Prof. Ram Meghe Institute Of Technology And Research, Badnera -Amravati

An Autonomous Institute Affiliated to
Sant Gadge Baba Amravati University,
Amravati, Maharashtra (India)

PROGRAMME SCHEME & SYLLABI

2023-2024

B.Tech 1st Year

(Civil Engineering)

(V1.0)

Published By
Principal
Prof. Ram Meghe Institute Of Technology And Research, Badnera - Amravati.

Department Vision :

To become a pace-setting center of excellence acclaimed across the region & imitated as a role model by its peers

Department Mission :

1. To elevate technical, entrepreneurial and communication skills of students so as to scale up their employability potential and encourage the spirits of enterprise

2. To elevate moral ethics and values in students so as to help them in shaping their attitude and belief towards varied aspect of life and provide them with unique prospective.

Program Educational Objectives :

1. **Preparation:** To strive for overall personality development of students so as to nurture not only quintessential technocrats but also responsible citizens.
2. **Core Competence:** To make the students apply the necessary problem-solving, design, and application skills for successful careers in Civil Engineering.
3. **Breadth:** To provide the educational foundation and communication skills that prepare the students for diverse career paths.
4. **Professionalism:** To inculcate the value systems & ethics, leadership and team work skills, bring holistic development of personality and to promote entrepreneurial thinking among students.
5. **Learning environment:** To provide students with an environment that develops confidence andstimulates innovative thinking for successful professional career.

Program Outcomes :

Engineering Graduate will be able to :

1. **Engineering Knowledge**: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis:** Identity, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences
and engineering sciences.
3. **Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
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 information to provide valid conclusions.
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.
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 professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
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.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of 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.
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.

Program Specific Outcomes :

1. **Computer Based Civil and Structural Engineering Design:** Design Civil end Structural engineering systems using contemporary software used by design and analysis firms.
2. **Entrepreneurial spirit:** Demonstrate ability to organize activities, work with and lead teams, understand prevalent trade practices, understand site culture.

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati
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Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: I (GROUP-A/GROUP-B)

Sr. No.	Course Code	Course Name	Teaching Scheme					Examination Scheme									
			Hours/ Week			Total Hours/ Week	Credits	THEORY						PRACTICAL			
										Internal				Max. Marks			
			Lecture	Tutorial	P/D			Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Max. Marks MSE/ MSIE	Max. Marks TA	Total	Overall Min Passing Marks	Int.	Ext.	Total	Min. Passing Marks
Theory																	
1	1SF01	Applied Mathematics - I	3				3	3	60	30	10	100	40				
2	1SF02	Applied Physics	3				3	3	60	30	10	100	40				
3	1SF03	Engineering Graphics	2				2	3	60	30	10	100	40				
4	1SF04	Programming for Problem Solving	2				2	3	60	30	10	100	40				
5	1SF05	Professional Communication Skills	1	1			2	3	60	30	10	100	40				
6	1SC01	Fundamentals of Civil Engineering	3				3	3	60	30	10	100	40				
7	1SF06	Design Thinking *	1				1				50	50	25				
Practical																	
8	1SF07	Applied Physics Lab			2		1							25	25	50	25
9	1SF08	Engineering Graphics Lab			2		1							25	25	50	25
10	1SF09	Programming for Problem Solving Lab			2		1							25	25	50	25
11	1SC02	Fundamentals of Civil Engineering Lab			2		1							25	25	50	25
12	1SF10	NSS/Sports/Yoga/Cultural/ Community Service **			2		1							50		50	25
		Total	**15**	**1**	**10**		**21**					**650**				**250**	
														Total		**900**	

* Assessment will be based on Unit Tests, Assignments and Case Studies

** Assessment will be based on participation in associated activities of not less than 30 hours

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Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: II (GROUP-B/GROUP-A)																		
Sr. No.	Course Code	Course Name	Teaching Scheme					Examination Scheme										
			Hours/ Week			Total Hours/ Week	Credits	THEORY						PRACTICAL				
										Internal				Max. Marks				
			Lecture	Tutorial	P/D			Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Max. Marks MSE/ MSIE	Max. Marks TA	Total	Overall Min Passing Marks	Int.	Ext.	Total	Min. Passing Marks	
Theory																		
Theory																		
1	2SF01	Applied Mathematics - II	3				3	3	60	30	10	100	40					
2	2SF02	Applied Chemistry	3				3	3	60	30	10	100	40					
3	2SF03	Basics of Electrical Engg	2				2	3	60	30	10	100	40					
4	2SF04	Biology for Engineers	2				2	3	60	30	10	100	40					
5	2SF05	Universal Human Values	2				2	3	60	30	10	100	40					
6	2SCM01	Engineering Mechanics	3				3	3	60	30	10	100	40					
7	2SF06	Indian Knowledge Systems *	2				2				50	50	25					
Practical																		
8	2SF07	Applied Chemistry Lab			2		1							25	25	50	25	
9	2SF08	Basic of Electrical Engg Lab			2		1							25	25	50	25	
10	2SCM02	Engineering Mechanics Lab			2		1							25	25	50	25	
11	2SF09	Workshop/Digital Fabrication Lab			2		1							25	25	50	25	
		Total	**17**		**8**		**21**					**650**				**200**		
														Total		**850**		

* Assessment will be based on Unt Tests and Assignments

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for UG Certificate

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	8
OR	
1. Internship (Min 120 hrs)	8

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SEMESTER: III

Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
											Internal				Max. Marks			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Max. Marks MSE/ MSIE	Max. Marks TA	Total	Overall Min Passing Marks	Int.	Ext.	Total	Min. Passing Marks
Theory																		
01	3SC01	Strength of Material	3			PCC		3	3	60	30	10	100	40				
02	3SC02	Concrete Technology	2			PCC		2	3	60	30	10	100	40				
03	3SC03	Transportation Engineering	3			PCC		3	3	60	30	10	100	40				
04	3SC04	Surveying - I	3			PCC		3	3	60	30	10	100	40				
05	3SC05	OE-1	3			OE		3	3	60	30	10	100	40				
06	3SC06	Construction Project & Management	2			EEMC		2	3	60	30	10	100	40				
07	3SC07	Environmental Studies (EVS)	2			VEC		2	3	60	30	10	100	40				
Practicals																		
08	3SC08	Concrete Technology - Lab			2	PCC		1							25	25	50	25
09	3SC09	Transportation Engineering - Lab			2	PCC		1							25	25	50	25
10	3SC10	Strength of Material - Lab			2	VSEC		1							25	25	50	25
11	3SC11	Surveying - I - Lab			2	VSEC		1							25	25	50	25
		Total	**18**		**8**			**22**					**700**				**200**	
															Total		**900**	

OE-1 Basic to Building Construction

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SEMESTER: IV

Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
									Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
			Lecture	Tutorial	P/D						Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
01	4SC01	Structural Analysis - I	3			PCC		3	3	60	30	10	100	40				
02	4SC02	Geotechnical Engineering-I	3			PCC		3	3	60	30	10	100	40				
03	4SC03	Environmental Engineering - I	3			PCC		3	3	60	30	10	100	40				
04	4SC04	MDM-1	3			MDM		3	3	60	30	10	100	40				
05	4SC05	OE-2	2			OE		2	3	60	30	10	100	40				
06	4SC06	Technical Report Writing	2			AEC		2	3	60	30	10	100	40				
07	4SC07	Entrepreneurship in Civil Engg	2			EEMC		2	3	60	30	10	100	40				
Practicals																		
08	4SC08	Geotechnical Engineering-I Lab			2	PCC		1							25	25	50	25
09	4SC09	Environmental Engineering-I Lab			2	PCC		1							25	25	50	25
10	4SC10	BP-CAD			2	PCC		1							25	25	50	25
11	4SC11	Mini-Project			4	ELC		2							25	25	50	25
		Total	**18**		**10**			**23**					**700**				**200**	
															Total		**900**	

