Vidyavardhaka Sangha®, Mysore
VIDYAVARDHAKA COLLEGE OF ENGINEERING
Autonomous Institute, affiliated to Visvesvaraya Technological University, Belagavi
(Approved by AICTE, New Delhi & Government of Karnataka)
Accredited by NBA (CV, CS, EE, EC, IS & ME) | NAAC with 'A' Grade
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Scheme of Teaching and Examination for BE with effect from 2020 – 2021

I SEMESTER (Common to all Programs) — PHYSICS CYCLE

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (hrs.)	CIE Marks	SEE Marks	Total	
1	BS	20MA11	Advanced Mathematics – I	Mathematics	3	2	0	3	50	50	100	4
2	BS	20PH12	Applied Physics	Physics	4	0	0	3	50	50	100	4
3	ES	20EE13	Basics of Electrical Engineering	Electrical Engineering	3	0	0	3	50	50	100	3
4	ES	20CV14	Basics of Civil Engineering	Civil Engineering	3	0	0	3	50	50	100	3
5	ES	20ME15	Engineering Graphics	Mechanical Engineering	2	0	2	3	50	50	100	3
6	BS	20PH16	Applied Physics Laboratory	Physics	0	0	2	3	50	50	100	1
7	ES	20EE17	Electrical Engineering Laboratory	Electrical Engineering	0	0	2	3	50	50	100	1
8	ES	20AL18	Engineering Exploration	Engineering Depts.	0	0	2	3	50	50	100	1
9	HS	20HS11	Environmental Studies*	Civil Engineering	1	0	0	-	50	-	50	-
TOTAL					**16**	**2**	**8**	**-**	**450**	**400**	**850**	**20**

***Mandatory Non-Credit Course**

Scheme of Teaching and Examination for BE with effect from 2020 – 2021

I SEMESTER (Common to all Programs) | **CHEMISTRY CYCLE**

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (hrs.)	CIE Marks	SEE Marks	Total	
1	BS	20MA11	Advanced Mathematics – I	Mathematics	3	2	0	3	50	50	100	4
2	BS	20CH12	Applied Chemistry	Chemistry	4	0	0	3	50	50	100	4
3	ES	20CS13	Programming for Problem Solving	Computer Science Engineering	3	0	0	3	50	50	100	3
4	ES	20ME14	Basics of Mechanical Engineering	Mechanical Engineering	3	0	0	3	50	50	100	3
5	ES	20EC15	Basics of Electronics and Communication Engineering	Electronics & Communication Engineering	3	0	0	3	50	50	100	3
6	BS	20CH16	Applied Chemistry Laboratory	Chemistry	0	0	2	3	50	50	100	1
7	ES	20CS17	Computer Programming Laboratory	Computer Science Engineering	0	0	2	3	50	50	100	1
8	HS	20HS12	Communicative English	Humanities	0	0	2	3	50	50	100	1
9	HS	20HS13	Social Innovation #	Basic Sciences	0	0	2	-	50	-	50	-
TOTAL					**16**	**2**	**8**	**-**	**450**	**400**	**850**	**20**

 # Mandatory Non-Credit Course for AICTE Activity Points

Scheme of Teaching and Examination for BE with effect from 2020 – 2021

II SEMESTER (Common to all Programs) | **PHYSICS CYCLE**

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (hrs.)	CIE Marks	SEE Marks	Total	
1	BS	20MA21	Advanced Mathematics – II	Mathematics	3	2	0	3	50	50	100	4
2	BS	20PH22	Applied Physics	Physics	4	0	0	3	50	50	100	4
3	ES	20EE23	Basics of Electrical Engineering	Electrical Engineering	3	0	0	3	50	50	100	3
4	ES	20CV24	Basics of Civil Engineering	Civil Engineering	3	0	0	3	50	50	100	3
5	ES	20ME25	Engineering Graphics	Mechanical Engineering	2	0	2	3	50	50	100	3
6	BS	20PH26	Applied Physics Laboratory	Physics	0	0	2	3	50	50	100	1
7	ES	20EE27	Electrical Engineering Laboratory	Electrical Engineering	0	0	2	3	50	50	100	1
8	ES	20AL28	Engineering Exploration	Engineering Depts.	0	0	2	3	50	50	100	1
9	HS	20HS21	Environmental Studies*	Civil Engineering	1	0	0	-	50	-	50	-
TOTAL					**16**	**2**	**8**	**-**	**450**	**400**	**850**	**20**

