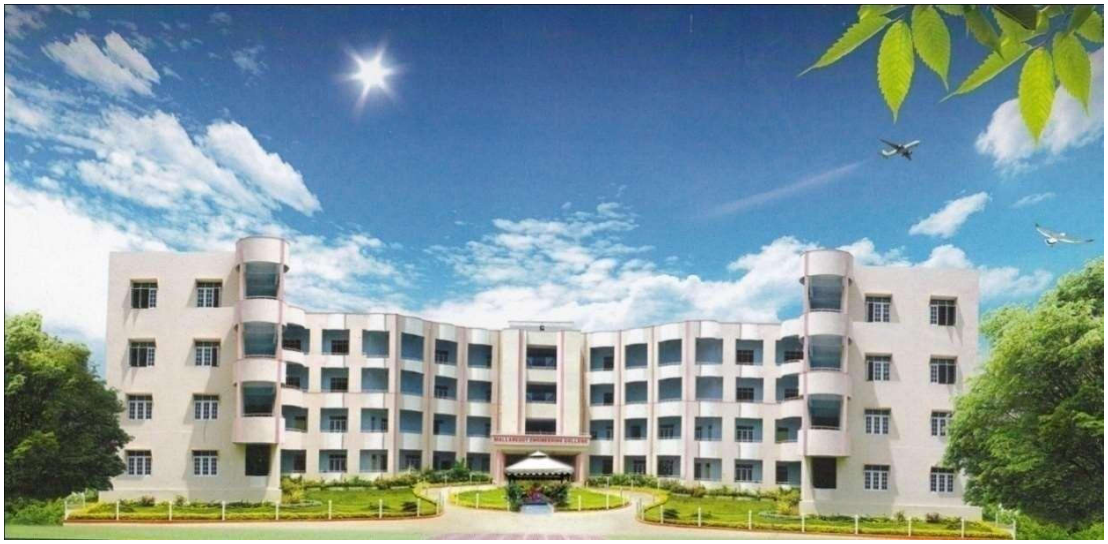
COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2022-2023 onwards



Department of Civil Engineering (CE)

For

B.Tech. - Four Year Degree Programme

(MR22 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)
MR22 –B.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year **2022-23** 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 with ethical 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 of complex 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 a member 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)
DEPARTMENT OF CIVIL ENGINEERING
PROPOSED B.TECH COURSE STRUCTURE (MR22 REGULATION)

I Semester MR22

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	HSMC	C0H01	English	3	0	0	3	40	60
2	BSC	C0B05	Linear Algebra and Differential Equations	3	1	0	4	40	60
3	ESC	C0201	Basic Electrical and Electronics Engineering	3	0	0	3	40	60
4	ESC	C0501	Programming for Problem Solving	3	0	0	3	40	60
5	ESC	C0202	Basic Electrical and Electronics Engineering Lab	0	0	2	1	40	60
6	ESC	C0502	Programming for Problem Solving Lab	0	0	2	1	40	60
7	HSMC	C0H02	English Language and Communications Skills Lab	0	0	2	1	40	60
8	ESC	C0302	Engineering Workshop	0	0	2	1	40	60
			Total	12	1	8	17		

II Semester MR22

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	BSC	C0B06	Vector Calculus and Numerical Techniques	3	1	0	4	40	60
2	ESC	C0303	Engineering Mechanics	3	0	0	3	40	60
3	BSC	C0B17	Engineering Chemistry	3	1	4	4	40	60
4	BSC	C0B12	Engineering Physics	3	1	0	4	40	60
5	ESC	C0553	Basic Python Programming Lab	0	0	3	2	40	60
6	ESC	C0304	Engineering Mechanics Lab	0	0	2	1	40	60
7	BSC	C0B18	Engineering Chemistry Lab	0	0	2	1	40	60
8	BSC	C0B13	Engineering Physics Lab	0	0	2	1	40	60
9	ESC	C0301	Engineering Graphics	3	0	0	3	40	60
			Total	15	3	13	23		

III Semester **MR22**

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	BSC		Probability and Statistics	3	1	0	3	40	60
2	PCC	C0101	Building Materials, Construction and Planning	3	0	0	3	40	60
3	PCC	C0102	Surveying	3	0	0	3	40	60
4	PCC	C0103	Strength of Materials – I	3	0	0	3	40	60
5	PCC	C0104	Fluid Mechanics	3	0	0	3	40	60
6	PCC	C0105	Surveying Laboratory - I	0	1	2	1	40	60
7	PCC	C0106	Strength of Materials Laboratory	0	0	2	1	40	60
8	PCC	C0107	Computer Aided Drafting Laboratory	0	0	2	1	40	60
9	ESC	C0554	Fundamentals of Data Structures lab	0	1	2	2	40	60
10	MC	C00M2	Environmental Science	3	0	0	0	-	-
			Total	18	2	8	20		

IV Semester **MR22**

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	PCC	C0108	Engineering Geology	3	0	0	3	40	60
2	PCC	C0109	Concrete Technology	3	0	0	3	40	60
3	PCC	C0110	Strength of Materials – II	3	0	0	3	40	60
4	PCC	C0111	Hydraulics and Hydraulics Machinery	3	0	0	3	40	60
5	PCC	C0112	Structural Analysis - I	3	0	0	3	40	60
6	PCC	C0113	Fluid Mechanics and Hydraulics Machinery Laboratory	0	0	2	1	40	60
7	PCC	C0114	Surveying Laboratory - II	0	1	2	1	40	60
8	PCC	C0115	Concrete Technology Laboratory	0	0	2	1	40	60
9	PROJ	C01P1	Real-time Research Project/ Field-Based Project	0	0	4	2	100	-
10	MC	C00M1	Gender Sensitization Laboratory	0	0	2	0	-	-
			Total	15	1	12	20		

V Semester **MR22**

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	PCC	C0116	Structural Analysis - II	3	0	0	3	40	60
2	PCC	C0117	Geotechnical Engineering	3	0	0	3	40	60
3	PCC	C0118	Structural Engineering -I (RCC)	3	0	0	3	40	60
4	HSMC	C0H08	Business Economics & Financial Analysis	3	0	0	3	40	60
5	PCC	C0119	Transportation Engineering	3	0	0	3	40	60
6	PCC	C0120	Hydrology and Water Resources Engineering - I	3	0	0	3	40	60
7	PCC	C0121	Transportation Engineering Laboratory	0	0	2	1	40	60
8	PCC	C0122	Geotechnical Engineering Laboratory	0	0	2	1	40	60
9	MC	C00M6	Intellectual Property Rights	3	0	0	0	-	-
10	MC	C00M3	Quantitative Aptitude & Verbal Reasoning-I	0	0	2	0	-	-
			Total	21	0	6	20		

VI Semester **MR22**

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	PCC	C0123	Environmental Engineering	3	0	0	3	40	60
2	PCC	C0124	Foundation Engineering	3	0	0	3	40	60
3	PCC	C0125	Structural Engineering -II (Steel Structures)	3	0	0	3	40	60
4	PEC-I	C0126	Green Building Technologies	3	0	0	3	40	60
		C0127	Geomatic Applications in Civil Engineering						
		C0128	Smart Cities Planning and Management						
		C0129	Road Safety System						
		C0130	Disaster Management and Mitigation						
5	OEC-I			3	0	0	3	40	60
6	PCC	C0131	Environmental Engineering Laboratory	0	0	2	1	40	60
7	PCC	C0132	Computer Aided Design Laboratory	0	0	2	1	40	60
8	HSMC	C0H03	Advanced English Communication Skills Laboratory	0	0	2	1	40	60
9	PROJ	C00P1	Industry Oriented Mini Project/ Internship	0	0	4	2	40	60
10	MC	C00M4	Quantitative Apptitude & Verbal Reasoning-II	0	0	2	0	-	-
11	MC	C00M5	Constitution of India	3	0	0	0	-	-

Total	18	0	12	20	

VII Semester **MR22**

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	PCC	C0133	Quantity Survey & Valuation	2	0	0	2	40	60
2	PCC	C0134	Project Management	2	0	0	2	40	60
3	PEC-II	C0135	Prestressed Concrete	3	0	0	3	40	60
		C0136	Elements of Earthquake Engineering						
		C0137	Advanced Structural Analysis						
		C0138	Advanced Concrete Technology						
		C0139	Repair & Rehabilitation of Structures						
4	PEC-III	C0140	Earth Retaining Structures	3	0	0	3	40	60
		C0141	Ground Improvement Techniques						
		C0142	Stability Analysis of Slopes						
		C0143	Soil Structure Interaction						
		C0144	Dynamics of Soils and Foundation						
5	PEC-IV	C0145	Design of Hydraulic Structures	3	0	0	3	40	60
		C0146	Advanced Water Resources Engineering						
		C0147	Ground Water Hydrology						
		C0148	Watershed Management						
		C0149	Remote Sensing and GIS						
6	OEC-II			3	0	0	3	40	60
7	PCC	C0150	Civil Engineering Software Laboratory	0	0	2	1	40	60
8	PROJ	C00P2	Project Stage - I	0	0	6	3	100	-
Total				14	0	8	20		

VIII Semester **MR22**

Sl. No.	Category	Course Code	Name of the Course	Contact hours/week			Credits	CIE	SEE
				L	T	P			
1	PEC-V	C0151	Soild Waste Management	3	0	0	3	40	60
		C0152	Environmental Impact Assessment						
		C0153	Air Pollution						
		C0154	Industrial Waste Water Treatment						
		C0155	Geo Environmental Engineering						
2	PEC-VI	C0156	Airports, Railways and Waterways	3	0	0	3	40	60
		C0157	Pavement Asset Management						
		C0158	Pavement Analysis & Design						
		C0159	Traffic Engineering and Management						
		C0160	Public Transportation						
3	OEC-III			3	0	0	3	40	60
4	PROJ	C00P3	Project Stage -II including Seminar	0	0	22	9+2	80	120
			Total	9	0	22	20		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I / I Semester		
Code: C0H01	**ENGLISH** (Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI&ML, IT and Mi.E)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

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, Roots, Prefixes, Suffixes
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, Active and Passive Voice
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 : **"**We wear the Mask" by Paul Laurence Dunbar
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,

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 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					1					2		2			
CO2										1		2			
CO3		1		1						2		2			
CO4					1	1			1	2		2			
CO5				1	1				1	2		2			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:C0B05	Linear Algebra and Differential Equations (Common For CE, ME&MINING)	L	T	P
Credits: 4		3	1	-

Prerequisites: NIL

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 [12 PERIODS]

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 [12 Periods]

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;.

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. Singular Value Decomposition.

Module - III: Differential Calculus [12 Periods]

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. **Functions of two Variables:** Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Module –IV: Ordinary Differential Equations [15 Periods]

First Order and First Degree ODE: Exact Differential Equations, Non Exact Differential Equations, 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), xV(x), Method of variation of parameters.

Module – V: Partial Differential Equations [12 Periods]

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.
4. Richard Bellman, Introduction to matrix Analysis, Siam, second Edition.
5.

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, Laxmi Publications, 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)

3http://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_j2B_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 Mapping:

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**	**PO 10**	**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**

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0501	**Programming for Problem Solving** (Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

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

MODULE I: Fundamentals and Introduction to 'C' Language [10 Periods]

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.

MODULEII: Conditional Statements and Repetition Statements [09 Periods]
Conditional Statements: Simple if statement, if-else statement, if-elseif- ladder, nested if- else, Dangling else problem, switch statements.

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 [10 Periods]
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 [09 Periods]

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 [10 Periods]

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 programming examples.