OE-2 :- Introduction to Earthquake Engineering

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for Diploma

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	8
OR	
1. Internship (Min 120 hrs)	8

MDM-1 COURSES BASKET

Branch -->	AI&DS	CIVIL	CSE	EXTC	IT	IIOT	MECH
MDM1	*Introduction to AI	ENVIRONMENTAL ENGG	# DATA STRUCTURES	$BASIC ELECTRONICS & DIGITAL CIRCUITS	DATA SCIENCE	FUNTAMENTALS OF IOT	PRODUCTIVITY TECHNIQUES
	*** Except CSE IT**		**# Except IT AI&DS**	**$ Except IIOT IT**	**Except AI&DS CSE**		

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Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: V

Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
											Internal				Max. Marks			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Max. Marks MSE/ MSIE	Max. Marks TA	Total	Overall Min Passing Marks	Int.	Ext.	Total	Min. Passing Marks
Theory																		
01	5SC01	Geotechnical Engineering-II	3			PCC		3	3	60	30	10	100	40				
02	5SC02	Design of Reinforced Concrete Structure	3			PCC		3	3	60	30	10	100	40				
03	5SC03	Environmental Engineering - II	3			PCC		3	3	60	30	10	100	40				
04	5SC04	PEC-1	3			PEC		3	3	60	30	10	100	40				
05	5SC05	MDM-2	3			MDM		3	3	60	30	10	100	40				
06	5SC06	OE-3	3			OE		3	3	60	30	10	100	40				
Practicals																		
07	5SC07	Geotechnical Engineering-II Lab			2	PCC		1							25	25	50	25
08	5SC08	Design of Reinforced Concrete			2	PCC		1							25	25	50	25
09	5SC09	Environmental Engineering -II Lab			2	PCC		1							25	25	50	25
10	5SC10	PEC-2			2	PEC		1							25	25	50	25
		Total	**18**		**8**			**22**					**600**				**200**	
															Total		**800**	

PEC-1 :- (i) Hydrology & Water Resources Engineering (ii) Irrigation and Hydraulic Structures (iii) Ground Improvement Techniques (iv) Dam Engineering

PEC-2 :-(i) CAD of Structure (ii) Building Information Modelling, (Iii) Software Based Practical (Environment/ Geotech/ Transportation)

OE-3 :- Disaster Management

MDM-2 COURSES BASKET

Branch -->	AI&DS	CIVIL	CSE	EXTC	IT	IIOT	MECH
MDM2	APPLIED AI	WATER RESOURCE ENGG	# ANALYSIS OF ALGORITHMS	DIGITAL INTEGRATED CIRCUITS	CRYPTOGRAPHY & NETWORK SECURITY	SENSORS & TRANSDUCERS	AUTOMOBILE ENGG & ELECTRIC VEHICLES
	*** Except CSE IT**		**# Except IT AI&DS**	**$ Except IIOT IT**	**Except AI&DS CSE**		

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Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: VI

Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
											Internal				Max. Marks			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Max. Marks MSE/ MSIE	Max. Marks TA	Total	Overall Min Passing Marks	Int.	Ext.	Total	Min. Passing Marks
Theory																		
01	6SC01	Design of Steel Structure	3			PCC		3	3	60	30	10	100	40				
02	6SC02	Surveying - II	3			PCC		3	3	60	30	10	100	40				
03	6SC03	Fluid Mechanics	3			PCC		3	3	60	30	10	100	40				
04	6SC04	PEC-3	3			PEC		3	3	60	30	10	100	40				
05	6SC05	PEC-4	3			PEC		3	3	60	30	10	100	40				
06	6SC06	MDM-3	3			MDM		3	3	60	30	10	100	40				
Practicals																		
07	6SC07	Design of Steel Structure - Lab			2	PCC		1							25	25	50	25
08	6SC08	Surveying - II - Lab			2	PCC		1							25	25	50	25
09	6SC09	Fluid Mechanics - Lab			2	VSEC		1							25	25	50	25
10	6SC10	NMCP - Lab			2	VSEC		1							25	25	50	25
		Total	**18**		**8**			**22**					**600**				**200**	
															Total		**800**	

PEC-3 :- (i) Docks, Harbour and Airport Engineering (ii) Repairs & Rehabilitation of Structures (iii) Sustainable Construction Methods iv) Watershed Engg. & Managem

PEC-4 :- (i) Sustainable Construction and Green Manufacturing, (ii) Disaster Management, (iii) Solid waste Management

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Sixth semesters) to qualify for B.Voc.

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	8
OR	
1. Internship (Min 120 hrs)	8

MDM-3 COURSES BASKET

Branch -->	AI&DS	CIVIL	CSE	EXTC	IT	IIOT	MECH
MDM3	* MACHINE LEARNING	TRANSPORTATION ENGG	# DATABASE MANAGEMENT SYSTEM	WIRELESS COMMUNICATION	BLOCK-CHAIN	SINGLE BOARD COMPUTERS	AUTOMATION IN MANUFACTURING
	*** Except CSE IT**		**# Except IT AI&DS**	**$ Except IIOT IT**	**Except AI&DS CSE**		

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati
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Four Year Under Graduate Degree Program in Bachelor of Technology
Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: VII

Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
									Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
			Lecture	Tutorial	P/D						Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
01	7SC01	Structural Analysis - II	3			PCC		3	3	60	30	10	100	40				
02	7SC02	Earthquake Resistant Design	3			PCC		3	3	60	30	10	100	40				
03	7SC03	PEC-5	3			PEC		3	3	60	30	10	100	40				
04	7SC04	PEC-6	3			PEC		3	3	60	30	10	100	40				
05	7SC05	MDM-4	3			MDM		3	3	60	30	10	100	40				
Practicals																		
06	7SC06	RM including Major Project (Phase I)			16	ELC		8							50	50	100	50
		Total	**15**		**16**			**23**					**500**				**100**	
															Total		**600**	

PEC-5 :-(i) Advanced Geotechnical Engineering (iv) Traffic Engineering & Management (ii) Advanced Foundation Engineering

PEC-6 :- (i) Industrial Waste Water Treatment (ii) Water power Engineering (iii) Advanced Water Treatment (iv) Advanced Waste Water Engineering

MDM-4 COURSES BASKET

Branch -->	AI&DS	CIVIL	CSE	EXTC	IT	IIOT	MECH
MDM4	INTRODUCTION TO DATA ANALYTICS	STRUCTURAL SYSTEM & ANALYSIS	BASICS OF ENTERPRISE RESOURSE PLANNING	INDUSTRIAL POWER ELECTRONICS	BIG DATA ANALYTICS	INDUSTRIAL INTERNET OF THINGS	ROBOTICS & INDUSTRIAL APPLICATIONS
	*** Except CSE IT**		**# Except IT AI&DS**	**$ Except IIOT IT**	**Except AI&DS CSE**		

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Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: VIII

Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
									Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
			Lecture	Tutorial	P/D						Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
01	8SC01	Engineering Hydraulics	3			PCC		3	3	60	30	10	100	40				
02	8SC02	Quantity Survey and Estimate	3			PCC		3	3	60	30	10	100	40				
03	8SC03	PEC-7	2			PEC		2	3	60	30	10	100	40				
Practicals																		
04	8SC04	Internship/ Major Project Phase II			24	ELC		12							100	100	200	100
		Total	**8**		**24**			**20**					**300**				**200**	
															Total		**500**	

PEC-7 :- (ii) Advanced Design of RCC Structures (i) Pre-stressed Concrete Structures, (ii) Matrix Method of Structural Analysis,

SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	Total
21	21	22	23	22	22	23	174

1SF01 Applied Mathematics-I

Teaching Scheme : 03 L **Credit : 03**

Pre-requisites:

1. Basic idea of differential and integral calculus.
2. Fundamental knowledge of trigonometric functions.
3. Essential knowledge of Differential Equation.
4. Elementary knowledge of determinant.

