ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2020-21 onwards

Department of Civil Engineering (CE)
For
B.Tech. - Four Year Degree Programme
(MR20 Regulations)

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)
(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH, Hyderabad)
Recognized under section 2(f) &12 (B) of UGC Act 1956, Accredited by NAAC with 'A' Grade (II Cycle) and NBA
Maisammaguda, Dhulapally (Post ViaKompally), Secunderabad - 500 100.
Website: www.mrec.ac.in E-mail: principal@mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR20 – ACADEMIC REGULATIONS (CBCS)
for B.Tech. (REGULAR) DEGREE PROGRAMME

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

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

VISION

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

MISSION

- 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.

DEPARTMENT VISION

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

DEPARTMENT MISSION

- 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 relateengineering issues to broader social context.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

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

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

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

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

COURSE STRUCTURE – B.Tech. CIVIL ENGINEERING

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

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

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

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

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

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

Course Objectives:

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

MODULE – I

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

MODULE – II

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

Module – III

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

MODULE – IV

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

MODULE – V

Essay **:** "Toasted English" by R. K. Narayan
Poem **:** "If" by Rudyard Kipling
Grammar **:** Direct and Indirect Speech, Misplaced Modifiers
Vocabulary **:** Redundancies and Clichés
Reading **:** Reading for Specific Purposes, Reading Comprehension practice
Writing **:** Paraphrasing & Summarizing,
* Exercises from the texts not prescribed shall also be used for classroom tasks.

Prescribed Textbook:

Reference Books:

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

Related Websites:

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

Course Outcomes:

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

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

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

COS	Programme Outcomes(POs)											
	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									
CO2	3	2										
CO3	3	2		2								
CO4	3	2	2									
CO5	2	2	1									

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:A0B05	Linear Algebra and Differential Equations (Common For CE, ME&MINING)	L	T	P
Credits: 4		3	1	-

Prerequisites: Matrices, Differentiation, and Integration

Course Objectives:

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

Module -I: Matrix algebra

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

Module- II: Eigen Values and Eigen Vectors

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

Module - III: Differential Calculus

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

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

Module – V: Partial Differential Equations

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

Text Books:

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

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 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)
3. http://www.math.cmu.edu/~wn0g/noll/2ch6a.pdf(Differential Calculus)
4. https://www.intmath.com/differential-equations/1-solving-des.php(Differential Equations)
5. https://www.math.uni-leipzig.de/~miersemann/pdebook.pdf(Partial differential Equations)

NPTEL:

1. https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_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, 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

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

Prerequisites: Fundamentals of Physics

Course Objectives:

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

Module – I: Waves and Oscillations

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

Module – II

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

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

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

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

Module – IV

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

Module – V

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

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

Text Books:

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

References:

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

e-Resources

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

Journals:

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

NPTEL Videos:

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

Course Outcomes:

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

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

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

CO S	Programme Outcomes(POs)												PSOS		
	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										3	2	
CO2	2	2	1										3		
CO3	3	2	2										3	2	
CO4	3	1	2										3		
CO5	3	2	2										3		

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

Prerequisites: Nil

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

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

MODULE II: Projection of Points, Lines and Planes

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

MODULE III: Projection of Solids, Section of Solids and Development of Surfaces

A. Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotating object method. Axis inclined to one reference plane.

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

Development of Surfaces: Development of lateral surfaces of simple Solids.

MODULE IV: Isometric Projections and Transformation of Projections

Isometric Projections: Principles of Isometric Projection – Isometric Views– Conventions –Plane Figures, Simple Solids.
Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice versa– simple objects.