Files – Basic Concept of a file, file input / output operations, text files and binary files, file status functions (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, Oxford University Press.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
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, Cengage Learning
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

Course Outcomes:

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

1. Write algorithms and to draw flowcharts for solving problems and translate the algorithms/flowcharts to programs (in C language).
2. Apply different types of control structures to code and test a given logic in C programming language.
3. Decompose a problem into functions and to develop modular reusable code and Use arrays to formulate algorithms and programs for Searching and sorting problems.
4. Develop programs that make use of concepts such as strings, pointers.
5. Analyze structures, 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	2										1	3	2	2
CO2	3	2	1									1	3	2	1
CO3	3	3	1									1	3	2	1
CO4	3	1										2	3	2	1
CO5	3	3	1									2	3	2	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for all branches)	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 **9 Periods**

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 **9 Periods**

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 **10 Periods**

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 **10 Periods**

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: Bipolar Junction Transistor (BJT): **10 Periods**

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 and Electronics 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", 3 rd 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 should be able to

1. Apply KCL, KVL and network theorems to analyse DC circuit.
2. Analyze the single-phase AC Circuits, the representation of alternating quantities and determining the power and power factor in these circuits.
3. Comprehend the construction and Operation of DC and AC machines.
4. Understand the operation of PN Junction diode and its application in rectifier circuits.
5. Compare the different configurations of BJT and draw the V-I characteristics of BJT, JFET and MOSFET.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0502	Programming for Problem Solving Lab (Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)	L	T	P
Credits: 1		-	1	2

Prerequisites: NIL

Course 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 and pointers in C language
5. Analyse structures and 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 Number	Name	Gender	Branch	Attendance percentage
501	John	Male	CSE	77.3
502	Alice	Male	ECE	80.5
503	Sam	Female	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

Course Outcomes:

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

1. Make use various programming constructs and to develop C programs
2. Implement different Operations on arrays, strings, functions, pointers in C programming language.
3. Analyze structures, unions and file in C language to develop Programs.

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**	**3**	**2**	
CO2	**3**	**2**	**1**									**1**	**3**	**3**	**1**
CO3	**2**	**3**	**1**									**1**	**3**	**2**	**1**

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I / II Semester		
Code: C0H02	**English Language and Communication Skills Lab**	**L**	**T**	**P**
Credits: 1	**(Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security),CSE (AI and ML), CSE (DS), CSE (IOT), AI&ML, IT and Mi.E)**	**-**	**-**	**3**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students 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 skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different 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 and Communication Skills Lab has 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 – Weak Forms 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: Reduction of Mother Tongue Interference and Conversation Practice
ICS Lab: Information Transfer, Debate
Minimum requirement of infrastructural 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 facility and 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 digital stereo –audio & video system and camcorder etc.
Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the textbook which are loaded on the systems):

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

Reference Books:

1. Roach, Peter. English Phonetics and Phonology. 4th edition, Cambridge University Press, 2009.
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 University Press, 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%20article%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. Hone 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 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		1				1		1	2	2		1			
CO2										1		1			
CO3							1		1	2		2			
CO4								1	1	2		2			
CO5										2		2			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:C0302	ENGINEERING WORKSHOP (Common for CE, EEE, ME,ECE 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 familiarize with 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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common for all branches)	L	T	P
Credits: 1		-	-	2

Course Objectives:

To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyze 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. Experimentally verify the basic circuit theorems, KCL and KVL
2. Measure power, power factor and phase angle in RC circuits experimentally.
3. Acquire hands on experience of conducting various tests on dc shunt motor, single phase transformers and three phase induction motors and obtaining their performance indices using standard analytical as well as graphical methods
4. Draw the characteristics of different semiconductor devices like PN junction Diode, Zener Diode, BJT and JFET by conducting suitable experiments.
5. Experimentally verify the working of half and full wave rectifier by using PN Junction diodes.

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	1	2	1	1	1	3	1	1
CO2	3		2		2		2	1	2	1	1	1	3	1	1
CO3	3	2	2	2	2		2	1	2	1	1	1	3	1	1
CO4	3	1	2		2		1	1	2	1	1	1	3	1	1
CO5	3	1	2		2		2	1	2	1	1	1	3	1	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech II Semester		
Code: C0B17	Engineering Chemistry (Common for ALL)	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 pathway 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 [10 Periods]

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: [10 Periods]

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 [17 Periods]

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: **[7 Periods]**

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) andElectroless plating (Nickel).

Module IV: Stereochemistry, Reaction mechanism& synthesis of drug molecules and NMR spectroscopy: **[12 Periods]**

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 ofn-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 (E_1&E_2) 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.

UNIT-V FUELS AND COMBUSTION **[08 PERIODS]**

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, New York, 3rd Edition, 1996.
3. K. P. C. Volhardt and N. E. Schore, **"Organic Chemistry: Structure and Function"**, 5thEdition, 2006.

Course Outcomes with BLOOM's

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

	Course Outcome	Bloom's Taxonomy Level
CO1	Understand water treatment, specifically hardness of water and purification of water by various methods.	Understand**(L2)**
CO2	Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity	Analyze**(L4)**
CO3	Apply knowledge of electrochemical cell concept with respect to fuel cells, batteries, theories of corrosion. Applications of corrosion control methods.	Apply**(L3)**
CO4	Acquire basic knowledge on the concepts of stereochemistry, chemical reaction mechanisms that are used in the synthesis of drug molecules, interpretation of NMR in organic molecules and their uses in medical field.	Analyze **(L4)**
CO5	Acquire the knowledge of various fuels and identify a better fuel source of less pollution.	Analyze **(L4)**

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								

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C 0301	ENGINEERING GRAPHICS (Common for All)	L	T	P
Credits: 3		2	-	2

PREREQUISITES: NIL

Course Objectives:

To develop in students, graphic skills for communication of concepts and ideas of engineering products.

MODULE I:

Introduction to Engineering Drawing, Principles of Engineering Graphics and their significance, Lettering.

Geometrical Constructions: Regular polygons only. Conic Sections: Ellipse, Parabola, Hyperbola– General method only Cycloidal Curves and Involute, tangents & normal for the curves.

Scales: Plane Scale, Diagonal scale, Vernier Scale.

MODULE II:

Orthographic Projections: Principles of Orthographic Projections – Conventions – First and Third Angle projections.

Projection of Points: Projection of points including all four quadrants.

Projection of Lines: Projection of Lines - parallel, perpendicular, inclined to reference planes and Traces.

MODULE III:

Projection of Planes: Axis inclined to both the reference plane.

Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotatingobject method. Axis inclined to both the reference plane.

MODULE IV:

Section of Solids: Sectioning of single solid with the cutting plane inclined to one plane and perpendicularto the other - true shape of section.

Development of Surfaces: Development of lateral surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone.

MODULE V:

Isometric Projections: Principles of Isometric Projection – Isometric Scale, Isometric Views– Conventions –Plane Figures,Simple Solids.

Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice versa–simple objects.

TEXT BOOKS

1. K.L.Narayana, S. Bheemanjaneyulu “Engineering Drawing with Auto CAD-2016” New Age InternationalPublishers, 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. international Publishing House, 3rdEdition, 2011.

E - RESOURCES

1. http://nptel.ac.in/courses/112103019/
2. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3. https://www.wiziq.com/tutorials/engineering-drawing
4. http://freevideolectures.com/Course/3420/Engineering-Drawing
5. http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711
6. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics nit jalandhar (EG MECI102)

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0B12	**Engineering Physics** (Common for ME, CE and Min. Eng.)	L	T	P
Credits: 4		3	1	-

Prerequisites: Fundamentals of Physics

Course Objectives:

1. To distinguish simple, damped and forced oscillators.
2. To summarize the factors affecting the Acoustics of a building and illustrate the two methods of ultrasonic production.
3. To compare the working of Ruby laser, He-Ne laser and semiconductor laser, besides illustrating the working principle of optical fibre and elaborate its applications.
4. To outline various Non Destructive testing technique's.
5. To compute the Electronic, ionic polarisabilities, Clausius-Mossotti relations and to explain the different approaches of synthesis of nanomaterials.

Module – I: Waves and Oscillations [10 Periods]

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 harmonic oscillator and Forced oscillator.

Module – II [12 Periods]

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, Acoustic quieting

Ultrasonics: Introduction, Production of Ultrasonic Waves - Piezo Electric Effect, Inverse piezo electric effect, Piezo-Electric crystal Method, Magnetostriction effect, Magnetostriction Method; Detection of Ultrasonic 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 [10 Periods]

LASER: Introduction, Characteristics of LASER; Absorption, Spontaneous and Stimulated emission; Einstein's coefficients derivation; Population inversion; Pumping mechanisms; Basic components of a LASER system; Types of Laser systems; Ruby LASER, He-Ne LASER, Semiconductor diode LASER (Homo junction and heterojunction); 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 **[10 Periods]**

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

Module – V **[10 Periods]**

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-Capacitors and transformers

Nanomaterials: Introduction to nanomaterials, Types of nanomaterials; factors affecting the properties of nanomaterials - surface area to volume ratio and Quantum confinement effect; Properties of nanomaterials; Synthesis of nanomaterials: Top-down and Bottom-up approach, sol-gel, ball milling; Applications of Nanomaterials- fully self-repairing paint, ultra-thin anti-glare layers for windows and mirrors, wear-resistant tires.

Course Outcomes:

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

1. Distinguish free, damped and forced vibrations.
2. Analyse the factors affecting the acoustics of building and to outline the two methods of ultrasonic production.
3. Compare and contrast Ruby, He-Ne, Semiconductor Lasers and discover the working principle of optical fibers besides and elucidating their applications.
4. Analyze various non-destructive testing technique's
5. Deduce electronic, ionic polarizabilities, Clausius-Mossotti relation and to outline the synthesis of nanomaterials by Sol-gel method and Ball milling method.

Text Books:

1. M N Avadhanulu, PG 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 Pandey and S. Chaturvedi, "**Engineering Physics**" Cengage Learning India Revised Edition, 2014.

References:

1. PK Palanisamy, "**Engineering Physics"**, 4th Edition, SciTech Publications, 2014.
2. G Prasad and Bhimashankaram, "**Engineering Physics"**, BS 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/

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	2	1									
CO2	2	2	1									
CO3	3	2	2									
CO4	3	1	2									
CO5	3	2	2									

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0303	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 **10 Periods**

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 **10 PERIODS**

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 **10 Periods**

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-Transfer formula for mass moment of inertia- by integration - Moment of Inertia of composite bodies.

MODULE IV:Kinematics & Kinetic **09 Periods**

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 09 Periods

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**, "Engineering Mechanics"**, Tata McGraw-Hill Education, 5th Edition, 2013.
2. K.Vijaya Kumar Reddy, J. Suresh Kumar**, "Engineering Mechanics"**, B S Publications, 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, 3rd Edition, 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, 2nd Edition, 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/
6. http://nptel.ac.in/courses/115104094/

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 frame appropriate equilibrium equations from the free body diagram.
2. Understand and solve the fundamental static problems and able to find centroid and centre of 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 of simple practical problems.
5. Understand and solve fundamental work, power and energy related problems and know the concepts 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**		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code:C0B06	Vector Calculus and Numerical Techniques (Common For CE,ME&MINING)	L	T	P
Credits: 4		3	1	-

Pre- requisite: NIL

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 volume integrals.
3. The various numerical techniques which are indispensable tools to solve many algebraic and transcendental 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 [12 periods]

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives,. Scalar potential functions. Solenoidal and Irrotational vectors. Vector Identities.

MODULE – II: Vector Integration [12 periods]

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 [12 periods]

(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 [12 periods]

Numerical Integration: Trapezoidal Rule, Simpson's $1/3^{rd}$ Rule, Simpson's 3/8 Rule.

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.

MODULE – V: Numerical solution of PDE [12 periods]

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, **Higher Engineering 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 Engineering Computation**, New age International publishers.
5) S.S.Sastry, **Introductory Methods of Numerical Analysis**,5th Edition,PHI Learning Private Limited

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 Edition 2013
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 and transcendental 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 by Md. 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 by Prof.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 scalar valued 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 desired level 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 using numerical techniques.
5. To find out the Numerical solution of partial differential equations.

Co-Po Mapping

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								

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0B13	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 is an 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 theoretical calculations.
3. Design new instruments with practical knowledge.
4. Understand measurement technology
5. Use new instruments and real time applications in engineering studies.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0B18	Engineering Chemistry Lab (Common for ALL)	L	T	P
Credits: 1		-	-	2

Course objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental 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^Hmetry.
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:

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

1. Acquire knowledge about the chemistry lab, kind of experiments that can be performed and the precautions to perform four types of titrations & understand the principle involved in the applications of the method.
2. Learn and apply basic technique used in chemistry laboratory for estimation hardness & alkalinity of water.
3. Understand about mineral analytic technique for estimation of ions/metal ions in minerals.
4. Apply instrumental techniques such as colorimetry, conductometry & potentiometry.
5. Learn to determine physical properties like free chlorides in water, viscosity & surface tension.

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												

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0553	**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: Python

List 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 a given string.
   b) Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 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 the module to another program.
   b) Write a python program to define a module and import a specific function in that module to another 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. **Develop** simple applications using python.
2. **Make use of** functions in python scripts.