Course Learning Objectives:

1. To familiarize with techniques in calculus.
2. To evaluate partial derivatives of explicit and implicit functions.
3. To understand maxima and minima concept.
4. To solve differential equation of certain type of differential equations.
5. To change into a mathematical formation of physical problem.
6. To determine infinite series and their convergence and divergence.

Course Outcomes:

After the completion of course students will be able to…

1. Make use of derivatives for finding nth derivatives and to solve indeterminate forms.
2. Extend the basic ideas of the calculus of functions of single variables to functions of several variables and its concept.
3. Find maximum and minimum value of a function.
4. Solve certain types of differential equations by various methods.
5. Utilize it for engineering problems of electrical circuit.
6. Determine infinite series and their convergence and divergence.

Unit I: Differential Calculus I

Successive differentiation, Leibnitz's theorem on the n^{th} derivative of a product, Indeterminate forms. (07 Hours)

Unit II: Differential Calculus II

Partial differentiation, Euler's theorem on homogeneous function. (06 Hours)

Unit III: Jacobian

Jacobians of explicit functions and implicit function with properties, functional dependence, maxima and minima of function of two independent variables. (07 Hours)

Unit IV: Ordinary differential equations of first order and first degree

Non-homogeneous differential equation, Linear differential equation, reducible to Linear differential equation, Exact differential equation and reducible to Exact differential equation.

(07 Hours)

Unit V: Differential equations of first order and higher degree

Solvable for p, solvable for x and solvable for y, Application to Orthogonal Trajectories and Electrical circuits by Kirchoff's law. (06 Hours)

Unit VI: Infinite Series

Tests for convergence by p-series test, Comparison test, Ratio test, Rabbe's test and Root test.

(07 Hours)

Recommended Text Book :

1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.

Reference Books:

1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

1SF02 Applied Physics

Teaching Scheme : 03 L **Credit : 03**

Course Prerequisites:

1. Elementary idea about electric charge, electricity & magnetism.
2. Basic knowledge of material science.
3. Fundamental knowledge of optics.

Course Objectives:

CLO 1: To enable the students to correlate the theoretical principles of fundamentals of modern aspects in physics with applications oriented studies in engineering.

CLO 2: To understand the ballistics of charges particles in electric and magnetic fields and applications of cathode ray oscilloscope.

CLO 3: To impart the knowledge of crystallography.

CLO 4: To impart the essential knowledge of interference and diffraction of light in various application of engineering physics.

CLO 5: To impart the knowledge of laser and its various applications in Engineering Physics.

CLO 6: To impart the knowledge of fibre optics.

CLO 7: To enhance imagination and creativity in students by performing practical experiments on related topics in various applications in engineering physics.

CLO 8: To impart the knowledge of fluid dynamics.

Course Outcomes:

CO 1: Apply the concepts of electric and magnetic fields in mass spectrograph and Cathode Ray Oscilloscope.

CO 2: The students will gain the basic ideas about crystallography and will be able to identify different types of crystal structures in solids.

CO 3: The students will be able to utilize the knowledge of interference and diffraction.

CO 4: The Students will gain the knowledge of LASER, its types and applications.

CO 5: The Students will acquire the knowledge of fibre optics, its types and applications.

CO 6: The Students will gain the knowledge of fluid dynamics and its applications.

UNIT I: Electron Ballistics: **(08 Hours)**

Motion of charged particle in uniform transverse electric and transverse magnetic fields, velocity selector (energy filter), Bainbridge mass spectrograph, Hall effect, cathode ray oscilloscope : working and its block diagram.

UNIT II: Crystallography: **(06 Hours)**

Crystal structure, Unit cell, Cubic crystal structure: SC, BCC and FCC, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, coordination number, atomic packing fraction, Miller indices, Bravais lattice Inter-planar distance between adjacent planes.

UNIT III: Interference and Diffraction of Light: **(07 Hours)**

Fundamental condition of interference, thin film interference due to reflected light, Newton's rings experiment and it's applications, Fresnel and Fraunhofer diffraction, plane transmission diffraction grating.

UNIT IV: **(06 Hours)**

Absorption, spontaneous and stimulated emission of radiation, population inversion, pumping, metastable state, characteristics and applications of laser, Ruby laser,He-Ne Laser.

UNIT V: Fibre Optics: **(07 Hours)**

Snell's law, total Internal reflection, construction of optical fibre, acceptance angle and acceptance cone, numerical aperture, types of optical fibre, attenuation, fibre optic communication system.

UNIT VI: Fluid Dynamics: **(06 Hours)**

Viscosity, Stoke's law, streamline and turbulent flow of liquid, Poiseuille's equation, Continuity equation, Bernoulli's theorem.

Text Books:

1. R.K.Gaur & S.L.Gupta: Engineering Physics, Dhanpat Rai & Sons.
2. Hitendra K. Malik & A.K.Singh: Engineering Physics, Tata McGraw Hill
3. M.N. Avadhanulu & P.G. Kshirsagar: Engineering Physics, S.Chand Pub., 2008

Reference Books:

1. Orazio Svelto: Principle of Lasers, Springer
2. Frank L.Pedrotti, Leno M. Pedrotti, Leno S. Pedrotti: Introduction to optics.

1SF03 Engineering Graphics

Teaching Scheme : 02 L **Credit : 02**

Pre-requisites:

1. Knowledge of basic math's and terms.

2. Ability to visualize objects in three dimensions before they are on a page.

3. Computer literacy.

Course Learning Objectives:

CLO 1: To acquire and apply engineering graphics knowledge for communicating ideas, information and instructions.

CLO 2: To understand the representations of 3D objects and their projections.

CLO 3: To understand the representations of orthographic and isometric views of objects.

CLO 4**:** To summarize the role of engineering drawing in various engineering disciplines.

Course Outcomes:

At the end of course, Learner will be able to

1. Use the drawing instruments effectively to dimension the given figures anddescribe the methods of projection.
2. Construct the various types of planes in different orientations.
3. Apply knowledge of projection to construct different view of regular solidobjects.
4. Define the sectional views of solids such as Prism, Pyramid, Cone, Cylinder& Cube.
5. Identify the pictorial views of the object.
6. Recognize the pictorial views of the object and construct isometric scale,isometric projection & views.

Unit I : Basics of Engineering Drawing and Projection:

Introduction to drawing instrument and their uses, concept of dimensioning and scales, geometric construction. Projection of Point, Projection of lines (Inclined to one plane at a time), Projection of planes (Inclined to both the planes). **(4hrs.)**

Unit II : Projection of Solids:

Projection of solids for Prism, Pyramid, Cone and Cylinder. **(4hrs.)**

Unit III : Section of Solids:

Section of solids for Prism, Pyramid, Cone and Cylinder **(5hrs.)**

Unit IV : Introduction to CAD Software:

Drafting environment and drafting screen, coordinate systems, drafting and dimensioning commands, editing commands, drafting of basic geometrical shapes, display commands, CAD software customization. **(5hrs.)**

Unit V: Orthographic Projection:

Construction of elevation, plan and side view of given object by using firstand third angle projection methods. **(6hrs.)**

Unit VI: Isometric Views and Projection:

Construction of isometric scale, isometric views and projection. **(6hrs.)**

List of Books Recommended:Text Books:

1. Bhatt N. D. & Panchal V. M. Engineering Drawing, 49th Edn., Charotar Pub. House, Anand,Gujrat, 2007.
2. Shah P. J. – Engineering Drawing, S. Chand Publication, 2008.
3. Dhawan R. K. – Engineering Drawing, S. Chand Publication, (5th edition, 2008).
4. Tickoo Sham – AutoCAD, BPB Publications.
5. Ingole D.S. – Engineering Graphics, Nirali Publication, Pune (1 st Edition 2020).