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

TEXT BOOKS

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

REFERENCES

1 K.L.Narayana, P.Kannaiah, "**Engineering Drawing**", SciTech Publishers. 2nd Edition, 2017

2 K.Venugopal,"**Engineering Drawing**",NewAge International Publishers, 3rd Edition, 2014.

3 K. V. Natarajan, "**A text book of Engineering Graphics**", Dhanalakshmi Publishers, 2015.

4 M.S. Kumar, "**Engineering Graphics**", D.D. Publications, 2011.

5 Trymbaka Murthy, "**Computer Aided Engineering Drawing**", I.K. international Publishing House, 3rd Edition, 2011.

E - RESOURCES

1 https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing

2 https://www.wiziq.com/tutorials/engineering-drawing

3 http://freevideolectures.com/Course/3420/Engineering-Drawing

4 http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711

5 http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics

6 http://nptel.ac.in/courses/112103019/

Course Outcomes:

At the end of the course students will be able to

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

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

COS	Programme Outcomes(POs)												PSOs		
	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		1		1					3		3	2		
CO2	3		1		1					3		3	2		
CO3	3		1		1					3		3	2		
CO4	3		1		1					3		3	2		
CO5	3		1							1		1			

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

Prerequisites: NIL

Course Objectives:

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

MODULE I: Fundamentals and Introduction to 'C' Language

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

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

MODULE II: Conditional Statements and Repetition Statements

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

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

MODULE III: Designing Structured Programs and Arrays

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

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

MODULE IV: Strings and Pointers

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

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

MODULE V Structures and File Handling

Structures – Declaration, definition and initialization of structures, accessing structure elements, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures,

unions, difference between structures and union, typedef, bit fields, enumerated types, C 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

Outcomes:

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

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

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

COS	Programme Outcomes(POs)												PSOs		
	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	2	2	2				2	1	1	3	3	2	2
CO2	3	3	2	2	2				2	1	1	3	3	2	1
CO3	3	3	3	2	2				1			3	3	2	1
CO4	3	2	3	2	2				1		1	2	3	2	1
CO5	3	3	3	2	2				1	1	1	2	3	2	1

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

Course objectives:

The main objective of this course is to provide the necessary exposure to the practical aspects, which 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.

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0502	Programming for Problem Solving Lab (Common for ALL)	L	T	P
Credits: 1		-	-	2

Prerequisites: NIL

Objectives:

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

Software Requirements: C

List of Programs:

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

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

Roll 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

Outcomes:

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

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

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

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

The Language Lab focuses on the production and practice of sounds of language and familiarizes 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 Communication Skills Lab shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab
The following course content is prescribed for the English Language Communication Skills Lab

Module - I:
CALL Lab : Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab : Ice-Breaking activity and JAM session; Listening: listening for sounds in context, for ideas; Speaking: ideation and translation of ideas into sentences.

Module - II:
CALL Lab : Structure of Syllables - Past Tense Marker and Plural Marker – 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 : Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab : Information Transfer, Debate

Minimum Requirement of infra structural facilities for EL Lab:
1. Computer Assisted Language Learning (CALL) Lab:
The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN 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 text book which are loaded on the systems):

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

Reference Books:

1. Gairns, Ruth and Redman, Stuart. *Oxford Word Skills: Learn and Practice English Vocabulary.* 2nd edition, Oxford University Press, 2008.
2. Hughes, John and Mallett, Andrew. *Successful Presentations DVD and Student's Book Pack*. Oxford University Press, 2013.
3. Hancock, Mark. *English Pronunciation in Use* (Intermediate). 2nd edition, Cambridge 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. Neutralize the accent for intelligibility
3. realize the importance of listening skills and speaking skills and their application in real life situations.
4. Recognize significance of non-verbal communication and develop confidence to face audience and shed inhibitions.
5. Speak with clarity and confidence; thereby enhance employability skills of the students.