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							1	1		
CO2		1	2	3								3		1	1
CO3	1	1	1	1	2	1	1					3		2	3

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0304	ENGINEERING MECHANICS LAB	L	T	P
Credits: 1	(Common for CE, ME and Min.E)	-	-	2

COURSE OBJECTIVES:

The objective of this subject is to provide the basic concept of force, moment of inertia, reaction and 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		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: C0B02	PROBABILITY AND STATISTICS	L	T	P
Credits: 4		3	1	0

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

- The theory of Probability, and probability distributions of single and multiple random variables
- The sampling theory and testing of hypothesis and making statistical inferences

MODULE - I: Probability

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

MODULE - II: Expectation and discrete distributions

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

MODULE - III: Continuous Distributions and sampling

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t –Distribution, F-Distribution.

MODULE - IV: Estimation & Tests of Hypotheses

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances. Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

MODULE - V: Applied Statistics

Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves, Correlation and regression, Rank correlation.

TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

REFERENCE BOOKS:

1. T. T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.

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												
CO S	**Programme Outcomes(POs)**											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO 12**
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									

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0101	BUILDING MATERIALS, CONSTRUCTION AND PLANNING	L	T	P
Credits: 3		3	0	0

Course Objectives: The objectives of the course is to

- List the construction material.
- Explain different construction techniques
- Understand the building bye-laws
- Highlight the smart building materials

MODULE - I

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.

Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fiber– reinforced glass bricks, steel & aluminum, Plastics.

MODULE - II

Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests. Admixtures – mineral & chemical admixtures – uses.

MODULE - III

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.

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire- resistant materials and constructions

MODULE - IV

Mortars, Masonry and Finishing's Mortars: Cement Mortar, Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.

Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.

Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

MODULE – V

Building Planning: Classification of buildings ,functional Planning of buildings: Sustainability and concept of Green building, General aspects to consider for planning, bye-laws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its relation to outside environment

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.
4. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

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 given situation and to be aware of various traditional building materials and also the emerging materials in the 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-laws used 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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: C0102	SURVEYING	L	T	P
Credits: 3		3	0	0

Course Objectives: The first step in engineering practice is surveying and the soundness of any civil engineering work is dependent on the reliability and accuracy of surveying. Therefore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

MODULE - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

MODULE - II

Levelling and Contouring Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method- Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours. Computation of Areas and Volumes

Areas - Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

MODULE - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

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

MODULE - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry. **Curves:** Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

MODULE - V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles,

classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXT BOOKS:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

REFERENCE BOOKS:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.

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 surface for 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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0103	STRENGTH OF MATERIALS -I	L	T	P
Credits: 3		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, strain energy, shear force, bending moments and geometry of deformation.

MODULE I: Simple Stresses and Strains, Strain Energy

Simple Stresses and Strains: Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain - Pure shear and Complementary shear - Elastic modulii, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

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

MODULE II: Shear Force and Bending Moment (Determinate Beams)

Types of beams – Concept of shear force and bending moment **-** S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

MODULE III: Theory of Simple Bending and Shear Stresses

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

B Shear Stresses: Derivation for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle and channel sections.

MODULE IV: Deflection of Beams (Determinant Beams)

Deflection of Beams: Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

Conjugate Beam Method: Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

MODULE V: Principal Stresses and strains, Theories of failures

Principal Stresses and Strains: Introduction – Stresses on an oblique plane of a bar under 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 –Principal stresses – Mohr's circle of stresses – ellipse of stress - Analytical and graphical solutions.

Theories of Failures: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and

Shear Strain Energy Theory (Von Mises Theory).

TESTBOOKS:

1. R.K.Bansal, **"Introduction to Strength of materials"** Laxmi publications Pvt. Ltd., 6th Edition-2015, New Delhi.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. 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,6thEdition2017NewDelhi.
3. **"Strength of materials"** by WANash,4th Edition,2007, Tata McGraw-Hill Education.

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 varying sections, composite bars and Temperature stresses.
2. Examine the variation of bending moment and shear force at any section and identify the position and 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 and magnitude 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 and develops an understanding of various theories of failures.

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

CO S	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0104	FLUID MECHANICS	L	T	P
Credits: 3		3	0	0

Course Objectives: The objectives of the course are to

- Introduce the concepts of fluid mechanics useful in Civil Engineering applications.
- Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- Learn about the application of mass, energy and momentum conservation laws for fluid flows.
- Train and analyses engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
- To obtain the velocity and pressure variations in various types of simple flows.
- To prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology.

MODULE – I

Properties of Fluid: Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics,** Fluid Pressure: Pressure at a point, Pascals law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

MODULE - II

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

Fluid Dynamics: Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. correction factors. Bernoulli's equation to real fluid flows.

MODULE - III

Flow Measurement in Pipes: Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applications of Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.

Flow Over Notches & Weirs: Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

MODULE – IV

Flow through Pipes: Reynolds experiment, Reynolds number**,** Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method and EPA NET, water hammer in pipes and control measures.

MODULE - V

Laminar & Turbulent Flow: Laminar flow through circular pipes, and fixed parallel plates.
Boundary Layer Concepts: Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Drag and Lift and types of drag, magnus effect.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

REFERENCE BOOKS:

1. Fluid Mechanics – Frank M. White – 8th Edition – Mc Graw Hill Education.
2. *Theory and Applications of Fluid Mechanics, K.Subramanya, Tata McGraw Hill
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited

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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0105	SURVEYING LABORATORY - I	L	T	P
Credits: 2		0	1	2

Course Objective:

1. 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, and Levelling Surveying.
2. Student will be able to learn and understand various instrument used in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile.

CYCLE - I

1. Chaining of a line using chain, measurements of area by cross staff survey.
2. Measurement of distance between two points when there is an obstacle for both chaining and ranging.
3. Compass survey - Traversing by compass and adjustments in included angles and measurement of area - graphical adjustments.
4. Distance between two inaccessible points by compass.
5. Plane Table Surveying-Measurement & Plotting of the area by Radiation method.
6. Determination of Positions objects by Intersection Method
7. Plane Table Survey- Traverse by Plane table Survey.

CYCLE – II

Leveling

1. Measurement of elevation of various given points.
2. Elevation difference between two given points by reciprocal leveling.
3. Longitudinal Leveling
4. Cross – section Leveling
5. Plotting of Contours by Indirect Method

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 measurement techniques
2. Calculate the errors, standard deviations, standard errors of the mean, accuracy ratio or relative precision 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 and a level (curved) surface on the earth
4. Distinguish between plan view, profile view and cross-sections as used in route surveying and demonstrate 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															
COS	**(Programme Outcomes POs)**												**PSOs**		
	P	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**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		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0106	STRENGTH OF MATERIALS LABORATORY	L	T	P
Credits: 1		0	0	2

Course Objectives:

- To conduct the Tension test, Compression test on various materials
- To conduct the Shear test, Bending test on determinate beams
- To conduct the Compression test on spring and Hardness test using various machines
- To conduct the Torsion test, Impact test on various materials

List of Experiments:

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on concrete.
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

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 for the 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	-

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0107	COMPUTER AIDED DRAFTING LABORATORY	L	T	P
Credits: 1		0	0	2

Course Objectives:

- To be able to plan buildings as per NBC**.**
- To understand various types of conventional signs and brick bonds.
- To draw the plan section and elevation for doors, trusses and staircases.
- To use AutoCAD tools to draw building plans, sections and elevations from a given line diagram and specifications.
- To develop working drawings of residential buildings.

List of Experiments:

1. Planning Aspects of Building systems as per National Building Code (NBC).
2. Brick bonds: English bond & Flemish bond – Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single /two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building –Electrical Layout.
10. Development of working drawing of building – Plumbing Layout.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh –Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.
3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant Publishing House.
4. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.

REFERENCE BOOKS:

1. Engineering Graphics by P. J. Sha - S. Chand & Co
2. Civil Engineering Drawing-I by S. Mahaboob Basha – Falcon Publishers
3. Building drawing by M. G. Shah - Tata McGraw-Hill Education
4. Structural Engineering Drawing by S. Mahaboob Basha – Falcon Publishers

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 computer software'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, chejjas and cupboards etc.,

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	3	3	3	2	2	3	2	2	2	3	2	3	3
CO 2	2	2	3	2	3	1	3	1	3	2	2	3	3	2	2
CO 3	2	2	3	2	1	3	1	3	2	1	1	3	2	0	2
CO 4	3	3	2	3	3	1	3	3	1	3	2	3	3	3	3
CO 5	3	3	3	3	2	3	3	3	1	1	2	3	2	2	3

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3		1		1	2	1								
CO 2	2	3	2	3	1	3		2							
CO 3	3	3	2	3	2	2		1							
CO 4	3	2	2	1	2	1									
CO 5	2	1	1			1	3	3							

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech III Semester		
Code:C00M2	ENVIRONMENTAL SCIENCE (Common for ALL)	L	T	P
Credits: Nil		2	-	-

Pre-Requisites: 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: [5 Periods]

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: [9 Periods]

A: Natural Resources: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable e-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 AND CONTROL: [7 Periods]

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: [6 Periods]

Greenhouse 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: **[5 Periods]**

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).

Text 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,I Edition, 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. Journal of earth science and climatic change (OMICS International Journal).
2. Journal of pollution effects & control (OMICS International Journal).
3. nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
4. http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html (NPTEL online video courses IIT lectures).

Course Outcomes:

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0108	ENGINEERING GEOLOGY	L	T	P
Credits: 3		3	0	0

Course Objectives: The objective of this Course is

- To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology.
- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects.

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: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, 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 and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

MODULE - III

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

MODULE - IV

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and

effect; measures to be taken to prevent their occurrence.

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

MODULE - V

Geology of Dams, Reservoirs, and Tunnels: 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 Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications

REFERENCE BOOKS:

1. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI

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 engineering practice.
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 and mineral 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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0109	CONCRETE TECHNOLOGY	L	T	P
Credits: 3		3	0	0

Pre-Requisites: Building Materials

Course Objectives: The objectives of the course are to

- **Know** different types of cement as per their properties for different field applications.
- **Understand Design** economic concrete mix proportion for different exposure conditions and intended purposes.
- **Know** field and laboratory **tests** on concrete in plastic and hardened stage.

MODULE I

Aggregate: Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

MODULE - II

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, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

MODULE – III

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.

Testing of Hardened Concrete: Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

MODULE - IV

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

Admixtures: Types of admixtures – mineral and chemical admixtures.

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.**Special Concretes:** Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete, Nano silica and Nano Alumina concrete.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, 5TH Edition,New Delhi

REFERENCE BOOKS:

1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers

IS Codes:
IS 383 : 2016
IS 516 : 2018 (Part -1 - 4)
IS 10262 – 2019

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 and admixture
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 compression etc 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 and development 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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0110	STRENGTH OF MATERIALS - II	L	T	P
Credits: 3		3	0	0

Pre requisite: Strength of Materials I

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 of Shafts & Springs

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion –Polar section modulus–Power transmitted by shafts–Combined bending and torsion – Design of shafts according to theories of failure.

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

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 and circumferential 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, Beam Columns

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.

Beam Columns: Laterally loaded struts–subjected to uniformly distributed and concentrated loads.

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

TEXT BOOKS:

1. R.K.Bansal "**Strength of materials**" Laxmi Publications (P)ltd.,6th Edition2015.
2. Basavarajaiah and Mahadevappa "**Strength of materials** "Universitypress 3rd Edition, 2011

REFERENCES:

1. Ferdin and pBeer "**Mechanics of Solid**", TataMc.Graw hill Publications1st Edition2000.
2. S.Ramakrishna and R.Narayan "**Strength of Materials**"DhanpatRaipublications.,1st Edition2015.
3. A.R.Basu, Nai Sarah"**Strength of Materials**"DhanpatRai&Co.,2nd Edition,2011.
4. L.S.Srinath "**Strength of Materials**" Macmillan India Ltd., 1st edition, 2014.

ERESOURCES:

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 pressurevesselsandDesignthethicknessofthethinandthickcylinderssubjectedtointernalpressure
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		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
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	-

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0111	HYDRAULICS AND HYDRAULIC MACHINERY	L	T	P
Credits: 3		3	0	0

Course Objectives: The objective of the course is

- To Define the fundamental principles of water conveyance in open channels.
- To Discuss and analyze the open channels in uniform and Non-uniform flow conditions.
- To Study the characteristics of hydroelectric power plant and its components.
- To analyze and design of hydraulic machinery and its modeling.