1SF04 Programming for Problem Solving

Teaching Scheme : 02 L **Credit : 02**

❖ Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Programming for Problem Solving by being able to do each of the following:

1. Develop a solid understanding of the fundamental concepts of programming and problem-solving, including the input-process-output cycle, algorithms, and program design principles such as top-down and bottom-up approaches.
2. Acquire proficiency in the C programming language, including the ability to write and execute basic C programs, effectively use input-output functions, work with variables, data types, and operators, and understand the concept of program execution.
3. Demonstrate competence in using control constructs such as decision-making statements and looping statements to create efficient and structured programs.

❖ Course Outcomes:

After Successful completion of this course, the student will be able to:

1. Understand the basic concepts of computer organization, program design and Algorithms.
2. Explain the basic structure and fundamentals of C programming.
3. Compare and contrast the decision-making constructs and looping statements in C programming.
4. Understand the concept of arrays and string functions in C language.
5. Demonstrate the ability to write and use the concept of functions.
6. Apply the concepts of pointer declaration, assignment and arithmetic operations in C.

- **Unit I Introduction (Hours: 5)**
  Organization of Computer, Basic concepts of Problem Solving, Program Design: Top Down, Bottom Up, Input Process Output Cycle, Algorithms: Conventions, Flowchart, Pseudo code

- **Unit II C Fundamentals (Hours: 5)**
  Introduction to C language, Basic structure, Program Execution First C Program, Input Output using scanf() and printf(), Data type, Variables, Operators and their precedence.

- **Unit III C Control construct (Hours: 5)**
  Decision making using if, if else and switch. Looping using for, while, do while, break and continue. Jumps in loop.

- **Unit IV Array and Strings (Hours: 5)**
  Introduction to Array, 1-D array: Declaration & Initialization, 2-D array: Declaration & Initialization, Strings: Declaration & Initialization, String functions.

- **Unit V Functions (Hours: 5)**
  Function: Pre defined functions, User defined functions, Multi-function Program, Elements of user defined functions, Return vale and their types, Function calls, Function Declaration.

- **Unit VI Pointers (Hours: 5)**
  Definition and uses of pointers, pointer declaration, pointer assignment, pointer arithmetic, Pointers and Functions: Call by value and call by reference.

❖ Text Book:

1) R. S. Salaria : Programming for Problem Solving , Khanna Publication .
2) E Balagurusamy: Computing Fundamentals and C Programming- Tata McGraw Hill, Second Edition

❖ Reference Books:

1. Herbert Schildt- C Complete reference (Tata McGraw Hill)
2. Yashwant Kanetkar- Let us C- Seventh Edition

1SF05 Professional Communication Skills

Teaching Scheme : 02 L Credit : 02

COURSE PRE-REQUISITES: BASIC KNOWLEDGE OF ENGLISH

COURSE OBJECTIVES: The course aims to:

1. Introduce Communication skill and its importance
2. Enhance the Employability and Career Skills of students
3. Orient the students towards grooming as a professional
4. discuss the importance of team building
5. Make them Employability Graduates
6. Develop their confidence and help them attend interviews successfully

COURSE OBJECTIVES: The course aims to:

1. After Completion of the course, Students shall
2. learn about basic communication system and its blocks
3. overcome the barriers in communication
4. study the importance of Time management in professionalism
5. learn to effectively introduce themselves in interviews
6. study the concept of group discussion
7. Learn to build Teams and set SMART Goals

UNIT I

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

UNIT II

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management- important parameters of Time management

UNIT III

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice—presenting the visuals effectively – 5 minute presentations

UNIT IV

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills

UNIT V

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview & panel interview – FAQs related to job interviews

UNIT VI

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management through setting SMART goals

TEXT BOOKS :

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.

REFERENCES:

1. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
2. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
3. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.
4. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition,Pearson Education, 2011

1SF06 Design Thinking

Teaching Scheme : 01 L **Credit : 01**

❖ Pre-requisites:

1. 12th Standard

❖ Course Learning Objectives:

CLO 1: To familiarize students with design thinking concepts and principles
CLO 2: To ensure students can practices the methods, processes and tools of design thinking
CLO 3: To ensure students can apply the design thinking approach and have ability to model real world situations

❖ Course Outcomes:

After completion of this course the student shall be able to:
CO 1: Examine Design Thinking concepts and principles
CO 2: Practice the methods, processes, and tools of Design Thinking
CO 3: Apply the Design Thinking approach and model to real world situations

❖ Contents:

Unit No. 1: Fundamentals of Design Thinking (02 Hrs.)

Principles of Design Thinking, The process of Design Thinking, How to plan a Design Thinking project

Unit No. 2: Understanding the Design Problem (03 Hrs.)

Search field determination, Problem clarification, Understanding of the problem, Problem analysis, Reformulation of the problem

Unit No. 3: Observing the Problem (02 Hrs.)

Observation Phase, Empathetic design, Tips for observing, Methods for Empathetic Design

Unit No. 4: Defining the Problem (02 Hrs.)

Point-of-View Phase, Characterization of the target group, Description of customer needs

Unit No. 5: Finding and Selecting Ideas (03 Hrs.)

Ideate Phase, The creative process and creative principles, Creativity techniques, Evaluation of ideas

Unit No. 6: Prototyping (03 Hrs.)

Prototype Phase, Lean Startup Method for Prototype Development, Visualization and presentation techniques

❖ Textbooks:

1. Christian Mueller-Roterberg, Handbook of Design Thinking, Research Gate November 2018
2. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Amazon books
3. Dr. D. Ravindran, Introduction to Design Thinking, Notion Press

1SF07 Engineering Physics Lab

Teaching Scheme : 02 P **Credit : 01**

Course Prerequisites:

1. Identify and handle various equipment likes vernier calliper, micrometer screw gauge, multimeter, spectrometer.
2. Basic knowledge of graphical representation of observed values.

Course Objectives:

To gain practical knowledge by applying experimental methods to correlate with the theory.

Apply the analytical techniques and graphical analysis to the experimental data.

To develop basic understanding of various experimental principles involved.

Course Outcomes:

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

1) Develop experimental skills to impart practical knowledge in real time.

Understand principle, concept, working and applications of areas in physics and compare the results obtained with theoretical calculations.

Conduct experiment and record experimental data, Analyse the obtained data and Draw conclusions from the Labortary exercise based on the analysed data

List of Experiments/ Practicals:

Engineering Physics Lab

Minimum : 08 experiments/ Practicals are to be performed.

List of Experiments:

1. Study of CRO I: To measure A.C voltage, D.C voltage and frequency using CRO.
2. Study of CRO II: To determine frequency of unknown signal by using Lissajous patterns.
3. To determine wavelength of monochromatic light by using Newton's Ring experiment.
4. To determine wavelength of monochromatic light by using Plane transmission diffraction grating.
5. Determination of grating element of diffraction grating, using LASER beam.
6. Study of various crystal structures.
7. To determine Miller Indices of crystal planes.
8. To plot the V-I characteristics of LED and to find it's striking potential.
9. To measure the intensity and divergence of given LASER beam.
10. To determine the coefficient of viscosity using Stoke's law.
11. Study of Hall effect in semiconductor.

1SF08 Engineering Graphics Lab

Teaching Scheme : 02 P **Credit : 01**

Course Learning Objectives:

CLO 1: To understand the concepts of drawing in engineering.

CLO 2: To improve the visualization skills for better understanding of projection of solids.

CLO 3: To acquire skills to interpret and convert multi-views drawing into single view and vice-versa.

Course Outcomes:

At the end of course, Learner will be able to –

1. Illustrate the projection of points, lines and surfaces.
2. Construct different types of solids in different positions along with their sectional views.
3. Understand the concept of orthographic and isometric projection.

List of Practical :

Every student will submit a set of at least SIX drawing sheets (from 1 to 7 listed below) and perform at least TWO practical (from 8 to 10 listed below) using CAD software.
Examination will consist of viva-voce based on the syllabus.