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

COS	Programme Outcomes(POs)												PSOs		
	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		1				1		1	2	2		1			
CO2										1		1			
CO3							1		1	2		2			
CO4								1	1	2		2			
CO5										2		2			

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

COURSE OBJECTIVES:

To understand the usage of hand tools, acquire the skills in model / pattern making and 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	
CO5	3				2	2	1		3			3		2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code:A0B06	Vector Calculus and Numerical Techniques (Common For CE,ME&MINING)	L	T	P
Credits: 4		3	1	-

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

Course Objectives: To learn

1. The physical quantities involved in engineering field related to vector valued functions.
2. The basic properties of vector valued functions and their applications to line, surface and 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

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

Line, Surface and Volume Integrals. Green Theorem, Gauss Divergence Theorem and Stokes Theorem (without proofs) and their applications.

MODULE III: : Algebraic and Transcendental equations and Interpolation

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

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

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

Numerical solution of Ordinary Differential Equations Introduction-Solution by Taylor's series method - Picard's Method of successive Approximations, Euler's Method,Modified Euler's Method – Runge-Kutta Methods.

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

MODULE – V: Numerical solution of PDE

Classification of second order equations , Finite difference approximations to derivatives ,- standard 5-point formula ,diagonal 5-point formula , solution of Laplace equation, Solution of Poisson's equation. Solution of one-dimensional heat, wave equations (by Crank-Nicolson explicit/implicit formula only).

Text Books:

1) B.S. Grewal, **HigherEngineering Mathematics**, Khanna Publishers, 36th Edition, 2010.
2) R K Jain S R KIyengar, **Advanced engineering mathematics**, Narosa publications.
3) Erwin Kreyszig, **Advanced Engineering Mathematics**, Wiley publications.
4) M. K Jain, S R K Iyengar, R.K Jain, **Numerical Methods for Scientific and EngineeringComputation**, New age International publishers.
5) S.S.Sastry, **Introductory Methods of Numerical Analysis**,5th Edition,PHI Learning 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 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	3	2	2								1
CO2	3	3	2	3								
CO3	3	3	3	3								1
CO4	3	3	3	3								
CO5	3	3	3	3								

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

Prerequisites: Nil

COURSE OBJECTIVES:

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

MODULE I:Introduction to Mechanics & System of Forces

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

MODULE II: Friction, Centroid and Center of Gravity

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

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

MODULE III: Moment of Inertia

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

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

MODULE IV:Kinematics& Kinetic

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

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

MODULE V: Work, Power, Energy & Mechanical Vibrations

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

TEXT BOOKS

1. S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati**, "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/

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		

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

Course objectives:

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

Module I: Water and its treatment

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

Module II: Molecular structure and Theories of Bonding:

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

Module III: Electrochemistry and Corrosion

A. Electrochemistry:

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

B. Corrosion:

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic

coatings - hot dipping (Galvanization), Electroplating (Copper) and Electroless plating (Nickel).

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

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism of n-Butane. Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution (SN^1 & SN^2) and (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

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"**, 5th Edition, 2006.

e-Resources:

a) Concerned Website links:

1) https://books.google.co.in/books?isbn=0070669325 (Engineering chemistry by Sivasankar).
2) https://www.youtube.com/watch?v=yQUD2vzfgh8 (Hot dipping Galvanization).
3)https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic_Chemistry_Structure_Function_6th_djvu.txt.

b) Concerned Journals/Magazines links:

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

c) NPTEL Videos:

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

Course Outcomes:

After completion of the course students will be able to:

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

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

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

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

Prerequisites: NIL

Course Objectives:

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

MODULE I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws - Series, parallel, series-parallel, star-to-delta and delta-to-star transformation- analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

MODULE II: AC Circuits

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

MODULE III: Introduction to Electrical Machines

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

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

MODULE IV: P-N Junction Diode

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

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

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

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

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

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

TEXT BOOKS

1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, "Basic Electrical 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", 3rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

E - RESOURCES

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

Course Outcomes:

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

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

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

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

Prerequisites: NIL

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

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

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

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

2020-21 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0304	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		

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

Course Objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical 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^H metry.
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn^{+2} ion in $KMnO_4$ by Colorimetry.
8. Determination of viscosity of given liquids by Ostwald's viscometer.
9. Determination of surface tension of given sample using stalagmometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.