MODULE - I

Open Channel Flow – I: Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient. Most economical sections. Computation of Uniform flow, Normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

MODULE - II

Open Channel Flow – II: Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method. **Rapidly varied flow:** Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

MODULE - III

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity – Rayleigh's method and Buckingham's π methods – Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular.

MODULE - IV

Hydraulic Turbines – I: Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

Hydraulic Turbines – II: Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed

– Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

MODULE - V

Centrifugal Pumps: Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.
Reciprocating pumps – Working, discharge, slip indicator diagrams.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).

REFERENCE BOOKS:

1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.).
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
4. Hydraulic Machines by Banga& Sharma (Khanna Publishers).

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 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 for various 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 representing velocity 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 along with 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	

22-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0112	STRUCTURAL ANALYSIS-I	L	T	P
Credits: 3		3	0	0

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 Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches – Three hinged parabolic circular arches having supports at different levels.

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.31st edition (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		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0113	FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY	L	T	P
Credits: 1		0	0	2

Course Objectives

- To **identify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To **explain** the standard measurement techniques of fluid mechanics and their applications.
- To **illustrate** the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To **analyze** the laboratory measurements and to document the results in an appropriate format.

List of Experiments

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Keplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal 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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0114	SURVEYING LABORATORY - II	L	T	P
Credits: 3		0	0	2

Course Objectives:

1. 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, and Levelling Surveying.
2. Student will be able to learn and understand about theodolite and total station in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile using total station.

CYCLE - I

Theodolite surveying:

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing (Gales traverse table).
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

CYCLE - II

Total Station:

1. Area Measurement
2. Stake Out
3. Remote Elevation Measurement
4. Missing Line Measurement
5. Longitudinal & Cross Section Profile
6. Contouring
7. Providing a Simple Circular Curve
8. Demonstration using DGPS

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 measurement techniques
2. Calculate the errors, standard deviations, standard errors of the mean, accuracy ratio or relative precision 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 and a level (curved) surface on the earth
4. Distinguish between plan view, profile view and cross-sections as used in route surveying and demonstrate 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															
COS	**(Programme Outcomes POs)**												**PSOs**		
	P	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**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		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0115	CONCRETE TECHNOLOGY LABORATORY	L	T	P
Credits: 1		0	0	2

Course Objectives:

1. To know the various procedures to determine the characteristics of cement
2. To understand the test procedures to evaluate the characteristics of aggregates
3. To know the test procedures to find the properties of fresh concrete
4. To understand the test procedures to find mechanical properties of hardened concrete

LIST OF EXERCISES:

1. Tests on Cement:

a) Soundness.
b) Compressive strength.

2. Tests on Aggregates:

a) Specific gravity of fine aggregate.
b) Specific gravity of coarse aggregate.
c) Bulking of fine aggregate.
d) Grading of fine aggregate

3. IS method of mix design of normal concrete as per IS : 10262

4. Tests on Fresh Concrete:

a) Slump cone test.
b) Compacting factor test.
c) Vee-Bee consistometer test.

5. Tests on Hardened Concrete:

a) Compressive & Tensile strength tests.
b) Modulus of elasticity of concrete.
c) Non-destructive testing of 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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: C01P1	REAL TIME RESEARCH PROJECT	L	T	P
Credits: 2		0	0	4

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: C00M1	GENDER SENSITIZATION	L	T	P
Credits: 0		0	0	2

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a 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

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men-Preparing for Womanhood. Growing up Male. First lessons in Caste.

MODULE – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

MODULE – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't

Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

MODULE – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: "*Chupulu".* Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

MODULE – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

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 this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".***

 ESSENTIAL READING: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

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 the ToIrmgana People's Struggle.* New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14 November 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?Flook Cndet,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:

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

CO- PO-PSO Mapping
(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			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0116	STRUCTURAL ANALYSIS-II	L	T	P
Credits: 3		3	0	0

Course Objectives: The objectives of the course are to

- Identify the various actions in arches.
- Understand classical methods of analysis for statically indeterminate structures.
- Differentiate the approximate and numerical methods of analysis for indeterminate structures.
- Find the degree of static and kinematic indeterminacies of the structures.
- Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

MODULE – I

Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

Moment Distribution Method - Analysis of continuous beams with and without settlement of supports using - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames -Shear force and Bending moment diagrams, Elastic curve.

MODULE – II

Kani's Method: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

Cables and suspension bridges:

Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

MODULE – III

Matrix Methods -Flexibility Matrix Method: Introduction to Flexibility matrix methods of analysis

;Analysis of continuous beams including settlement of supports ; Analysis of pin-jointed determinate plane frames

MODULE – IV

Matrix Methods - Stiffness Matrix Method:: Introduction to Stiffness matrix methods of analyses using 'system approach' up-to three degree of indeterminacy– Analysis of continuous beams including settlement of supports- Analysis of pin-jointed determinate plane frames ; Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

MODULE- V

Influence Lines for Indeterminate Beams: Introduction – Influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

TEXT BOOKS:

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt. Ltd

REFERENCE BOOKS:

1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C.S. Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.
5. Structural Analysis by R. C. Hibbeler, Pearson Education
6. Structural Analysis by Devdas Menon, Narosa Publishing House.
7. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros.

Course Outcomes: After the completion of the course student should be able to

1. **Analyze** the two hinged arches.
2. **Solve** statically indeterminate beams and portal frames using classical methods.
3. **Sketch** the shear force and bending moment diagrams for indeterminate structures.
4. **Formulate** the stiffness matrix and analyze the beams by matrix methods.
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

CO S	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PS O1	PS O2	PS O3
CO 1	3	3	3	3	3	3	3	3	2	2	2	3	3	2	3
CO 2	3	2	3	3	3	1	3	3		3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3		3	1		3	3	3
CO 4	3	3	1	3	3		3			2	2	2	3	2	3
CO 5	3	3	3	3	3	3	3	3		3	1	3	3	3	3

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0117	GEOTECHNICAL ENGINEERING	L	T	P
Credits: 3		3	0	0

Course Objectives: The objectives of the course are to :

- Understand the formation of soil and classification of the soils.
- Characterize the Index & Engineering Properties of Soils.
- Determine the flow characteristics & stresses due to externally applied loads.
- Estimate the consolidation properties of soils.
- Determine the shear strength parameters.

MODULE – I

Introduction: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity- Field density by core cutter and sand replacement methods-Relative density.

Index Properties of Soils: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

MODULE –II

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 - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

MODULE –III

Stress Distribution in Soils: 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.

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-Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage

conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, 2nd Edition, New age

International Publishers, 2006

2. Soil Mechanics and Foundation Engineeringby V. N. S. Murthy, CBS Publishers & Distributors/Alkem Company (S), 2011
3. Principals of Geotechnical Engineering by Braja, M. Das, Cengage Learning Publishers, 10th Edition, 2020

REFERENCE BOOKS:

1. An Introduction to Geotechnical Engineering by R. D. Holtz, W. D. Kovacs, and Thomas Sheahan, Pearson, 2nd edition (2011).
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Geotechnical Engineering Principles and Practices by Coduto and M. Y. Ronald, Pearson 2nd edition (2010).
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi (2017).
5. Foundation Engineering by P.C. Varghese, PHI (2005).

E RESOURCES

6. http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf
7. http://www.alljntuworld.in/wp-content/uploads/2015/12/GTE-Lecture-Notes.pdf
8. http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf
9. http://www.nptel.ac.in/courses/105105105/
10. http://www.nptel.ac.in/courses/105105104/

Course Outcomes: At the end of the course the student will able to :

1. Characterize and classify the soils.
2. Estimate seepage, stresses under various loading conditions.
3. Understand laboratory and field compaction characteristics.
4. Analyze the compressibility of the soils.
5. Understand the strength of soils under various drainage conditions.

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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0118	STRUCTURAL ENGINEERING-I (RCC)	L	T	P
Credits: 3		3	0	0

Course Objectives: The objectives of the course are to

- **Identify** the basic components of any structural system and the standard loading for the RC structure.
- **Identify** and **tell** the various codal provisions given in IS. 456 .
- **Describe** the salient feature of limit state method, compare with other methods and the concepts of limit state of collapse and limit state of serviceability.
- **Evaluate** the behaviour of RC member under flexure, shear and compression, torsion and bond.

MODULE - I

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – What is meant by Design? – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000.

Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement

MODULE – II

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

MODULE - III

Design of Two-way slabs with different end conditions, one-way slab, and continuous slab Using I S Coefficients -Limit state design for serviceability for deflection, cracking and codal provisions.

MODULE – IV

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

MODULE – V

Design of foundation - Different types of footings – Design of flat isolated square, rectangular, combined footings for two columns.

TEXT BOOKS:

1. Limit state designed of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International

Publishers.

REFERENCE BOOKS:

1. Reinforced concrete structures, Vol. 1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of India Pvt.Ltd.,
3. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press
4. Design of concrete structures by J.N. Bandhyopadhyay PHI Learning Private Limited.
5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & company.
6. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0H08	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	L	T	P
Credits: 3		3	0	0

Course Objective: To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

MODULE – I: Introduction to Business and Economics

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

MODULE - II: Demand and Supply Analysis

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

MODULE - III: Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

MODULE - IV: Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

MODULE - V: Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications,

International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

Course Outcome:

1. The students will understand the various Forms of Business and the impact of economic variables on the Business.
2. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
3. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

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/

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.

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				

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0119	TRANSPORTATION ENGINEERING	L	T	P
Credits: 3		3	0	0

Course Objectives:

- This course aims at providing a comprehensive insight of various elements of Highway transportation engineering. Topics related to the highway development, characterization of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will be covered as a part of this course.

MODULE -I

Introduction: History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

MODULE – II

Introduction to Highway Geometric Design: Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

MODULE - III

Basic Traffic Characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – on-street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, introduction to interchanges

MODULE - IV

Tests on Soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone

polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Construction of earth roads, WBM roads, bituminous pavements, cement concrete roads.

MODULE -V

Introduction to Pavement Design: Types of pavements and their typical cross sections. Function of Individual layers, Flexible Pavement analysis and design: IRC 37- 2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.

TEXT BOOKS:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014
2. KadiyaliL.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition, First Reprint; Khanna Publishers, New Delhi, 2018

Code of Provisions:

Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

REFERENCE BOOKS:

1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014
4. C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1st Edition, Universities Press, 2016
5. Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage Learning, Stamford, CT, USA, 2010
6. Parthachakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013
7. Nicholas J Garber and Lester AHoel, Traffic and Highway Engineering, 5th Edition, Cengage Learning India Private Limited, New Delhi, 5th Indian Reprint, 2011.

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/
8. http://nptel.ac.in/courses/105105107/

Course Outcomes: At the end of this course, the students will develop:

1. An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance.
2. An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.
3. An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by Indian Roads Congress.
4. An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.
5. An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioural patterns.

CO-PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0120	HYDROLOGY AND WATER RESOURCES ENGINEERING	L	T	P
Credits: 3		3	0	0

Course Objectives: This course provides the description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle. and its components. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.

MODULE - I

Introduction: Concepts of Hydrologic cycle, **Precipitation:** Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

MODULE - II

Abstractions from precipitation:

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Run off: Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis, concepts of watershed management.

MODULE - III

Hydrographs: Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - unit Hydrograph, definition, limitations and applications and Unit hydrograph, S-hydrograph, Synthetic Unit Hydrograph.

MODULE - IV

Groundwater Hydrology: Occurrence, movement and application of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law.

Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants. Crop water requirements – Water requirements of crops – crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation

water; Soil-water relationships, root zones oil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, Micro irrigation.

MODULE - V

Canal systems: Classification of Irrigation canals – Canal Alignment, Design of channels-rigid boundary channels, alluvial channels. Canal outlets non-modular, semi-modular and modular outlets. Waterlogging: causes, effects and remedial measures. Lining of canals-Types of lining-Advantages and disadvantages, Design of unlined canals**,** Drainage of irrigated lands-necessity, methods.

TEXT BOOKS:

1. Hydrology by K. Subramanya (Tata McGraw-Hill).
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers.
3. G L Asawa, Irrigation Engineering, Wiley Eastern .

REFERENCE BOOKS:

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill).
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications.
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N. Duggal and J.P. Soni (New Age International)
5. Manual on Storm Water Drainage System- 2019, CPH EO New Delhi.

