, to ensure a collaborative project environment.
5. Utilize technology tools for communication, collaboration, information management, and decision support.

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

COS	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	1	1	1	1	3		1	1	3	1
CO2	3	2	3	3	3	2	1		1	3		1	1	3	2
CO3	3	3	3	3	3	3	1		2	1	1	3	1	3	1
CO4	3	1	3	3	2	3	2	1		3	2	3	3	3	2
CO5	3	1	2	1	3	1	3	2	3	3	2	3	3	3	1

2021-22 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: A00P2	**MAJOR PROJECT**	**L**	**T**	**P**
Credits: 12		**-**	**-**	**24**

Course Objectives: To utilize science and engineering to make product/process using innovative techniques, predict the results and prepare technical documents.

Course Outcomes:

At the end of the course, students should be able to

1. Identify project goals, constraints, deliverables, performance criteria, control needs and requirements.
2. Implement concepts, tools and techniques to do quality projects.
3. Adapt projects in response to issues that arise internally and externally.
4. Interact with team and stakeholders in a professional manner, respecting differences, to ensure a collaborative project environment.
5. Utilize technology tools for communication, collaboration, information management, and decision support.

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

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	1	1	1	1	3		1	1	3	1
CO2	3	2	3	3	3	2	1		1	3		1	1	3	2
CO3	3	3	3	3	3	3	1		2	1	1	3	1	3	1
CO4	3	1	3	3	2	3	2	1		3	2	3	3	3	2
CO5	3	1	2	1	3	1	3	2	3	3	2	3	3	3	1

2021-22 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: A00P3	SEMINAR	L	T	P
Credits: 1		-	-	2

Course outcome

1. Basic Knowledge about the engineering fundamentals in the civil engineering
2. Give oral presentation on technical and general topics
3. Express ideas clearly with examples
4. Identify the research opportunities related to their area.
5. Communicate effectively.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	1	1	1	1	3		1	1	3	1
CO2	3	2	3	3	3	2	1		1	3		1	1	3	2
CO3	3	3	3	3	3	3	1		2	1	1	3	1	3	1
CO4	3	1	3	3	2	3	2	1		3	2	3	3	3	2
CO5	3	1	2	1	3	1	3	2	3	3	2	3	3	3	1