 # Mandatory Non-Credit Course for AICTE Activity Points

Scheme of Teaching and Examination for BE with effect from 2020 – 2021

II SEMESTER (Common to all Programs) | **CHEMISTRY CYCLE**

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (hrs.)	CIE Marks	SEE Marks	Total	
1	BS	20MA21	Advanced Mathematics – II	Mathematics	3	2	0	3	50	50	100	4
2	BS	20CH22	Applied Chemistry	Chemistry	4	0	0	3	50	50	100	4
3	ES	20CS23	Programming for Problem Solving	Computer Science Engineering	3	0	0	3	50	50	100	3
4	ES	20ME24	Basics of Mechanical Engineering	Mechanical Engineering	3	0	0	3	50	50	100	3
5	ES	20EC25	Basics of Electronics and Communication Engineering	Electronics & Communication Engineering	3	0	0	3	50	50	100	3
6	BS	20CH26	Applied Chemistry Laboratory	Chemistry	0	0	2	3	50	50	100	1
7	ES	20CS27	Computer Programming Laboratory	Computer Science Engineering	0	0	2	3	50	50	100	1
8	HS	20HS22	Communicative English	Humanities	0	0	2	3	50	50	100	1
9	HS	20HS23	Social Innovation #	Basic Sciences	0	0	2	-	50	-	50	-
TOTAL					**16**	**2**	**8**	**-**	**450**	**400**	**850**	**20**

 # Mandatory Non-Credit Course for AICTE Activity Points

PHYSICS CYCLE

SEMESTER – I			
Course Name	**: Advanced Mathematics-I**	**Course Code**	**: 20MA11**
Number of Lecture Hours / Week	**: 03**	**CIE Marks**	**: 50**
Number of Tutorial Hours / Week	**: 02**	**SEE Marks**	**: 50**
Total Number of Lecture Hours + Tutorial Hours	**: 40 + 20= 60**	**SEE Duration**	**: 03 Hrs**
L:T:P	**: 3:2:0**	**CREDITS**	**: 04**

COURSE OVERVIEW:

Advanced Mathematics-I is a course which provides Mathematical techniques in the advanced areas of Mathematics that are of utmost relevance to the engineering disciplines. The principal topics are partial differentiation, ordinary differential equations, integral calculus, Infinite series, numerical methods and linear algebra. The purpose of this course is to provide the skills and knowledge required to perform fundamental Mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, infinite series, numerical methods and linear algebra. The course aims at showing the relevance of Mathematics in engineering and applied sciences.

COURSE LEARNING OBJECTIVES (CLO) :

The objective is to enable the students to apply the knowledge of Mathematics in various fields of engineering by the following means:

a) Explain the concept of calculus, infinite series, numerical methods and linear algebra for applying it appropriately in solving engineering problems.

b) Explain how to analyze the engineering problems by making use of the concepts of calculus, infinite series, numerical methods and linear algebra.

c) Explain the usage of modern tool to understand the concepts and solve problems in calculus, infinite series, numerical methods and linear algebra.

MODULES	TEACHING HOURS
MODULE 1: Differential Calculus: Partial Differentiation- basics, Euler's theorem of first kind (only problems), total derivatives, Jacobian, Maclaurin series of one and two variable, Differentiation under Integral sign.	**8**
MODULE 2: Ordinary Differential Equations: **Linear Equations**: Bernoulli's equation, Exact Equations, Reducible to Exact (IF of the form $x^a y^b$), Orthogonal Trajectory (Cartesian only), and Newton's law of cooling. **Non-Linear Equations:** Solve for p, Clairaut's form (singular,	**8**

general solution).	
MODULE 3: Integral Calculus: Multiple Integrals – Double integrals, changing the order of integration, changing Cartesian form to polar form. Special Functions- Beta and Gamma Functions, relation between beta and gamma function, properties, and its problems (related to reduction formula of definite integral).	**8**
MODULE 4: Numerical methods and Infinite Series: Numerical methods: Types of errors in numerical methods, Solution of Algebraic and Transcendental Equation: Newton-Raphson. Finite Differences: Forward and Backward Interpolation, Lagrange's Interpolation. Numerical Integration- Simpson's 1/3rdrule. **Infinite Series:** Convergence of infinite series: D-Alembert's Ratio Test, Raabe's Test, Leibnitz's test, absolute and conditional convergent.	**8**
MODULE 5: Linear Algebra: Vectors, linearly dependent and independent vectors, Solution to systems of Linear Equation: Rank, Consistency, Gauss Elimination, LU decomposition. Eigen values- Eigen vectors, Diagonalization, Gauss–Seidel Method, Rayleigh Power method.	**8**

Text Books

1. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. Gilbert Strang, Linear Algebra and its Applications, Wellesley Publishers.

REFERENCE BOOK

1. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd. Publishers.