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-We															
COS	**Programme Outcomes(POs)**												**PSOs**		
	P	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0121	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.

III. Mix Preparation(Demo)
1. Marshall's Stability Sample Preparation
2. Marshall's Stability sample testing

IV. Traffic lab
1. Volume Studies at Mid Blocks
2. Volume Studies at Intersections
3. Speed Studies using Moving Car Method
4. Parking Studies

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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0122	GEOTECHNICAL ENGINEERING LABORATORY	L	T	P
Credits: 1		0	0	2

Pre-Requisites: Soil Mechanics (Co-requisite)

Course Objectives: To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.

List of Experiments:

1. Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)
2. a) Field density by core cutter method and
   b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

REFERENCE BOOKS:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International, 2002.
2. Manual of Soil Laboratory Testing, K. H., Head, CRC Press, 2006, 3rd Edition.

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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C00M6	INTELLECTUAL PROPERTY RIGHTS	L	T	P
Credits: 0		3	0	0

Course Objectives:

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

Course Outcomes:

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

MODULE – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

MODULE – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

MODULE – III

Law of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

MODULE – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

MODULE – V

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0123	ENVIRONMENTAL ENGINEERING	L	T	P
Credits: 3		3	0	0

Course Objectives: This subject provides the knowledge of water sources, water treatment, design of distribution system wastewater treatment, and safe disposal methods. The topics of characteristics of wastewater, sludge digestion are also included, basics of Air Pollution & Control.

MODULE – I

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

MODULE – II

Layout and general outline of water treatment units: Sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

MODULE - III

Characteristics of sewage :Waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing **–** ultimate disposal of sewage – sewage farming –self-purification of rivers.

MODULE – IV

Waste water treatment plant : Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

MODULE – V

Air pollution: Classification of air pollution– Effects air pollution–Global effects– Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior – Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–

automobile pollution and control.

TEXT BOOKS:

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.ASincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications.
4. Environmental Engineering, I and II by SK Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering CS Rao, Wiley Publications

REFERENCE BOOKS:

1. Water and Waste Water Technology by Steel, Wiley
2. Wastewater engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr. Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson
   /Brooks/Cole; Second Edition 2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0124	FOUNDATION ENGINEERING	L	T	P
Credits: 3		3	0	0

Prerequisite – Geotechnical Engineering Course

Course Objectives:

- To Plan and execute the Soil exploration program for civil Engineering Projects.
- To analyse the stability of slopes.
- To determine the lateral earth pressures and design retaining walls.
- To determine the Bearing capacity of Soils.
- To design pile foundation.

MODULE – I

Soil Exploration: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs 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 slip circle method, method of slices, Bishop's Simplified method of slices

– Taylor's Stability Number- stability of slopes of earth dams under different conditions.

MODULE – III

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.

Retaining Walls: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

MODULE – IV

Shallow Foundations - Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - 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 Capacity through SPT results - pile load tests –Pile under lateral loading - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, New age International Publishers, 2016.
2. Soil Mechanics and Foundation Engineering by V. N. S. Murthy, CBS Publishers and Distributors, 2007.
3. Bowles, J.E., (2001) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing

company, Newyork.

4. Principals of Foundation Engineering by Braja, M. Das, Cengage Learning Publishers, 8th Edition, 2016

REFERENCE BOOKS:

1. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
2. Geotechnical Engineering by S. K. Gulhati & Manoj Datta – Tata McGraw Hill Publishing company New Delhi. 2005.
3. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john Wiley & sons inc (1980)
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0125	STRUCTURAL ENGINEERING – II (STEEL STRUCTURES)	L	T	P
Credits: 3		3	0	0

Course Objectives: The objectives of the course is to

- Explain the mechanical properties of structural steel, plasticity, yield.
- **Describe** the salient features of Limit State Method of design of Steel structures.
- **Identify** and **explain** the codal provisions given in IS. 800.
- **Analyze** the behaviour of steel structures under tension, compression and flexure.
- **Design** the tension, compression, flexural members and plate girder
- Design the connection in steel structure, build - up member and (bolted and welded).

MODULE – I

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths - deflection limits
–serviceability – stability check.

Design of Connections– Different types of connections – Bolted connections – Design strength – efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements- Design of Beam- column connections - Eccentric connections - Type I and Type II connection.

MODULE – II

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

MODULE – III

Design of compression members – Buckling class – slenderness ratio – Design of simple compression members laced – battened columns
Column Splice – column base – slab base.

MODULE – IV

Plastic Analysis; Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beam splice, Introduction to welded plate girders.

MODULE – V

Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design truss design.

TEXT BOOKS:

1. Design of steel structures by S.K. Duggal, Tata McGraw-Hill publishers, 2000, 2nd Edition.
2. Design of steel structures by N. Subramanian, Oxford University press, 2008.
3. Design of steel structures by K.S. Sairam, Pearson Educational India, 2nd Edition, 2013.

REFERENCE BOOKS:

1. Design of steel structures by Edwin H. Gayrold and Charles Gayrold, Tata McGraw hill publishers, 1972
2. Design of steel structures by L.S. Jaya Gopal, D. Tensing, Vikas Publishing House.

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0126	GREEN BUILDING TECHNOLOGIES [Professional Elective-I]	L	T	P
Credits: 3		3	-	-

Prerequisite: Nil

Course Objectives

- To learn about the environmental Implications of building construction materials.
- To learn about suitable Industrial waste materials including Biomass materials that can be used as construction material for various Infra Projects.
- To understand Thermal characteristics and heat flow characteristics of building materials.
- To study about the non-conventional energy resources like solar energy and different case studies.
- To learn about management of water, solid and sewage.

UNIT- I

Introduction

Environmental implications of buildings energy, carbon emissions, water use, waste Disposal. Building materials: sources, methods of production and environmental Implications. Introduction to green buildings, green materials, sources of green materials, Green Globes.

UNIT- II

Implications of Resources

Implication of resources for Building Materials and alternative concepts. Recycling of Industrial and Building Wastes. Biomass Resources for buildings.

UNIT- III

Comforts in Building

Comforts in Building: Thermal Comfort in Buildings-Issues; Heat Transfer Characteristics of Building Materials and Building Techniques.

Various strategies such as Building energy system, water cycle, [IEQ], Material selection strategies.

UNIT- IV:

Energy Conservation

Utility of Solar energy is buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling.

Case studies of Solar Passive Cooled and Heated Buildings.

UNIT- V:

Green Composites for Buildings & Waste Management

Green Composites for buildings. Concepts of Green Composites. Water Utilization in Buildings.

Waste Management: Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage water and Sewage.

TEXT BOOKS:

1. K.S. Jagadish, B.U. Venkatarama Reddy and K.S. Nanjundarao. Alterative Building Materials and Technologies. New Age International, 2007.
2. Michael Bauer, Peter Mosle and Michael Schwarz "Green Building-Guide book for Sustainable Architecture "Springer, 2010.

REFERENCE BOOKS:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Michael F. Ashby Materials and the Environment, Elsevier, 2009.
3. Jerry Yudelson Green building Through Integrated Design McGraw Hill, 2009.
4. Mili M.Ajumdar (Ed) Energy Efficient Building in India. Teri and Mnes, 2001/2002
5. Low Energy Cooling for Sustainable Buildings John Wiley and Sons Ltd. 2009.
6. Green My Home': 10 Steps to Lowering Energy Costs and Reducing Your Carbon Footprint by Dennis.
7. C. Brewer, ISBN: 97814227798411, Publisher: Kaplan Publishing. Publications Date
8. B. Givoni Man, Climate and Architecture Elsevier, 1969.
9. T. A Markus and E. N. Morris Buildings Climate and Energy. Pitman, London Arvindkishan et al (Ed)

Courses Outcomes;

- Relate safety to Green Technology.
- Identify Renewable Energy systems.
- Understand the impact of continued use of non-renewable energy resources.
- Investigate renewable energy systems.
- Understand energy consumption, efficiency & waste management.

E RESOURCES:

1. http://www.ncrec.gov/Pdfs/bicar/GreenBuilding.pdf

Course Outcomes:

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

1. Identify green building materials and their sources.
2. Understand the construction process of green buildings and their benefits quality, healthy and safe environments.
3. Learn the strategies to construct green buildings.
4. Identify the issues a raised due to construction of green buildings.
5. Gain knowledge on the case studies of green buildings.

CO-POMAPPING (3/2/1indicatesstrength of correlation)3-Strong,2-Medium,1-Weak															
COS	**ProgrammeOutcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1		3	2	1	2		3	2	1	1	1	1		2	3
CO2		1	2			2	3			1		1		2	3
CO3	1	1	1				2					1	1	2	1
CO4				2			2			1	2	1		2	
CO5			1			1	1		1	2	1	1		2	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0127	GEOMATIC APPLICATIONS IN CIVIL ENGINEERING	L	T	P
Credits: 3	[Professional Elective-I]	3	-	-

Course Objectives:

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images.
- Know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

UNIT - I:

Concepts of Remote Sensing Basics of remote sensing: Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT- II:

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co- ordinate systems, Map projections, Map transformation, Geo-referencing.

UNIT- III:

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization.

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.

UNIT- IV:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data

accuracy, Micro and Macro components of accuracy, sources of error in GIS. **Spatial Analysis:** Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT- V:

Applications: Land use and landcover mapping determination of crop characteristics, ground water potential identification, pollutant mapping, snow mapping, rainfall runoff modelling, soil erosion, soil classification, water shed prioritization, solid waste collection, water supply.

TEXT BOOKS:

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw-Hill Education (Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 7th Edition, 2015.\
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R. Sathi Kumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.

Course Outcomes: After the completion of the course student should be able to

- **Describe** different concepts and terms used in Remote Sensing and its data.
- Understand the Data conversion and Process in different coordinate systems of GIS interface.
- **Evaluate** the accuracy of Data and implementing a GIS.
- **Understand the applicability of** RS and GIS for various applications.
- **Understand the applications of geomatic concepts**

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0128	SMART CITIES PLANNING AND MANAGEMENT [Professional Elective-I]	L	T	P
Credits: 3		3	-	-

Course Objectives:

- To introduce students on smart city basic concepts, global standards and Indian context of smart cities.
- To understand smart community, smart transportation and smart buildings.
- To understand Energy demand, Green approach to meet Energy demand and their capacities.
- To identify Smart Transportation Technologies in cities and concepts towards smart city.

UNIT – I: **Introduction to Smart Urban Infrastructures and Smart Cities**: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities Smart Cities – Global Standards and Performance Benchmarks, Practice Codes -Indian scenario - India "100 Smart Cities" Policy and Mission.

UNIT – II: **Smart Cities Planning and Development**: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water – Cyber Security, Safety, and Privacy - Internet of Things, Block chain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT – III: **Smart Urban Energy Systems** – I: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – a statistical analysis -Meeting energy demand through direct and indirect solar resources - Efficiency of indirect solar resources and its utility, Capacity limit for the indirect solar resources - Effectiveness in responsive environment in smart city; Smart communication using green resources.

UNIT – IV: **Smart Urban Energy Systems** – II: Introduction to PV technology - PV of various scale for smart city applications - Energy efficiency - Policies of Solar PV in smart domains (RPO, REC, Carbon credit, etc.) Definition - Structure of Smart Grid - Indian Perspective - Advantage & limitation - Definition, Structure of Smart Grid- Indian Perspective Advantage & limitation.

UNIT – V: **Smart Urban Transportation Systems**: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanagachidambaresan, R. Maheswar,
2. V. Manikandan, K. Ramakrishnan, Springer, 2020 2. Society 5.0: A People-centric

Super-smart Society, Hitachi-UTokyo Laboratory (HUTokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCE BOOKS:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity YuminJoo, Yu- Min Joo, Teck- Boon Tan, Edward Elgar Pub, 2020.
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020.
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier. 2020.

Course Outcomes: After completion of the course, the student should be able to

- Recognize smart city concepts and their international and national standards.
- Recognize smart community, transportation and building concepts.
- Develop and calibrate energy demand and their capacity limits.
- Predict the various smart urban transportation systems and the transition from existing city towards a smart city.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:C0129	ROAD SAFETY SYSTEM [Professional Elective-I]	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.