1. Projection of straight line
2. Projection of plane
3. Projection of solids
4. Section of solids
5. Orthographic projection
6. Isometric projection/view
7. Free hand sketches of simple machine elements, like
   (a) Screw threads ISI profile
   (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts
   (c) Foundation bolts – Rag, eye, lewis types
8. Drafting of basic 2D geometrical shapes using CAD software
9. Drafting of basic 3D geometrical shapes using CAD software
10. Drafting of 2D and 3D objects using surface modelling commands.

1SF09 Programming for Problem Solving Lab

Teaching Scheme : 02 P **Credit : 01**

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Programming for Problem Solving by being able to do each of the following:

1. Develop a solid understanding of the fundamental concepts of programming and problem-solving, including the input-process-output cycle, algorithms, and program design principles such as top-down and bottom-up approaches.
2. Acquire proficiency in the C programming language, including the ability to write and execute basic C programs, effectively use input-output functions, work with variables, data types, and operators, and understand the concept of program execution.
3. Demonstrate competence in using control constructs such as decision-making statements and looping statements to create efficient and structured programs.

Course Outcomes: After Successful completion of this course, the student will be able to:

1. Describe the basic concepts of problem-solving in programming and explain the input-process-output cycle.
2. Identify and explain the basic structure of a C program, including input-output using scanf() and printf().
3. Compare and contrast the decision-making constructs and looping in C
4. Understand the concept of arrays, including 1-D and 2-D arrays
5. Utilize pre-defined functions in C and demonstrate the ability to write and use user-defined functions.
6. Apply the concepts of pointers in C, including their declaration, assignment, and arithmetic operations.

List of Experiments:
Minimum 8 experiments are to be performed.

1. Set up a C programming environment (compiler, IDE, etc.).
2. Write a simple program to display "Hello, World!".
3. Solve a simple problem using a top-down approach and develop a program accordingly.
4. Use flowcharts or pseudo code to represent the algorithm for a specific problem.
5. Write program to illustrate precedence of operator
6. Write programs that demonstrate the use of if, if-else, and switch statements for decision making.
7. Create and manipulate 1-D, 2-D arrays (declaration, initialization, accessing elements).
8. Explore string manipulation functions (strcpy, strcat, strlen, etc.)

9. Write programs using user-defined functions to solve specific tasks
10. Understand and use return values and their types.
11. Explore the concept of call by value using pointers.
12. Explore the concept of call by reference using pointers

1SC01 Fundamentals of Civil Engineering

Teaching Scheme : 03 L Credit : 03

Course Prerequisites: Nil

Course Objectives:

Students will be taught -

1. Concepts related to building components and foundation.
2. Application and use of different building components.
3. Application of different masonry and damp proof course in building.
4. Basic concepts of Surveying.
5. Basic concepts of Transportation Engineering.
6. Basic concepts of Concrete Technology.

Course Outcomes:

At the end of course students will be able to

1. Understand Load bearing and Frame structure.
2. Know the types of staircase, doors, windows and other related fixtures.
3. Recognize the various bonds in stone and brick masonry.
4. Understand the objectives and need of surveying instrument
5. Understand the elements of Transportation Engineering
6. Understand the physical properties of cement, sand and aggregate

UNIT I: Building Foundation

Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages. Foundation: Definition and necessity, loads on foundation, Bearing Capacity soil, SBC values based on IS code. Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls & columns, Raft foundations.

UNIT II: Building Components

Stairs: Functions, technical terms and types of staircases, Types of Floors: Basement floor, ground floor and upper floors, Roofs: Flat & pitched roof, steel roof trusses – types and suitability, Doors: Purpose, size of door, door frames & its types, Windows: Purpose, types of windows & their suitability. Ventilators: Types and their suitability. Fixtures & fastening for doors & windows. Scaffolding: Purpose, types, suitability.

UNIT III: Masonry Construction

Stone Masonry: Technical terms, General principles to be observed during construction, random rubble masonry, coursed and un- coursed rubble masonry, Selection of stone for masonry. Brick Masonry**:** Classification of bricks, tests on bricks, properties of burnt bricks, Brick masonry construction: Technical terms, general principles, commonly used types of bonds and their suitability. Damp

proofing: causes of dampness, its effects, various methods of damp proofing, material used for damp proofing

UNIT IV: Introduction to Surveying

Definition of surveying, primary divisions, object and classification of surveying, principles of surveying, instruments for chaining and taping, methods of chain and tape surveying, basics of compass Surveying**,** Methods of traversing, principle and basic definitions, Symbols used in Surveying

UNIT V: Introduction to Transportation Engineering

Modes of Transportation, Role of Transportation in National development, Road Transport characteristics, Classification of Roads, Road Patterns, Alignment principles, Survey for highway, Elements of Traffic Engineering and Traffic Control

UNIT VI: Introduction to Concrete Technology

Cement: Physical properties of Portland cement, types of cement, laboratory tests on cement. Aggregate: Classification of aggregate, physical properties of cement, bulking and moisture content, specific gravity, bulk density. Properties of fresh concrete: Workability, mixing, centering & formwork, placing, compaction and curing of concrete.

Text Books:

1) Sushilkumar: Building Construction, Standard Publishers Distributors.
2) T.P. Kanetkar & Kulkarni: Surveying & Levelling Part I
3) Gambhir M.L.: Concrete Technology, Dhanpat Rai & Sons
4) Khanna S.K. & Justo C.E.: Highway Engineering

Reference Books:

1) Mackay W.B.: Building Construction, Vol. I, Longmans.
2) Punmia B.C.: Building Construction.
3) D. Clarke: Plane and Geodatic Surveying, Volume I

1SC02 Fundamentals of Civil Engineering Lab

Teaching Scheme : 02 P Credit : 01

Course Prerequisites: Nil

Course Objectives:

Students will be taught -

1. Detailing of different types of door.
2. Drawing of develop plan from line plan.
3. Laying of layout on the field.
4. To visit and observed the various building components.
5. To observed the features of load bearing and framed structure.
6. Introduction to various surveying equipments in the laboratory .

Course Outcomes:

At the end of course students will be able to

1. Design different types of staircase for buildings
2. Provide layouts for different structures
3. Understand the application of various laboratory instruments on the field.

List of Experiments/ Practicals:

1) Drawing of following building elements on A-3 size sheet.
   a) Panelled door, flush door, and glazed window and aluminium sliding window.
2) Drawing of any four staircases. [On A-3 size sheet, plan & section.]
3) Preparation of developed plan from given line plan of a two room building [On a A-3 size sheet.]
4) Layout of the above, in field.
5) Fields visits to building under construction and its report writing including material of construction, construction processes, Human recourses required, and construction details.
6) Sketch book containing Free hand sketches of following:
   Different types of foundations, Bonds in brick masonry, Fixtures & fastenings of doors & windows.
7) Field visit for studying building component in Load bearing and framed structure.
8) Introduction to instruments of Surveying laboratory
9) Introduction to instruments of Transportation Engineering laboratory
10) Introduction to instruments of Concrete Technology laboratory

Minimum Eight (08) experiments/ Practicals are to be performed.

2SF01 Applied Mathematics-II

Lectures: 3 L Credits: 03

Pre-requisites:

1) Basic Knowledge of Matrix and Complex number.

2) Elementary Integral Calculus.

Course Learning Objectives :

1. To deal with system of equations and solutions of Eigen value problem.
2. To express real valued periodic function in terms of sines and cosines
3. To Use Complex number theory in engineering application such as signal processing.
4. To familiarize with techniques in integral calculus.
5. To know the idea of double integration and to evaluate, change the order and apply it to get the area of the region.
6. To evaluate triple integral and its applications that is to find volume by triple integral.

Course Outcomes :

After the completion of course students will be able to…

1. Make use of system of equations in matrix forms.
2. Find the periodic functions as an infinite series.
3. Able to apply de Moivre's theorem in various concepts of complex number.
4. Use new technique DUIS and to evaluate Beta and Gamma function.
5. Evaluate double integral, triple integral and its applications.