Course outcomes:

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

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

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: A0202	Basic Electrical and Electronics Engineering Lab (Common for ALL)	L	T	P
Credits: 1		-	-	2

Prerequisites: NIL

Course Objectives:

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

List of Experiments:

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

Course Outcomes:

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

1. Analyze electrical circuits by applying basic laws
2. Analyze the performance of DC Motor, three phase Induction motor and transformer
3. Understand V-I Characteristics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

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

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

Pre-requisite: Basic Probability

Course Objectives:

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

MODULE - I: Introduction to Probability:

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

MODULE - II: Random variables:

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

MODULE - III: Sampling Distributions:

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

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

Large sample tests:

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

MODULE IV: Small sample tests:

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

MODULE V: Correlation, Regression:

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

TEST BOOKS:

1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.

2. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publicaitons.
3. Monte Gomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.

REFERENCE BOOKS:

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

E RESOURCES:

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

Course Outcomes:

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

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

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

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

Pre Requisites: NIL

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

MODULE I: Introduction

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

MODULE II: Mineralogy and Petrology

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

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

MODULE III: Structural Geology and Geophysical Studies

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

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

MODULE IV: Geology of Dams and Reservoirs and Tunnels

Geology of Dams and Reservoirs: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs, Geo-hazards, ground subsidence.

Tunnels: Purposes of tunneling, Effects of Tunneling on the ground. Role of Geological Considerations (Lithological, structural and ground water) in tunneling, over break and lining in tunnels, Tunnels in rock, subsidence over old mines, mining subsidence.

MODULE V: Ground Water

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

TEST BOOKS:

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

REFERENCES:

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

E RESOURCES:

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

Course Outcomes

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

1. Demonstrate an advanced knowledge of how geological principles can be applied to 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	

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

Pre Requisites: Engineering Mechanics

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

MODULE I: Simple Stresses and Strains, Strain Energy

Simple Stresses and Strains: Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Poisson's ratio and volumetric strain – relationship between Elastic constants – Bars of varying section – composite bars – Temperature stresses – Self weight.

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

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

Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading.

MODULE III: Theory of Simple Bending and Shear Stresses

A Theory of Simple Bending: Assumptions – Derivation - Neutral axis – Determination of bending stresses and section modulus of rectangular, circular sections (Solid and Hollow), I,T, Angle and Channel sections.

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

MODULE IV: Deflection of Beams (Determinant Beams)

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

MODULE V: Principal Stresses and Strains, Theories of failures

Principal Stresses and Strains: Introduction–Stresses on an inclined section of a uni- axial loading–compound stresses–Normal and tangential stresses on an inclined plane for biaxial stresses Two perpendicular normal stresses accompanied by a state of simple shear–Mohr's circle of stresses–Principalstressesandstrains–Analyticalandgraphicalsolutions.

Theories of Failures: Introduction Various Theories of failures like Maximum Principal stress theory–Maximum Principal strain theory–Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory (Von Mises Theory).

TEST BOOKS:

1. R.K.Bansal, **"Introduction to Strength of materials"** Laxmi publications Pvt. Ltd., 6th Edition-2015, New Delhi.

2. R. Subramanian **"Strength of materials",** Oxford university press, 2nd Edition 2010 New Delhi

REFERENCES:

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

E RESOURCES:

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

Course Outcomes:

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

1. Understand the concepts of simple stresses and strains and estimation of stresses for Bars of 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

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

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

Pre Requisites: NIL

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

MODULE-I:

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

MEASUREMENT OF DISTANCES AND DIRECTIONS:

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

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

MODULE-II: LEVELING AND CONTOURING:

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

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

MODULE-III

A. **COMPUTATION OF AREAS AND VOLUMES: Areas:**Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries, Planimeter. **Volumes**:Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.
B. **THEODOLITE SURVEYING:** Types of Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling when the base is accessible and in accessible

MODULE-IV

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

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

MODULE-V

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

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

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

TEST BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain "**Surveying**" (Vol – 1, 2 & 3), Laxmi Publications (P) ltd., 14th Edition, 2014.