MODULE I DESCRIPTION OF PROBLEMS
Causes of accidents – Human factors – Vehicles – Road and its condition – Environmental Studies

MODULE II ACCIDENT ANALYSIS TECHNIQUES
Collision Diagram – Preparation, Spatial Analysis of Accidents – Methods and GIS in Accident Analysis - Black Spot, Black Route and Area Identification

MODULE III BEFORE AND AFTER STUDIES
Part A: Accident Prediction Models – Development
Part B: Empirical Bayees Approach – Before and After Evaluation – Case Studies

MODULE 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.

MODULE 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		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0130	DISASTER MANAGEMENT & MITIGATION (PROFESSIONAL ELECTIVE-IV)	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				

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:C0131	ENVIRONMENTAL ENGINEERING LABORATORY	L	T	P
Credits:1		0	0	2

Course Objectives: The objectives of the course are to

- **Perform** the experiments to determine water and waste water quality.
- **Understand** the water & wastewater sampling, their quality standards.
- **Estimate** quality of water, wastewater, Industrial water.

Practical Work: List of Experiments

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD
12. Determination of Residual Chlorine
13. Total count
14. Noise level measurement

TEXT/REFERENCE BOOKS:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson
/ Brooks/ Cole; Second Edition 2008.
3. Peavy, H. s, Rowe, D. R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
4. Met Calf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw- Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S. M. Patil, 1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Course Outcomes: After the completion of the course student should be able to

1. Understand about the equipment used to conduct the test procedures.
2. Perform the experiments in the lab.
3. Examine and Estimate water, waste water, air and soil Quality.
4. Compare the water, air quality standards with prescribed standards set by the local governments.
5. Develop a report on the quality aspects of the environment.

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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:C0132	COMPUTER AIDED DESIGN LABORATORY	L	T	P
Credits:1		0	0	2

Pre-Requisites: Computer Aided Civil Engineering Drawing Principles –Excel- Structural Engineering
-1 & 2

Course Objectives: The objectives of the course are to

- Learn the usage of any fundamental software for design.
- Create geometries using pre-processor.
- Analyse and Interpret the results using post processor.
- Design the structural elements.

List Of Experiments

1. Analysis & Design determinate structures using a software
2. Analysis & Design of fixed & continuous beams using a software
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL, LL, WL, EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built-up steel beam
8. Developing an excel template for foundation design
9. Detailing of RCC beam and RCC slab
10. Detailing of RCC column and RCC footing

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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0H03	ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY	L	T	P
Credits:1		0	0	2

1. **Introduction**

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. **Objectives:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. **Syllabus**:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading

– Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub- skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension

– Exercises for Practice.

2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application – Resume vs. Curriculum Vitae
   – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette
   – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills -** Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation
4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies
   – Exercises for Practice.
5. **Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

4. **Minimum Requirement:**
   The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. **Suggested Software:** The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

6. **Books Recommended:**

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice.* (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use*
   Series. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power.* Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ.* Bloomsbury Publishing.

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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C00P1	INDUSTRY ORIENTED MINI PROJECT/INTERNSHIP	L	T	P
Credits:2		0	0	4

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

6. Identify project goals, constraints, deliverables, performance criteria, control needs and requirements.
7. Implement concepts, tools and techniques to do quality projects.
8. Adapt projects in response to issues that arise internally and externally.
9. Interact with team and stakeholders in a professional manner, respecting differences, to ensure a collaborative project environment.
10. 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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C00M5	CONSTITUTION OF INDIA	L	T	P
Credits: 3		3	0	0

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

MODULE - 1 History of Making of the Indian Constitution- History of Drafting Committee.
MODULE - 2 Philosophy of the Indian Constitution- Preamble Salient Features
MODULE - 3 Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

MODULE - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

MODULE - 5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

MODULE - 6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru.
- The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0133	QUANTITY SURVEY & VALUATION	L	T	P
Credits:3		3	0	0

Course Objectives: The subject provide process of estimations required for various work in construction. To have knowledge of using SOR &SSR for analysis of rates on various works and basics of planning tools for a construction projects.

MODULE – I

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

MODULE – II

Detailed estimation of single and multi storied building.

MODULE – III

Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

MODULE – IV

Rate Analysis – Working out data for various items of work over head and contingent charges.

MODULE-V

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation - Standard specifications for different items of building construction.

NOTE: NUMBER OF EXERCISES PROPOSED:

1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

TEXT BOOKS:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016
4. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014

REFERENCE BOOKS:

1. Standard Schedule of rates and standard data book by public works department.
2. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works

– B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

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	

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0134	PROJECT MANAGEMENT	L	T	P
Credits:3		3	0	0

Course Objective: The Objective of this course is to lay on important foundation to student in managing projects with a special focus on every phase such as project planning, execution, monitoring and evaluation.

MODULE- I:

Introduction: Introduction to Project management – Project Characteristics-Project Life cycle- Project Identification. Formulation and implementation. Project management in different sectors: Construction, Services Sector, Public sector and Government Projects. Systems approach to project management.

MODULE- II:

Project Planning and Appraisal: Project Planning – Project Appraisal-Feasibility Study-Technical, Commercial, Economic, Financial, Management, Social Cost Benefit Analysis-Project Risk Analysis.

MODULE- III:

Project Finance: Project Cost Estimation, Project Financing-Investment Criteria. Project Evaluation Techniques - Pay Back Period, Accounting rate of return. Net present value, Internal Rate of return, Profitability Index, Cash Flows Estimation for new and replacement projects-Cost of Capital, Risk Analysis.

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MODULE- IV:

Project Planning and Control: Planning Steps-Scheduling- Network Diagrams. Network Analysis, Critical Path, Quality Management, Project Execution, Monitoring and control, Agile project Management, Scrum, Lean Production and project management.

MODULE- V; Organizational Behavior and Project Management: Organizational Structure and Integration, Role of Project manager, Roles in the project team, Project stakeholder engagement. Leadership in project management, participative management, team building approach. Conflict Management in Projects, Stress Management.

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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:B0135	PRESTRESSED CONCRETE [Professional Elective-II]	L	T	P
Credits: 3		3	-	-

Prerequisites: Concrete Technology, DRCS

Pre-Requisites: Reinforced Concrete Design

Course Objectives: The objectives of the course are to

- Understand the principles & necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.
- Understand Analysis and design of prestressed concrete members.

UNIT - I:

Introduction: Historic development- General principles of prestressing pre-tensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.

UNIT - II:

Methods and Systems of prestressing: Pre-tensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system. **Losses of Prestress:** Loss of prestress in pretensioned and posttensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT - III:

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions**.**

UNIT - IV:

Transfer of Prestress in Pretensioned Members: Transmission of prestressing 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, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

UNIT - V:

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

Deflections: Importance of control of deflections- Factors influencing deflections – Short

term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

REFERENCE BOOKS:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

Reference Codes: IS 1343:2016

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:B0136	ELEMENTS OF EARTHQUAKE ENGINEERING [Professional Elective-II]	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Structural Engineering –II & RC Design.

Course Objectives: The objectives of the course are to

- Understand Engineering Seismology.
- Explain and discuss single degree of freedom systems subjected to free and forced vibrations.
- Acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes.
- understand importance of ductile detailing of RC structures.

UNIT - I

Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales- Energy Released- Earthquake measuring instruments seismogram - Seismoscope, Seismograph, - strong ground motions- Seismic zones of India.

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system- Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation- Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

UNIT - II

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of buildings- Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials- unconfined concrete-confined concrete-masonry-reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations- basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members-Structural models for frame buildings- Seismic methods of analysis- IS code based methods for seismic design- Vertical irregularities- Plan configuration problems- Lateral load

resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT - IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

NIT - V

Ductility: Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 -Behaviour of beams, columns and joints in RC buildings during earthquakes.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N. Iyengar, I.K. International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy

BIS Codes: **1**. IS 1893(Part-1):2016. **2**. IS 13920:2016. **3.** IS 4326. **4**. IS 456:200

Course Outcomes: After the completion of the course student should be able to

- Explain and derive fundamental equations in structural dynamics.
- Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes.
- Evaluate base shear using IS methods.
- Design and Detail the reinforcement for earthquake forces.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VII Semester		
Code:C0137	ADVANCED STRUCTURAL ANALYSIS [PROFESSIONAL ELECTIVE-II]	L	T	P
Credits: 3		3	-	-

Course Objectives: The objectives of the course are to

- Understand the matrix method of analysis statically indeterminate frames and trusses.
- Know the transformation of coordinates and assembly of stiffness matrices.
- Differentiate between flexibility and stiffness methods of analysis of beams, frames and plane trusses.
- Understand the structural behavior of large frames with or without shear walls.

UNIT - I

Introduction to matrix methods of analysis statically indeterminacy and kinematics indeterminacy- degree of freedom-coordinate system-structure idealization stiffness and flexibility matrices-suitability element stiffness equations-elements flexibility equations-mixed force-displacement equations-for truss element, beam element and tensional element Transformation of coordinates-element stiffness matrix-and load vector-local and global coordinates.

UNIT - II

Assembly of stiffness matrix from element stiffness matrix-direct stiffness method-general procedure- bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.

UNIT - III

Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.

UNIT - IV

Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.

UNIT - V

Special analysis procedures-static condensation and sub structuring-initial and thermal stresses. Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.

TEXT BOOKS:

1. Advanced Structural Analysis by A.K. Jain Nemchand Publishers.
2. Matrix methods of structural analysis by Pandit and Gupta.

REFERENCE BOOKS:

1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.

3. Matrix methods of structural analysis by J Meek
4. Structural Analysis by Ghali and Neyveli

Course Outcomes: After the completion of the course student should be able to

- Analyze the multistory building frames by various approximate methods.
- Solve the continuous beams, portal frames by matrix methods of analysis.
- Analyze and design of large frames with or without shear walls.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VII Semester		
Code:C0138	ADVANCED CONCRETE TECHNOLOGY [Professional Elective-II]	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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:C0139	REHABILITATION AND RETROFITTING OF STRUCTURES [Professional Elective-II]	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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0140	EARTH RETAINING STRUCTURES [Professional Elective-III]	L	T	P
Credits:3		3	-	-

Course Objectives:

- To estimate earth pressure under different loads and conditions.
- To determine the stability of gravity and cantilever Retaining walls.
- To design sheet pile walls and bracings.
- To design Reinforced soil walls.

UNIT - I

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

UNIT - II

Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage.

UNIT - III

Flexible Walls: Sheet pile walls, Construction methods- Cantilever and Anchored (Free and Fixed support methods) sheet pile walls in coarse and fine grained soils, Rowe's moment reduction method.

UNIT - IV

Braced Cuts: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation, Diaphragm walls – slurry support.

UNIT - V

Reinforced Soil Walls/Mechanically Stabilized Earth: - Introduction to geosynthetics – Functions and applications - Failure mechanisms of Reinforced soil walls -bond and rupture failures- Internal and external stability by Static analyses -Soil Nailing.

TEXT BOOKS:

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey

REFERENCE BOOKS:

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)

2. Rowe, R. K. - Geotechnical & Geo-environmental Engineering Hand Book - Springer (2001)
3. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.

Course Outcome: At the end of the course the student will able to

- Calculate the earth pressures under different applied loads and ground conditions.
- Assess stability of conventional retaining walls.
- Design flexible retaining walls under different soil and fixity conditions.
- Design the supporting systems for excavations.
- Design geosynthetic reinforced earth walls.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0141	GROUND IMPROVEMENT TECHNIQUES [Professional Elective-III]	L	T	P
Credits:3		3	-	-

Prerequisites: Geo-Technical Engineering, Foundation Engineering

Course Objectives:

- To Identify difficult ground conditions in engineering practice.
- To select suitable ground improvement techniques for problematic soils.
- To assess suitable physical, chemical, mechanical and hydraulic modifications.

UNIT - I

Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

UNIT - II

Mechanical Modification – Deep Compaction Techniques- Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

UNIT - III

Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering. Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains.

UNIT - IV

Physical and chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen; Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control.

UNIT - V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

TEXT BOOKS:

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis
3. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey.

REFERENCE BOOKS:

1. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
2. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
3. K. Krisch& F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis.
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

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 the student will able to

- Understand the various ground improvement methods.
- Assess different compaction methods for ground modification.
- Design dewatering systems to reduce the settlements.
- Comprehend stabilizations with chemical and grouting techniques.
- Understand the principles of soil reinforcement and confinement in engineering constructions.

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		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0142	STABILITY ANALYSIS OF SLOPES	L	T	P
Credits: 3	[Professional Elective-III]	3	-	-

Course Objectives:

- To know the basic concepts of slope stability.
- To identify various causes of failure of slopes.
- To analyse and design the slopes under various loading.
- To adopt slope protection methods.