Unit I : Matrices

Rank of a matrix, Consistency of linear system of equations by matrix method, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof). (07 Hours)

Unit II :Fourier series

Fourier expansion of function in (C, C+2L), half range Fourier series. (06 Hours)

Unit III : Complex Numbers

Roots of complex number by deMoivre's theorem, Hyperbolic and inverse hyperbolic functions, Separation of real and imaginary parts, Logarithm of complex numbers. (07 Hours)

Unit IV : Integral Calculus I

Differentiation under integral sign, Beta Function and Gamma Function. (07 Hours)

Unit V : Integral Calculus II

Double integration, change of order of integration, transformation to polar coordinates, Evaluation of area by double integration. (06 Hours)

Unit VI : Integral Calculus III

Triple integration, Transformation to spherical polar coordinates, Volume of solid by triple integration. (07 Hours)

TEXT BOOK: -

(1) Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics, Vol.-I, & II, Pune V.G. Prakashan, Pune.
(2) Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers

REFERENCE BOOKS: -

1) Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley
2) Ramana B.V. - Higher Engineering Mathematics, (TMH)
3) Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH)
4) Dass H.K. – Advanced Engineering Mathematics (S. Chand)

2SF02 Applied Chemistry

Teaching Scheme : 03 L Credit : 03

Pre-Requisites:

1. Fundamentals of redox reactions and electrochemistry.
2. Knowledge of chemical reaction.
3. Basic knowledge of qualitative and quantitative analysis.

Course Learning Objectives:

1. To enable students to manufacture functional materials on the basis of chemical forces.
2. To provide the knowledge of properties of cement and their applications.
3. To impart knowledge of characteristics of water and its disadvantages in boiler technology.
4. To impart knowledge of processes used for the removal of impurities in water.
5. To enable students to calculate various types of hardness of unknown water samples.
6. To provide knowledge about significance of fuels and lubricants.
7. To summarize students with operating principles, working processes and applications of energy conversion and storage devices.
8. To impart knowledge of various type of corrosion and corrosion control methods.

Course Outcomes:

After the completion of the course the students will be able to…

1. Apply the knowledge of chemical forces to design functional materials.
2. Apply the knowledge of useful engineering materials such as cement and lubricant.
3. Describe properties of hard water, its disadvantages and various processes for removal of water impurities.
4. Describe properties of chemical fuels, analysis methods and its applications.
5. Identify various types of corrosion, mechanism and control methods to protect metals.
6. Describe operating principles working processes and applications of energy conversion and storage devices.

UNIT I: ENGINEERING MATERIALS AND THEIR PROPERTIES: (06 Hrs)

Introduction, Classification of Engineering materials, Chemical Forces in materials- Primary forces and Secondary forces, Properties of materials, Role of chemical forces in alteration of magnitude of the properties such as Density, Melting Point, Solubility, Strength, Stiffness, Elasticity and Plasticity. Real life examples where these interactions played major role to enhanced their properties: - vulcanized rubber and plasticized PVC.

UNIT II: CEMENT ENGINEERING: (06 Hrs)

Introduction, Types of cement, Raw materials used for the manufacturing of Portland cement, Manufacturing of Portland cement by wet process. Functions of chemical constituents of cement: Tri-calcium aluminate, Tri-calcium silicate, Di-calcium silicate, Tetra-calcium alumino ferrite, magnesia, sulphur trioxide, iron oxide, alkalis, free lime, alumina. Physical Properties of Portland cement: Heat of hydration, Fitness, Soundness, Strength, Setting and hardening.

UNIT III: WATER CHARACTERISTICS & THEIR EFFECTS ON BOILER: (08 Hrs)

Introduction. Characteristics of water: - Hardness, pH, alkalinity, DO, TDS and Chloride ion concentration. Disadvantages of characteristics of water in Boiler: - Scale & sludge, Priming & Foaming, Caustic embrittlement and Boiler corrosion. Methods of analysis: - EDTA method, Iodometric method and conductometric titration. Methods for removal of impurities: Sedimentation, Neutralization, Zeolite process, De-Ionization process and Reverse osmosis. Calculation of hardness by data obtained from EDTA and zeolite processes.

UNIT IV: FUEL and LUBRICANT: (07 Hrs)

Introduction, Types of Fuels, Properties of Fuels: Ignition Temperature, Calorific value. Types of calorific value.

Solid Fuel: Coal, classification of coal, analysis of coal: ultimate analysis.

Liquid Fuel: Crude oil, Fractional distillation of crude oil, Properties of liquid fuel: Octane number and Cetane number.

Gaseous Fuel: Hydrogen gas, economy of hydrogen gas as fuel.

Lubricants: Introduction, classification of lubricants, properties of lubricants, uses of lubricants.

UNIT V: ENERGY SOURCES & STORAGE DEVICES: (06 Hr)

Introduction, Principle of batteries, Types of Batteries: Primary Batteries-Dry Cell, Mercury cell, Secondary Batteries- NICAD (Ni-Cd) battery, Lithium-ion battery. Green energy sources: Photo voltaic cell (Solar Cell), Fuel Cell.

UNIT VI: CORROSION & Its CONTROL: (07 Hrs)

Introduction, Types of corrosion: Dry and Wet corrosion, Mechanism of dry and wet corrosion, Factor affecting corrosion: Nature of metal and nature of environment, Types of wet corrosion-Pitting corrosion, waterline corrosion, stress and galvanic corrosion, Methods of corrosion control-

Cathodic protection: Sacrificial anode and impressed current method, Protective coating: Galvanizing and Tinning process.

Text Books

1. Engineering Chemistry by Jain & Jain (Dhanpat Rai & Sons)
2. Engineering chemistry by S. S. Dara, S. Chand Publication
3. Engineering & Technology Vol-I & II-by Rajaram& Kuriocose
4. Engineering Chemistry by Prasanta Rath (Cengage learning)
5. Engineering & Technology by Shashi Chawala, Dhanpat Rai & Sons.
6. Engineering Chemistry by K. Sesha Maheswaramma, Mridula Chugh, Pearson.

2SF03 Basics of Electrical Engineering

Teaching Scheme : 02 L **Credit : 02**

❖ **Pre-requisites:**

1. Concepts of Electrostatics and Current Electricity.
2. Fundamentals of Magnetic effect of electric current, magnetism and Electromagnetic Induction.

❖ **Course Learning Objectives :**

CLO 1 : To introduce students with different terminologies in electrical engineering and network simplification methods of resistances.
CLO 2 : To understand DC Circuit analysis.
CLO 3 : To understand magnetic circuits and Electromagnetic induction.
CLO 4 : To understand Single phase A.C. fundamentals.
CLO 5 : To understand Three phase A.C circuits.
CLO 6 : To understand single phase Transformer and Safety in electrical installation.

❖ **Course Outcomes :**

After completion of this course the student shall be able to :

CO 1: Understand fundamentals of Electrical Engineering and be adequately trained to solve Network of resistances by using transformation techniques.

CO 2: Demonstrate DC circuits by finding different parameters like voltage, currents, resistance using laws and theorems.

CO 3: Explain different properties of electromagnets and phenomenon of electromagnetic induction in magnetic circuits.

CO 4: Illustrate the different terms of AC and analyze single phase AC circuits.

CO 5: Explain Three phase A.C circuits

CO 6: Explain single phase Transformer and Safety in electrical installation.

UNIT I: Fundamentals of Electrical Engineering: **(05 Hours)**

Basic concepts of Current, Voltage, Power, energy and relationship between them. Resistance, Resistivity, Conductance, Conductivity, Network simplification of Resistances (Series, Parallel, Delta-Star and Star-Delta transformation)

UNIT II: DC Circuit Analysis : **(05 Hours)**

Types of Sources, Current and voltage division principle, Ohm's Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law , Superposition Theorem, Thevenin's Theorem

UNIT III: Magnetic circuits and Electromagnetic Induction: **(05 Hours)**

Basic concepts of Flux, flux density, MMF, Reluctance, Permeance, Magnetic field intensity and their relationship. Series Magnetic circuits, B-H curve, Principle of electromagnetic induction, Types of Magnetically induced EMF, Concept of self and mutual Inductance.