2. Duggal S K, "**Surveying**" (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. 4th Edition, 2004.

REFERENCES:

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

E RESOURCES:

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

Course Outcomes:

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

1. Apply basic geometry to detect difference in plane and arc distance over "spherical" earth 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	

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

Pre Requisites: NIL

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

MODULE I: Introduction and Hydrostatic Forces

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

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

MODULE II: Fluid Kinematics and Classification of Flows

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube.

Classification of Flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flownet analysis.

MODULE III: Fluid Dynamics and Applications of Momentum Principle

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

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

MODULE IV: Boundary Layer Theory and Laminar and Turbulent Flow

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

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

MODULE V: Closed Conduit Flow and Measurement of Flow

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

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

TEST BOOKS:

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

REFERENCES:

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

E RESOURCES:

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

Course Outcomes:

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

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

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

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

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

Prerequisite: NIL

Course Objective: This course deals with the experiments conducted to determine engineering properties of rocks and minerals.

List of Experiments:

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

Course Outcomes

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

1. Learn geology and its types, various features like fault, fissures, weathering etc., minerals, rocks, and rock formations in relation to civil engineering structures.
2. Understand various techniques to determine engineering properties of rocks etc.
3. Understand various techniques to analyze and to made possible solutions for various Geological Engineering problems.
4. Understand various techniques to analyze and to made possible solutions for various Geological Engineering problems.
5. Study the various geological maps, topographical maps etc.,.

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

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

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

Prerequisite: Engineering Mechanics, Strength of Materials.

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

List of Experiments:

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

Course Outcomes

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

1. Demonstrate the basic knowledge of the mechanical properties of materials
2. Estimate compressive strength of wood, concrete, brick materials and decide their suitability 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	-

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

Prerequisite: NIL

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

List of Experiments:

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

Course Outcomes

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

1. Discuss the relative precision expected from pacing, taping, and electronic distance 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**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	2				2	2		2	3		
CO2	3	3	3	1	2				2	2		2	3		
CO3	3	3	3	2	2				2	2		2	3		
CO4	3	3	3	3	2				2	2		2	3		
CO5	3	3	3	3	2				2	2		2	3		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A0554	FUNDAMENTALS OF DATA STRUCTURES LAB (Common for CE, ME and Min.E.)	L	T	P
Credits: 2		-	-	4

Prerequisites: C Programming.

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

Software Requirements: C

List of Programs:

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

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

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

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

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

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

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

8 Write a program to implements Circular Queue operations using Arrays

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

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

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

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

TEXTBOOKS

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

REFERENCES

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

Course Outcomes:

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

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

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

COS	Programme Outcomes(POs)												PSOs		
	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	2	3	2										2	3	2
CO2	2	2	3										2	2	3
CO3		2	3											2	3
CO4		2	3											2	3
CO5	2	3	2										2	3	2

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

Pre-requisite: Nil

Course Objectives:

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

MODULE I: Ecosystems

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

Activity: Plantation.

MODULE II: Natural resources, Biodiversity and Biotic resources:

A) Natural Resources:

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

B) Biodiversity and Biotic resources:

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

Activity: case studies.

MODULE III: Environmental pollution&control:

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

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

MODULE IV: Global Environmental Problems and Global effects:

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

Activity: Poster Making.

MODULE V: Towards sustainable future:

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

TEST BOOKS:

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

REFERENCE BOOKS:

1. Erach Bharucha,**"Environmental studies"** University Grants Commission, and University Press,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) http://www.gdrc.org/uem/ait-terms.html (Glossary of Environmental terms).

(2) http://www.environmentalscience.org/ (Environmental sciences Lectures series).

(3) Journal of earth science and climatic change (OMICS International Journal).