UNIT - I

Earth and Rock fill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.

UNIT - II

Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters.

UNIT - III

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non- circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes. Taylor Charts.

UNIT - IV

Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Introduction to Seismic stability, Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).

UNIT - V

Slope Protection and Rock fill Dams: Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete). Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures, Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

TEXT BOOKS:

1. Engineering for Embankment Dams, B. Singh and R. S. Varshney, A.A. Balkema, 1995.
2. Embankment Dams, H.D. Sharma, Oxford and IBH Publishing Co., 1991.

REFERENCE BOOKS:

1. Earth and Earth Rock Dams, J. L. Sherard, John Wiley & Sons Inc, 1963.
2. Earth and Rockfill Dams, Christian Kutzner, A.A. Balkema, 1997
3. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
4. Sowers, G.F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
5. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilization methods – John Wiley & sons. (2002).
6. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.

Course Outcomes: At the end of the course the student will able to

- Select suitable site and materials for the construction of earth / rockfill dams.
- Analyse seepage through a given earth / rockfill dam section and propose suitable seepage control measures.
- Analyse the stability of earthen dams.
- Design the slopes by using different analytical methods.
- Implement slope protection methods.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0143	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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0144	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	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0145	DESIGN OF HYDRAULIC STRUCTURES (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Hydraulics, Hydrology &Water Resources Engineering

Course Objectives: To study various types of storage works and, diversion headwork, their components and design principles for their construction.

UNIT - I

Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve-Reservoir Sedimentation

–Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

UNIT - II

Gravity dams: 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.

UNIT- III

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

UNIT- IV

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

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 - Launching Apron.

UNIT- V

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canal escapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: types, selection of suitable type, various types, design considerations for cross drainage works

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic structures by Santhosh Kumar Garg, Khanna Publishers.
2. Irrigation engineering by K. R. Arora Standard Publishers.
3. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., New Delhi

REFERENCE BOOKS:

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

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

- Know types of water retaining structures for multiple purposes and its key parameters considered for planning and designing.
- Understand details in any Irrigation System and its requirements.
- Know, Analyze and Design of a irrigation system components.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0146	ADVANCED WATER RESOURCES ENGINEERING (Professional Elective-IV)	L	T	P
Credits:3		3	-	-

Course Objectives:

- Overview of Statistical applications in Hydrology.
- General Idea of Flood routing.
- Summary of various flood mitigation measures.
- Overview of climate and causes of climate change.
- Summary of Optimization models and applications.

UNIT - I:

Statistics in Hydrology: Random variables, probability of hydrologic events, probability (Gumbel, Log- Pearson type-III distribution) and statistical methods for flood frequency, trend analysis for hydrologic events.

Regression Analysis: Identification of appropriate models, parameters estimation by the least square method, measures of goodness fit, uncertainty features of LS based model parameters, statistical Inferences of Regression Coefficients, confidence Interval. Multivariate linear regression and correlation.

UNIT - II:

Flood Routing: Mathematics of flood routing, various methods of flood routing, Hydrologic and Hydraulic routing. -Modified Puls Method- Muskhinghum Method-flood forecasting (unit hydrograph method)

UNIT - III

Flood mitigation: flood ways, channel improvement, evacuation and flood proofing, land management, flood plain management, estimating benefits of flood mitigation.

Flood plain adjustments and regulations: Results of controlling floods, alternatives to controlling floods, range of possible adjustments, practical range of choice, critical characteristics of flood hazards.

UNIT - IV

Climate System- Weather and Climate- Overview of earth-atmosphere- vertical structure of atmosphere- Radiation and Temperature- Temperature variation- vertical variation in Air temperature- temperature extremes. Causes of climate change - Modeling of climate change-General circulation models (GCMs) –IPCC scenarios - IPCC Assessment Report (AR5) - Physical Science basis.

UNIT - V

Optimization Techniques, Model Formulation, models, General L.P Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Model. Formulation of a LPP - revised simplex method - duality theory - dual simplex method - sensitivity analysis.

Introduction and Applications of ANN, Machine and Deep Learning in water resources Engineering.

TEXT BOOKS:

1. Vedula S. and. Mujumdar P.P. '*Water resources Systems'*, McGraw-Hill Publishing Company, New Delhi. 2005
2. Ven TeChow, '*Hand book of Applied Hydrology'* McGraw-Hill Book Company, New York., 1964
3. Subramanya, K. '*Hydrology for Engineers'*, Tata McGraw-Hill Publishing Company, New Delhi. (1984.
4. Raja Sekharan S. and Vijaya Laxmi Pai G. A., '*Neural Networks, Fuzzy Logic, and Genetic Algorithm'*, Prentice-Hall of India, New Delhi. 2003

REFERENCE BOOKS:

1. Snedecor, G.W., and W.G. Cochran, '*Statistical Methods'*, East West Press, New Delhi. 1994
2. Alfredo, H.S. and Tang Wah, '*Probability Concepts in Engineering Planning and Design: Vol-I (Basic Principles),* John Wiley & Sons, New York. 1975
3. RL Wilby, SP charles, E Zoritaa, B Timbal, P WHetton, LO Mearns - *Guide lines for use of climate science from Statistical Modeling models*. 2004
4. *Physical science basis of AR 5 report of IPCC - working group I contribution to Assessment Report*- https://ipcc.ch/report/ar5/wg1/ 2013.

Course Outcomes: Students are expected to have gained knowledge of

- Ability to apply statistical techniques for flood frequency studies and hydrological events and Applications of Regression Models for estimation of various parameters.
- Applications of flood routing, flood forecasting techniques for real time flood studies.
- Understanding of various mitigation measures for control of floods.
- Understanding of climate change using GCM models.
- Ability to formulate optimization models and soft computing applications

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:C0147	GROUND WATER HYDROLOGY (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Hydraulics & Fluid Mechanics

Course objectives: The objectives of the course are:

- **To explain** the concepts of Groundwater Development and Management.
- To **demonstrate and** derive the basic equations used in Groundwater development and management and the corresponding equations.
- To know the investigations, field studies to conduct basic ground water studies.

UNIT- I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. Ground Water Movement- Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.

UNIT- II

Analysis of Pumping Test Data-I: Steady flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's equations, assumptions, formation constants, yield of an open well interface and well tests.

UNIT- III

Analysis of Pumping Test Data-II: Unsteady flow towards well-Non-Equilibrium equations, Thesis solution, Jocob and Chow's simplifications, Leak aquifers.

UNIT- IV

Surface and sub-surface Investigation: Surface methods of exploration-Electrical resistivity method and Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

UNIT- V

Saline water intrusion in aquifer: Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.

2. Ground water by H. M. Raghunath, Wiley Eastern Ltd.
3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

REFERENCE BOOKS:

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C. W. Fetta, CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

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

- **Identify** different fundamental equations and concepts as applied in the Groundwater studies.
- **Discuss** and derive differential equation governing groundwater flow in three dimensions.
- To **solve** groundwater mathematical equations and analyze pumping tests in steady and non- steady flow cases.
- **Distinguish** and understand the saline water intrusion problem in costal aquifers.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:C0148	WATERSHED MANAGEMENT (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Course Objectives:

- Introduce students to watershed processes and functions and to the principles underpinning watershed management and decision-making.
- Examine strategies for planning and management of watershed resources in general, and in the particular contexts of developing countries.
- Provide exposure to watershed management issues for a wide range of conditions from watersheds relatively non- impacted by human development to those heavily impacted by development and to the restoration techniques and issues required.
- Provide an opportunity for in-depth practical teamwork in the formulation of watershed management strategies and plans.

UNIT-I

INTRODUCTION: Concept of watershed development, objectives of watershed development, need for atershed development in India, Integrated and multidisciplinary approach for watershed management.

CHARACTERISTICS OF WATERSHED: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II

Watershed delineation – Runoff Computations from a watershed – Flood Frequency Analysis – Gumbell, Log Pearson and Weibull Methods of Analysis.

UNIT-III

PRINCIPLES OF EROSION: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

MEASURES TO CONTROL EROSION: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-IV

WATER HARVESTING: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

FOREST AND GRASS LAND MANAGEMENT: Interpretation of Satellite Imageries- Land use and Land Cover. Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT-V

RESSERVOIR 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.

Course Outcomes:

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

1. Understand the concepts of watershed management and its effect on land, water and ecosystem resources
2. Identify causes of soilerosion
3. Plan and design soil conservation measures in awatershed
4. Analyze public policies and practices of watershedplanning
5. Plan and design water harvesting and groundwater rechargestructures

TEXT BOOKS:

1. Watershed Management by JVS Murthy, - New AgeInternationalPublishers.
2. Water Resource Engineering by R.Awurbs and WP James, - PrenticeHallPublishers.

REFERENCE:

1. Land and Water Management by VVN Murthy, -KalyaniPublications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall ofIndia.

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

CO S	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CO 1		2				1	1			1		1	1		
CO 2	1				2			2				2		2	
CO 3	1	2					3					2		1	3
CO 4		2		3	2	3		2		3		2		1	
CO 5	3	2		2		3	2		2		3	1			2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:C0149	REMOTE SENSING & GIS (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Prerequisite: Surveying

Course Objectives: The objectives of the course are to

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images.
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types.
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT - II:

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co- ordinate systems, Map projections, Map transformation, Geo-referencing.

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization.

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.

UNIT - III:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT - IV:

Awareness and digitization of GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS.

UNIT - V:

Applications of GIS: GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

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, 1st Editon, 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: After the completion of the course student should be able to

- **Describe** different concepts and terms used in Remote Sensing and its data.
- Understand the Data conversion and Process in different coordinate systems of GIS interface.
- **Evaluate** the accuracy of Data and implementing a GIS.
- **U**nderstand the applicability of RS and GIS for various applications.

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C0150	CIVIL ENGINEERING SOFTWARE LABORATORY	L	T	P
Credits: 1		0	0	3

Course Objectives:

- Analyze and design structural elements.
- Apply water resources related problems.
- Design various geometric elements using transportation software.
- Analyze slope stability and seepage determination.
- Estimate the quantities of civil engineering structures.

Student Version Softwares:

Group 1	Group 2	Group 3	Group 4	Group 5
1. STAAD 2. DESIGN BUILDER 3. MIDAS 4. ETabs	1. CIVIL 3D 2. ISSIM 3. ISSUM 4. MX Road	1. Plaxis 2. Geo Studio	1. eQuest 2. EPA SWMM 3. EPA EPZ Suite 4. EPA NET 5. QGIS 6. HECRAS	1. PRIMAVERA 2. TEKLA 3. RS & GIS

***Note:**

1.) Open/education/academic version of software is desirable.

2.) The student may choose any software one from each of the groups.

List of experiments:

1. Estimate, planning and management of any one civil engineering structure.
2. Analyze and design G+3 building.
3. Design various geometric elements and intersections for any Highway.
4. Analyze slope stability and seepage determination.
5. Analyze and design water networks, storm water, channel flow and flood determination.

Course Outcomes: At the end of the course the student should be able to:

1. Understand the features and capabilities of the software.
2. Apply fundamental principles in problem solving using software tools.
3. Apply the software algorithm in the domain area.
4. Develop solution for a range of problem of civil engineering using software tools and
5. Able to prepare technical report.

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

2022-23 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:C00P2	PROJECT STAGE –I	L	T	P
Credits: 6		0	0	6

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

11. Identify project goals, constraints, deliverables, performance criteria, control needs and requirements.
12. Implement concepts, tools and techniques to do quality projects.
13. Adapt projects in response to issues that arise internally and externally.
14. Interact with team and stakeholders in a professional manner, respecting differences, to ensure a collaborative project environment.
15. 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

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:C0151	SOLID WASTE MANAGEMENT [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Course Objectives: The objectives of the course are to

- **Define** the terms and understand the necessity of solid waste management.
- **Explain** the strategies for the collection of solid waste.
- **Describe** the solid waste disposal methods.
- **Categorize** Hazardous Waste.

UNIT - I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques.

UNIT - III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolisis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT - IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT - V

Hazardous waste Management: Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

Course Outcomes: At the end of the course the student will able to:

- Identify the physical and chemical composition of solid wastes.
- Analyze the functional elements for solid waste management.
- Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
- Identify and design waste disposal systems.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:C0152	**ENVIRONMENTAL IMPACT ASSESSMENT** [Professional Elective-V]	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Course Objectives: The objectives of the course are to

- **Define and Classify** Environmental Impacts and the terminology.
- **Understands** the environmental Impact assessment procedure.
- **Explain** the EIA methodology.
- **List and describe** environmental audits.