UNIT IV: A.C. Fundamentals: **(05 Hours)**

Generation of sinusoidal alternating voltages and currents, Different terminologies associated with AC circuit. Behavior of AC circuit containing Pure R, L, and C. Phasor representation in rectangular & polar form, Impedance and admittance concept. Series R-L, R-C and R-L-C circuit, Resonance in Series R-L-C circuit, Power in single phase circuit: - Concepts of active, reactive and apparent power, Power factor

UNIT V: Poly-phase Circuits : **(05 Hours)**

Generation of Three phase voltages, current and power, Star connected and delta connected balanced circuits, Relationship between line current, phase current and line voltage, phase voltage , analysis of balanced three phase circuits Power measurement in Three phase circuit .

UNIT VI: Single phase Transformer : **(05 Hours)**

- Single-phase transformer construction and working (Ideal and practical) , Types of Transformer, EMF equation of Transformer, Efficiency & Regulation of transformer, condition for maximum efficiency.
- Electrical Safety **:** Safety precautions in electrical installation, Earthing, Types of Earthing (Plate and Pipe Earthing)

Recommended Text Books :

1. B. L. Thereja, Basic electrical engineering, S. Chand Publications.

2. D.P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", TMH Publishing Co. Ltd., New Delhi, 3rd edition

3. Leonard S. Bobrow, "Fundamentals of Electrical Engineering", 2nd Edition, Oxford Press.

4. Kulshreshtha D.C., " Basic Electrical Engineering" , First Ed., TMH

Reference Books :

1. Leonard S. Bobrow, “Fundamentals of Electrical Engineering”, 2nd Edition, Oxford Press. R
2. A.E. Fitzgerald, D.E. Higginbotham, “Basic Electrical Engineering”, McGraw Hill Book Co., New York, 2nd edition
3. Dr.S.L.Uppal, “Electrical Wiring, Estimating and Costing”, Khanna Publishers.

2SF04 Biology for Engineers

Teaching Scheme : 02 L **Credit : 02**

Course Learning Objectives:

CLO1: To acquire the knowledge of basic concepts of biology and need of the subject in Engineering.

CLO2: To study the human organs and their analogy with the engineering applications.

CLO3: To acquire the knowledge of various medical tools and instruments used in medical field.

CLO4: To be acquainted with the latest trends in bio-engineering.

CLO5: To become familiar with the concept of Bio-mimicry and understand how nature has inspired innovations in technology.

Course outcomes:

1. Understand basic biological concepts and define the terminologies.
2. Understand various organs in body, their function; it's analogy with engineering applications.
3. Acquire knowledge of medical tools and machineries used in the treatment.
4. Understand the concepts of 3D printing and its biomedical applications and trends in bio-engineering.
5. Understand the concepts like biosensors, biofuels and biochips
6. Understand the concept of Bio-mimicry and nature inspired technology.

UNIT-I

Introduction to Basic Biology:

Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes, The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types. **(4 Hours)**

UNIT-II

Human Organ Systems and Bio Designs – 1

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics.). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). **(4 Hours)**

UNIT-III

Human Organ Systems and Bio Designs – 2

Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems). Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis). **(5 Hours)**

UNIT-IV

Trends in Bioengineering-1

Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D Printed tooth, Dental implants, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Biomedical sensors, devices and measurement systems. **(4 Hours)**

Unit-V

Trends in Bioengineering-2

Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels. Tissue engineering And its application, transgenic plants and animals. **(4 Hours)**

Unit-VI

Nature-Bioinspired Materials and Mechanisms:

Bio-mimicry, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs). **(5 Hours)**

Reference Books:

1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
3. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
7. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
8. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.

Reference for Biomedical sensors:

https://www.intechopen.com/chapters/48226

2SF05 Universal Human Values

Teaching Scheme : 02 L Credit : 02

Objective : To facilitate in students the understanding of Universal Human Values and imbibe professional Ethics.

COURSE OUTCOMES

1. Understand the need for value education and its significance in personal and societal development.
2. Understand the harmony between the 'I' and the body and its significance for overall well-being.
3. Identify and appreciate the values in human-human relationships, emphasizing trust (Vishwas) and respect (Samman).
4. Develop a holistic perception of harmony at all levels of existence.
5. Communicate effectively about the importance of harmony in nature, promoting awareness and inspiring others to adopt sustainable practices.
6. Recognize the relevance of a humanistic constitution and humanistic universal order.

UNIT I

Process for ValueEducation

Understanding nature and scope for Value Education, Self-Exploration–concept and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' – Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body

UNIT III

Understanding Harmony in the Family and Society- Harmony Human - Human Relationship

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas.

UNIT IV

Building the Universal Harmonious Order

Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to worldfamily!

UNIT V

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

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

UNIT VI

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

TEXT BOOK

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course inHuman Values and ProfessionalEthics.

REFERENCES

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs,Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, JeevanVidyaEkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age InternationalPublishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh,Amravati.
9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers , Oxford UniversityPress
10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, ExcelBooks.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted2008.

2SF06 Indian Knowledge System

Teaching Scheme : 02 L Credit : 02

Course Objectives: In this course students will know and understand contribution of ancient Indian scientists through :

1) Introduction to contribution of Indian scientist in various fields of Science and Technology and Astronomy
2) Introduce to contribution of Indian scientist in Chemistry , Metallurgy and Mathematics.
3) Introduction to contribution of Indian scientist in Medical Sciences and Life Sciences.

Course Outcomes: After Successful completion of this course, the student will be able to:

1) Discuss contribution of Indian Scientists in various fields of scientists and technology.
2) Narrate contribution of Indian Scientists in the field of Astronomy.
3) Discuss contribution of Indian Scientists in the field of Chemistry and Metallurgy
4) Discover contribution of Indian Scientists in the field of Mathematics
5) Collect contribution of Indian Scientists in the field of Medical Science and Ayurveda.
6) Discuss contribution of Indian Scientists in the field of Plant and Animal Science.

Unit I : India's Contribution to Science and Technology:

Pre-Independence contribution. Brief information about various fields of contributions. (4 Hrs)

Unit II :Contribution in Astronomy:

The Beginnings of Indian Astronomy, The Early Historical Period, The Siddhāntic Era, The Kerala School, Other Post-Siddhāntic Developments. (4 Hrs)

Unit III : Contribution to Chemistry and Metallurgy:

Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Classical Age, Laboratories and Apparatus

Metallurgy before and during the Harappan Civilization, Iron Metallurgy and it's applications, Zinc Metallurgy. (4 Hrs)

Unit IV : Contributions to Mathematics :

First Steps , contributions from: early historical period, the classical period, the classical period: post Aryabhatta, contributions of Shri P C Mahalanobis, Shri Shrinivasa Ramajujan. (4 Hrs)

Unit V : Contributions to Medical Science and Ayurveda as way of life, health and well being

The tradition of surgery, Inoculation for smallpox, Microbioilogy and Paracitology, Communicable diseases and epidemics, An evolving pharmacopoeia, Cross-cultural interactions, What is Ayurveda? Integrative approach to healthcare, Integrative approach to healthcare, Principles of Ayurvedic healing, Five elements, three Doshas and Treating diseases to restore health. (4 Hrs)

Unit VI : Contributions to Plant and Animal Science

Plant Science in Ancient India, Animal Science in Ancient India, Indian Traditional Knowledge on Environmental Conservation. (4 Hrs)

Text Book :

1) Indian Contributions to Science compiled by Vijnana Bharati

Reference Books:

1) History of Science and technology in India by Dr. Binod bihari satpathy
2) Hindu achievements In exact science by Benoy Kumar Sarkar
3) Science in Ancient India by Subhash C. Kak

2SF07 Applied Chemistry Lab

Teaching Scheme : 02 P Credit : 01

Pre-Requisites:

1. Basic knowledge of qualitative and quantitative analysis.
2. Basic knowledge of titrations-based experiments.
3. Knowledge of chemistry lab precautions, prohibitions and safety aids.