(4) Journal of pollution effects & control (OMICS International Journal).

(5) nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).

(6)http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html(NPTELonline video courses IIT lectures).

Course Outcomes:

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

1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.

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

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

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

Prerequisite: NIL

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

MODULE I: Building Stones, Bricks and Tiles

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

MODULE II: Cement & Admixtures

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

MODULE III: Building Components and Building Services

A. Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ;foundations – types ; Damp Proof Course; Joinery – doors – windows – materials – types.

B. Building Services: Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics, Fire protection & fire hazards.

MODULE IV: Masonry and Finishing Form Work

Masonry And Finishing: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick. Finishers: Plastering, Pointing, Painting.

Form Work: Requirements, Standards, Scaffolding, Shoring, Underpinning.

MODULE V: Green Building and Building Planning:

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

TEST BOOKS:

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

REFERENCES:

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

E RESOURCES:

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

Course Outcomes

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

1. To identify various building materials and select suitable type of building material for 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	

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

Prerequisite: Strength of Materials

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

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

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

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

MODULE II: Direct and Bending Stresses

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

MODULE III: Thin Cylinders & Thick Cylinders

A: Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal 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

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

MODULE V: Unsymmetrical Bending and Shear Centre

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

subjected to unsymmetrical bending– Principal axes–Resolution of bending moment into two rectangular axe through the centroid–Location of neutral axis-Deflection of beams under unsymmetrical bending.
Shear Centre: Introduction-shear centre for symmetrical and unsymmetrical (Channel, I, T & L) Sections

TEXTBOOKS:

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

REFERENCES:

1. Ferdinandp Beer "**Mechanics of Solid**", TataMc.Grawhill Publications 1stEdition 2000.
2. S.Ramakrishna and R.Narayan "**Strength of Materials**" Dhanpat Rai publications., 1stEdition 2015.
3. A.R.Basu,NaiSarah "**Strength of Materials**" DhanpatRai&Co., 2nd Edition , 2011.
4. L.S.Srinath "**Strength of Materials**" Macmillan IndiaLtd.,1st edition, 2014.

E RESOURCES:

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

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

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

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

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

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

Prerequisites: Building Materials, Construction & Planning

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

MODULE I: Cement & Admixtures

Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement –Tests on cement– Different grades of cement.

Admixtures: Types of admixtures – mineral and chemical admixtures – properties – dosages – effects – usage

MODULE II: Aggregates

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

MODULE III: Fresh& Hardened Concrete

A: Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

B: Hardened Concrete: Water / Cement ratio – Abram‘s Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength.

MODULE IV: Testing Of Hardened Concrete & Elasticity, Creep & Shrinkage

Testing Of Hardened Concrete: Compression tests – Tension tests: Flexure tests – Splitting tests – Pull-out test, Nondestructive testing methods – codal provisions for NDT

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

MODULE V: Mix Design & Special Concretes

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

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

TEST BOOKS:

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

REFERENCES:

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

E RESOURCES:

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

Course Outcomes

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

1. To understand various chemical and physical properties of ordinary Portland cement 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**	**PO 10**	**PO11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**		**2**	**1**		**2**							2	2
CO2	**3**	**2**		**2**	**2**	**1**	**2**							2	2
CO3	**3**	**3**	**3**	**3**	**3**		**1**							3	2
CO4	**3**	**3**		**3**	**2**		**3**			**2**				2	2
CO5	**3**	**2**	**3**	**3**	**3**		**2**			**3**				3	2

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

Prerequisite: Fluid Mechanics

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

MODULE I: Open Channel Flow

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

MODULE II: Hydraulic Similitude

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

MODULE III: Basics of Turbo Machinery and Turbo Machinery

A. Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat vertical, inclined and curved vanes, jet striking centrally and at tip.