UNIT - I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT - II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions - Construction Stage Impacts, post project impacts.

UNIT - III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT - IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT - V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Airports.

TEXT BOOKS:

1. Anjaneyulu.Y and Manickam. V. Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

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

- Identify the environmental attributes to be considered for the EIA study.
- Formulate objectives of the EIA studies.
- Identify the methodology to prepare rapid EIA.
- Prepare EIA reports and environmental management plans.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:C0153	AIR POLLUTION [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Course Objectives: The objectives of the course is to

- **Understand the** Air pollution Concepts.
- **Identify** the source of air pollution.
- **Know** Air pollution Control devices.
- **Distinguish the** Air quality monitoring devices.

UNIT - I

Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution- Global effects– Ambient Air Quality and standards– Monitoring air pollution, Sampling and analysis of Pollutants in ambient air – Stack sampling.

UNIT - II

Meteorology and Air Pollution: Factors influencing air pollution , Windrose , Mixing Depths , Lapse rates and dispersion - Atmospheric stability, Plume behavior, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT - III

Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution - Control mechanism

- Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.

UNIT - IV

Control of Gaseous Pollutants: Process and equipment for the removal by chemical methods - Working principles and operation of absorption and adsorption equipment - Combustion and condensation equipment.

UNIT - V

Automobile and Indoor Pollution: Vehicular pollution – Sources and types of emission – Effect of operating conditions-Alternate fuels and emissions-Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and air cleaning systems-indoor air quality.

TEXT BOOKS:

1. M. N. Rao and HVN Rao, Air Pollution, Tata McGraw Hill Publishers
2. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.

REFERENCE BOOKS:

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford &I.B.H.
3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L.

Maynard publisher Academic Press.

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

- Identify sampling and analysis techniques for air quality assessment.
- Describe the plume behavior for atmospheric stability conditions.
- Apply plume dispersion modelling and assess the concentrations.
- Design air pollution controlling devices.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:C0154	INDUSTRIAL WASTE WATER TREATMENT [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Course Objectives:

- Students will be able to characterize the waste and apply the knowledge of laws for municipal solid waste management, for handling of biomedical wastes and for handling of plastic wastes.
- Students will be able to apply the knowledge of mathematics, science, and engineering for effective solid wastes collection systems, for waste collection route optimization and for processing of solid waste.
- Students will be able to design composting systems, maintain and operate the aerobic and anaerobic composting process for effective organic waste recycling.
- Students will be able to manage construction and operations of landfill facilities, energy recovery systems and management of leachate systems.
- Students will understand the working, operation and maintenance of incinerators and air pollution control equipments.

UNIT – I

Sources of Pollution - Physical, Chemical, Organic & Biological properties of Industrial Wastes - Difference between industrial & municipal waste waters

Industrial waste water discharges into streams. Lakes and oceans and problems. Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries.

UNIT – II

Basic theories of industrial waste water management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems.

UNIT – III

Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods.

UNIT – IV

Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT – V

Manufacturing Process and design origin of liquid waste from Suger Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods. Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

TEXT BOOK:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

REFERENCES:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

Course Outcomes:

- Understands components of solid waste management and the laws governing it.
- Understands the solid waste collection systems, route optimization techniques and processing of solid wastes.
- Understands the design, operation and maintenance of landfills and composting units.
- Understands the importance and techniques of operation and maintenance of incinerators.

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:C0155	GEO ENVIRONMENTAL ENGINEERING [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Course Objectives:

- To introduce traditional curriculum consisting mostly of practical courses in numerous special aspects of soil engineering.
- To accentuate the understanding of the basic principles and exposes the student to the latest developments, with a strong research orientation.
- To mould the students with broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

UNIT-I

SOURCES AND SITE CHARACTERIZATION: Scope of Geo-environmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

UNIT-II

SOLID AND HAZARDOUS WASTE MANAGEMENT: Classification of waste, Characterization solid wastes, Environmental Concerns with waste, waste management strategies.

UNIT-III

CONTAMINANT TRANSPORT: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

UNIT-IV

REMEDIATION TECHNIQUES: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

UNIT-V

LANDFILLS: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

Course Outcomes:

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

- An understanding to function on multidisciplinary teams.
- A critical awareness of current issues in Geotechnical Engineering.
- Improvising techniques, skills, and modern engineering tools necessary for successful career in geotechnical engineering practice.
- Ground Water Contamination
- Emerging Remediation Technologies.

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

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: C0156	AIRPORTS, RAILWAYS AND WATERWAYS [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Course Objectives: The objectives of the course are to

- Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
- Introduce component of railway tracks, train resistance, crossing, signalling, high speed tracks and Metro Rail.
- Explain the classes of harbours, features, planning and design of port facilities.

UNIT - I

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

UNIT - II

Introduction to Railways: Role of Indian Railways in national development – Railways for Urban Transportation – LRT, Mono Rail, Metro Rail &MRTS. Permanent Way: Components and their Functions: Rails

- Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Ballast, Functions, Materials, Ballast less Tracks, Subgrade and Embankments –Functions and Materials.

UNIT - III

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT - IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signalling and Interlocking - Track Circuiting - Track Maintenance.

UNIT - V

Dock & Harbour Engineering: Port and Harbour Engineering: Types of water transportation, water transportation in India, Requirements of Ports and Harbours, Classification of Ports and Harbours, Breakwaters, Dry docks, fenders, piers, wharves, Jetties, Navigational Aids : types, Requirements, Maintenance of Ports and Harbours. Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: docks,

wet docks, slipways, Locks.Dredging: classification, dredgers, uses of dredged materials.

TEXT BOOKS:

1. Venkataramaiah C (2016), "Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

REFERENCE BOOKS:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportation Engineering by R. Srinivasa Kumar, University Press India.

Course Outcomes: At the end of this course, the students will develop:

- An ability to design of runways and taxiways.
- An ability to design the infrastructure for large and small airports.
- An ability to design Super elevation and transition curve for railway horizontal curves.
- An ability to design various crossing sturnout and signals in Railway Projects.
- An ability plan the harbours and ports projects including the infrastructure required for new ports and harbours.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: C0157	PAVEMENT ASSET MANAGEMENT [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Course Objectives: The objectives of the course are to

- Understand the role of Pavement Asset Management.
- Understand the Flexible pavement failures and importance of maintenance.
- Understand the Rigid pavement failures and importance of maintenance.
- Understand pavement evaluation.
- Understand pavement performance and deterioration modeling.

UNIT - I:

Introduction to Pavement Asset Management

Introduction to road assets: Pavement structure, shoulders, road side tree plantations, street lighting, traffic signs, traffic signals, intersection elements, interchange elements; Pavement Management as a part of Road Asset Management: Evolution and Development of Pavement Management Systems (PMS), Components of PMS and their inter linkages, Project and Network level PMS.

UNIT - II:

Flexible Pavement Failures and Maintenance

Flexible Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of surface defects, deformation and disintegration of flexible pavements.

Maintenance of Flexible Pavements: Periodic maintenance: periodic renewals, need and importance of periodic renewals, planning and programming of renewals, identification of stretches to be renewed, types of renewal treatments, periodicity of renewal, rectification of profile at the time of renewal; pothole filling / patching, tools and equipment for pothole / patch repairs, modern mobile mechanized pothole filling/road patching technologies, arrangements for traffic and safety measures during road maintenance, preventive maintenance: introduction, selection of preventive maintenance treatment, warrants for preventive maintenance, flexible pavement preservation tools.

Importance of maintenance: Homogeneous sections by AASHTO's cumulative difference approach, types of maintenance – Preventive maintenance, minor rehabilitation, major rehabilitation, reconstruction; planning of maintenance activities.

UNIT - III:

Rigid Pavement Failures and Maintenance

Rigid Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of joint spalling, faulting, polished aggregate, shrinkage cracking, pumping, linear cracking, durability cracking;

Maintenance of Rigid Pavements: Assessing maintenance needs, methods for repairing

concrete pavements, crack sealing and joint resealing, crack stitching (cross stitching), partial-depth repair, full depth repair, slab stabilization, special techniques for rehabilitation of rigid pavements, repair materials, tools and plant, planning the maintenance operations, arrangement for traffic and safety, rigid pavement preservation tools.

UNIT - IV:

Pavement Evaluation: Pavement Structural Condition Evaluation: Importance of structural condition evaluation of pavements, benkelman beam technique for flexible pavement evaluation, falling weight deflectometer technique for both flexible and rigid pavements

Pavement Functional Condition Evaluation: Importance of functional condition evaluation of pavements, pavement roughness concepts; instrumentation used to assess pavement roughness, international roughness index and its importance, measurement of surface defects in both flexible and rigid pavements

Pavement Safety Condition Evaluation: Pavement texture, importance of surface friction characteristics on pavement safety, discussion on the methods of evaluation of pavement safety

UNIT - V:

Pavement Performance and Deterioration Modelling: Structural condition (Distress) models, functional condition models, initiation models and progression models; Combined measures of pavement quality, discussions on condition indices and serviceability indices, pavement condition rating, introduction to pavement rating manuals by different agencies.

TEXT BOOKS:

1. Ralph Haas, Ronald Hudson, Zanieswki with Lynne Cowe Falls, "Pavement Asset Management', Wiley, 2015.
2. Shahin, M.Y., "Pavement Management for Airports, Roads and Parking Lots", Springer, 2nd Edition, 2005

REFERENCE BOOKS:

1. IRC 82: 2015, First Revision, Code of Practice for maintenance of Bituminous Road Surfaces
2. IRC SP 83: 2018, First Revision, Guidelines for maintenance, repair and rehabilitation of cement concrete pavements
3. Feng Li, Jinyan Feng, Youxin Li, Siqi Zhou, Preventive Maintenance Technology for Asphalt Pavement, Springer, 2021
4. ACRP Synthesis 22, Common Airport Maintenance Practices, Transportation Research Board, Washington DC, 2011
5. R. Keith Moble, An Introduction to Predictive Maintenance, Second Edition, Butterworth Heinemann Publications, 2002
6. NCHRP 523 – "Optimal Timing of Pavement Preventive Maintenance Treatment Applications", Transport Research Board, 2004
7. NCHRP Synthesis 501 – "Pavement Management Systems: Putting data to work – A Synthesis of Highway Practice, Transport Research Board, 2017
8. Highway Rating manuals
9. HDM 4 manuals
10. Derek Pearson, "Deterioration and Maintenance of Pavements, Ice Publishing, 2012
11. Rajib Basu Mallick and Tahar El-Kochi, Pavement Engineering: Principles and Practice,

CRC Press 2013

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

- Understand the role of Pavement Asset Management.
- Understand the Flexible and Rigid pavement failures and importance of maintenance.
- Understand importance of pavement evaluation.
- Understand pavement performance and deterioration modeling.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: C0158	PAVEMENT ANALYSIS AND DESIGN [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Transportation Engineering.

Course Objectives:

- Engineering analysis of stresses and strains in typical highway pavement structures due to loading from traffic and climate.
- Characterization of paving materials; structural pavement design by IRC, and AASHTO for flexible and rigid pavement are discussed.
- Overlay design for Flexible and Rigid pavement is discussed.

UNIT – I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses In Flexible Pavements**: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two- and Three-Layered Systems, Fundamental Design Concepts. **Stresses In Rigid Pavements**: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT – III

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

UNIT - IV

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods.

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT – V

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, Rural Road designs – code of practice. **Design of Overlays**: Types of Overlays, Suitability, Design of overlays.

TEXT BOOKS:

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

REFERENCE BOOKS:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes 37,58,62,81 for Flexible and Rigid Pavements design, low volume roads and over lays.

Course Outcomes: The student will be able to

- Understand Factors Affecting Pavement Design.
- Understand Stresses In Pavements and Material Characteristics.
- Design Flexible and Rigid Pavements.
- Design of Pavement for Low Volume Roads

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: C0159	TRAFFIC ENGINEERING AND MANAGEMENT [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 problems in 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**", Khanna Publishers, 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 Special Publications 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 of vehicular 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		

2022-23 Onwards (MR22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: C0160	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															
CO S	**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

2022-23 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:C00P3	PROJECT STAGE –II INCLUDING SEMINAR	L	T	P
Credits: 9+2		0	0	22

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