Course Learning Objectives:

1. To impart skills of quantitative and qualitative analysis.
2. To provide knowledge of synthesis of co-crystal.

Course Outcomes:

After the completion of the course the students will be able to…

1. Determine the properties of water, chemical fuel, lubricant and cement based on laboratory techniques.
2. Synthesise co-crystals and determination of melting point of it.
3. Handle some important analytical instruments.

LIST OF EXPERIMENTS

1. Preparation of Paracetamol and oxalic acid co-crystal and determination of its melting point.
2. Determination of hardness of water by EDTA method.
3. Determination Alkalinity (NaOH and Na_2CO_3) in given water sample
4. Determination of chlorine in water sample. (Iodometry)
5. Determination of Dissolved Oxygen in Water Sample.
6. Determination of pH of unknown sample by pH meter.
7. Determination of H^+ ion concentration by conductivity meter.
8. Determination of % CaO in given cement sample.
9. Determination of % of moisture in coal sample by proximate analysis.
10. Determination of viscosity of lubricating oil by Redwood viscometer No.1/No. 2
11. Determination of flash point of lubricating oil by Abel's apparatus
12. Determination of acid value of lubricating oil.
13. Determination of mass of Zn coating on galvanized article.

Minimum nine (09) experiments are to be performed

Text Books

1. Experiments and Calculations in Engineering Chemistry by S. S. Dara, S. Chand & Company LTD.
2. Engineering Chemistry Practical Book by Dipika Jaspal and Arti Malviya.
3. Laboratory Manual on Engineering Chemistry by S. K. Bhasin and Sudha Rani, Dhanpat Rai Publishing Company.

2SF08 Basics of Electrical Engineering Lab

Teaching Scheme : 02 P **Credit : 01**

❖ **List of Experiments:**

1. To validate Kirchoff's Current Law for DC Circuits .
2. To validate Kirchoff's Voltage Law for DC Circuits
3. To verify Thevenin theorems for DC Circuits.
4. To verify Superposition theorem for DC Circuits.
5. To analyze RLC Series circuit and to plot its phasor diagram.
6. To verify relationships between line and phase values for Star connected load.
7. To verify relationships between line and phase values for Delta connected load.
8. To conduct load test on single phase transformer and pre-determine its efficiency and regulation.
9. Open circuit and short circuit test on Single phase transformer.
10. Demonstration of Earthing

2SF09 Workshop/Digital Fabrication Lab

Teaching Scheme : 02 P **Credit : 01**

Course Objectives:

1. To make familiar with different tools, equipment and to understand their basic purposes.
2. To develop skills and get hands on experience of marking, measuring, cutting, machining, shaping and forming processes.
3. To understand and develop skills for different joining processes.
4. To make the students well versed with basic electrical, electronics and computer components.
5. To understand the modern manufacturing techniques such as CNC, Robotic Operations and 3D printing.

Course Outcomes:

1. Upon completion of this course, the students will gain knowledge of different manufacturing processes, tools & equipment's, which are commonly employed in industries.
2. On completion of this course, the students will be able to improve craftsmanship & fabricate the components using various manufacturing techniques.
3. Students will be conversant with modern electrical, electronics & computer components & their applications

Group A

1) **Fitting :** Introduction to different tools , equipment's and operations in Fitting Shop. Prepare one job in the Fitting shop, involving operations like marking, filing, hacksaw cutting, drilling and tapping etc.

2) **Sheet Metal :** Introduction to Sheet Metal tools and equipment's, their uses, different sheet metal joints and operations in Sheet Metal. Prepare one job in the Sheet Metal shop.

3) **Welding :** Introduction to Welding, welding tools and equipment's, their uses. Brief introduction to different welding processes, different welding joints. Prepare one job in the Welding shop.

4) **Smithy :** Introduction to different tools , equipments and Smithy operations like upsetting, drawing ,bending, forming etc. Prepare one job in the smithy shop.

5) **Carpentry :** Introduction to different wood working tools , equipment's and machines , types of joints and operations performed in Carpentry Shop. Prepare one job in the Carpentry shop.

6) **Machining :-** Introduction and practice of basic machining operations on Drilling , Lathe and shaper machine tools.

Group B

1) To identify the computer hardware parts, understand working of these parts, & Assemble demonstrate its working

2) Identification of various electrical & electronic components & tools used in domestic/industrial applications

3) Development of circuit schematic using EDA tools

4) 3D printing demonstration

5) Robotic operations demonstration

6) CNC operations demonstrations

Note- Students have to perform any 4 practical from group A & any 3 practical from group B

2SCM01 Engineering Mechanics

Teaching Scheme : 03 L Credit : 03

Course Prerequisites: Nil

Course Objectives:

Students will be taught -

1. Concepts related to Forces and its effects, resolution and composition of coplanar forces.
2. Application of principles of statics to the system of rigid bodies.
3. Analysis of simple structures like trusses and beams.
4. Concepts related to friction, its application.
5. Concepts related to centroid, moment of inertia, radius of gyration and product of inertia and its application.
6. Concepts related to kinetic and kinematics, and its applications to various types of motion.

Course Outcomes:

At the end of course students will be able to -

1. Compose and resolve the forces, analyse the equilibrium force systems.
2. Analyse the statically determinate structures.
3. Calculate frictional forces for simple contact, wedges and belt friction.
4. Locate centroid and calculate moment of inertia.
5. Calculate various kinematic quantities.
6. Apply the equations of kinetics.

UNIT I: Equilibrium and Resultant

Concept of force, force systems, moment, couple, resolution and compositions of coplanar forces. Free-body diagrams, equations of equilibrium-Lami's theorem, problems on equilibrium of co-planar forces acting on a rigid body and system of rigid bodies. (06 hrs)

UNIT II: Analysis of Determinate structure (Beams, Trusses and Frames)

Determinate and Indeterminate structure, introduction to the types of beams, trusses and frames. Analysis of beams and trusses using principles of statics (Determinate only). (06 hrs)

UNIT III: Friction

Friction, types of friction, angle of friction, angle of repose, cone of friction, Coulomb's laws of friction, wedge friction and belt friction. (06 hrs)

UNIT IV: Center of Gravity and Moment of Inertia

Centroid, First Moment of Area, Centroid of composite sections, Second Moment of Area, Radius of Gyration, product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Definition of principal axes and principal moment of inertia. (06 hrs)

UNIT V: Kinetics

Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components. (06 hrs)

UNIT VI: Kinematics

Application of D'Alembert's Principle, concept of dynamic equilibrium, Work-Energy Equation, Impulse-Momentum Equation to the bodies in motion. (06 hrs)

Text Books:

1. Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
2. Bhavikatti, S. S. and Rajashekarappa, K. G., Engineering Mechanics, New Age International Publishers, New Delhi.

Reference Books:

1. Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore
2. Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C., Auckland.
3. Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
4. Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

2SCM02 Engineering Mechanics Lab

Teaching Scheme : 02 P Credit : 01

Course Prerequisites: Nil

Course Objectives:

Students will be taught -

1. Performance of practical's based on concepts related to engineering mechanics.
2. Working of Lifting Machines
3. Graphical analysis to verify analytical concepts.

Course Outcomes:

Students will be able to -

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.
3. Perform graphical analysis of force systems and simple structures. List of Experiments/

List of Experiments/ Practicals:

1. To verify Law of Polygon of forces
2. To determine reactions at the supports of simple beam.
3. To determine forces in members of Jib crane.
4. To determine coefficient of friction on inclined plane.
5. To determine Coefficient of coil friction.
6. To verify law of machine for screw jack.
7. To verify law of machine for differential axle wheel.
8. To verify law of machine for single purchase crab.
9. To verify law of machine for double purchase crab.
10. Three compulsory graphical solutions.

Minimum Eight (08) experiments/ Practical's are to be performed.