B: Turbo Machinery: Velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

MODULE IV: Hydraulic Turbines

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

MODULE V: Centrifugal-Pump and Hydropower Engineering

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

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

TEST BOOKS:

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

REFERENCES:

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

E-RESOURCES:

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

Course Outcomes

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

1. Apply the knowledge in addressing problems regarding open channels and possess skills to 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	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	-	-	-	-	-	-	-	2	2	
CO2	3	3	3	1	1	-	-	-	-	-	-	-	2	2	
CO3	3	3	2	1	1	-	-	-	-	-	-	-	3	2	
CO4	3	3	1	1	1	-	-	-	-	-	-	-	2	2	
CO5	3	3	1	1	1	-	-	-	-	-	-	-	3	2	

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

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

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

MODULE I: Surface Water Hydrology

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

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

MODULE II: Ground Water Hydrology

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

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

MODULE III: Irrigation

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

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

MODULE IV: Canal Systems

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

MODULE V: Reservoir Planning:

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

TEST BOOKS:

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

REFERENCES:

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

E –RESOURCES

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

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

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

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3	3	1	2	2	2	1	-	-	-	3	3	1
CO2	3	3	3	3	1	2	2	2	1	-	-	-	3	3	-
CO3	3	3	3	2	1	2	2	1	-	-	1	2	3	2	1
CO4	3	3	3	2	1	3	2	1	-	-	1	1	3	3	-
CO5	3	3	3	3	1	2	2	2	1	-	2	-	3	2	1

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

Prerequisites: BMCP

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

List of Exercises:

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

Course Outcomes:

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

1. The students will be able to draft the plan, elevation and sectional views of the buildings, Industrial structures, and framed buildings.
2. The students will be able to analyze and design the simple structural members using 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

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

Prerequisite: NIL

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

List of Experiments:

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

Course Outcomes

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

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

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

COS	Programme Outcomes(POs)												PSOs		
	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	2	1	1	2	2	2	1		2	2	2		3	
CO 2	3	2	3	3	1	2	1	1		2		1		3	
CO 3	3	2	1	3	2	1	3	2		2		2		2	2
CO 4	3	3	3	1	2			1		3	2		3	3	
CO 5	3	3	3	2	2			1		3			1	3	

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

Prerequisite: Concrete Technology

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

List of Exercise:

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

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	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2		3	2				2				3	3	
CO2	3	3		3	3	2	1		3				3	2	
CO3	3	3		3	3				2				3	2	
CO4	3	3	3	3			1		3				3	2	
CO5	3	3		3	2	2	1		2				3	2	

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

Prerequisites: NIL

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

Software Requirements: Java

List of Programs:

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

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

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

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

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

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

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

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

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

10. Write a Java program that

a) create user defined Thread by extending Thread class.

b) create user defined Thread by implementing Runnable Interface

c) create two user defined Threads i.e. Multi Threading using Thread

11. Write a Java program

a) checks whether a given string is a palindrome or not.

b) for sorting a given list of names in ascending order.

c) that reads a line if integers and then displays each integer and the sum of all integers (use string tokenizer class of java.util).

12. Write a Java program that

a) reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) reads a file and displays the file on the screen, with a line number before each line.

TEXT BOOKS:

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

REFERENCES:

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

Course Outcomes:

Course Outcomes:

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

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

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

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2			3		2							
CO3		2	2		2							
CO4			3		3							
CO5		2	2		3							

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

Course Objective:
To develop students' sensibility with regard to issues of gender in contemporary India.To 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
Gender: Why Should We Study It? *(Towards a World of Equals:* Unit -1)
Socialization: Making Women, Making Men *(Towards a World of Equals:* Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First Lessons in Caste. Different Masculinities.
Just Relationships: Being Together as Equals *(Towards* a *World of Equals:* Unit -*2)*
Mary iKorn and Onler. Love and Acid just do not Mix. Love Letters. Mothers aniJ Fathers.
Further Reading: Rosa Parks-The Brave Heart.

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

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

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

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

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

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

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:

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

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

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO 12**	**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			