COURSE OUTCOMES (COs): At the end of this course, students will be able to

CO1	**Understand** the basic concepts of calculus for a single and multivariable function, ordinary differential equations, infinite series, numerical methods and linear algebra. (PO-1)
CO2	**Apply** the concept of calculus, ordinary differential equations, infinite series, numerical methods and linear algebra to solve the problems arising in engineering fields. (PO-1)
CO3	**Analyze** the solutions of engineering problems using the concepts of calculus, ordinary differential equations, infinites series, numerical methods and linear algebra. (PO-2)
CO4	Using **modern tool** to **solve/analyze** engineering problems from the concepts of calculus, numerical methods and linear algebra. (PO-5)

SEMESTER – I / II			
Course Name	**: Applied Physics**	**Course Code :**	**20PH12/22**
Number of Lecture / Week	**: 04**	**CIE Marks :**	**50**
Number of Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total Number of Lecture Hours	**: 50**	**SEE Duration :**	**03 Hrs**
L:T:P	**: 4:0:0**	**CREDITS :**	**04**

COURSE OVERVIEW:

This course provides the knowledge about photonic devices, oscillations and waves. It deals with the concepts of elastic moduli for various materials. It highlights the properties of conductors, semiconductors and dielectric materials. It imparts the study of crystal structure using X-ray diffraction technique and its applications.

COURSE LEARNING OBJECTIVES:

1. To elucidate the concepts of photonic devices, oscillations and waves.
2. To explain the classification of physics of materials.
3. To impart the concepts of mechanical, electrical and thermal properties of materials among students.

MODULES	TEACHING HOURS
MODULE 1: Physics of photonic devices Introduction to lasers, energy density using Einstein coefficients, condition for laser action, requisites of a laser system, construction and working of semiconductor diode laser, application of lasers in holography, propagation mechanism, angle of acceptance and numerical aperture, condition for ray propagation, modes of propagation and types of optical fibers, normalized frequency parameter, attenuation, optical fiber in point to point communication system, numerical problems.	**10**
MODULE 2: Oscillations & waves Definition of simple harmonic motion, derivation of equation for simple harmonic motion, mechanical simple harmonic oscillator (mass suspended to spring oscillator), equivalent force constant for springs in series and parallel combination, theory of damped oscillations - over, critical and under damping, theory of forced oscillations, Mach number and Mach angle, properties of shock waves, laws of conservation of mass, energy and momentum, construction and working of Reddy shock tube, characteristics of Reddy shock tube, applications of shock waves, numerical problems.	**10**
MODULE 3: Elastic properties of materials	**10**

Introduction to elasticity and plasticity, concept of stress and strain, Hooke's law, stress-strain curve, different elastic moduli, Poisson's ratio, relation between shearing strain, elongation strain and compression strain, relation between Young's modulus, Rigidity modulus and Poisson's ratio, relation between Young's modulus, Bulk modulus and Poisson's ratio, limits of Poisson's ratio, neutral surface, bending moment of a beam with circular and rectangular cross section, Young's modulus using single cantilever, couple per unit twist of a solid cylinder, numerical problems.	
MODULE 4: Physics of solids Introduction to classical free electron theory, assumptions of quantum free electron theory, Fermi energy and Fermi factor, density of states (Qualitative), expression for Fermi energy at zero Kelvin, success of quantum free electron theory, introduction to semiconductors, expression for electrical conductivity for an intrinsic semiconductor, expression for hole concentration and electron concentration (Qualitative), law of mass action, Fermi levels in intrinsic semiconductor, Hall effect in semiconductors, introduction to dielectric materials, polar and non-polar dielectrics, internal field in a solid (Qualitative), Clausius-Mossotti equation, numerical problems.	**10**
MODULE 5: Crystal structure Introduction to crystal structure, space lattice, unit cell, primitive and non-primitive cell, lattice parameters, Bravais lattice, crystal systems, direction and planes in a crystal, Miller indices, inter-planar spacing using Miller indices, coordination number and atomic packing factor for simple cubic, face centered cubic and base body centered cubic structures, Bragg's law, determination of crystal structure using Bragg's X–ray diffractometer, crystal structure of sodium chloride and diamond, numerical problems.	**10**

Text Books:

1. Engineering physics, R K Gaur & S L Gupta, Dhanpat Rai publications
2. Engineering physics, M N Avadhanulu, P G Kshirsagar & TVS Arun Murthy, 11th edition, S Chand.

Reference Books:

1. Solid state physics, S O Pillai, new Age International, 6th edition
2. Lasers and non-linear optics, BB Laud, New Age International Pvt Ltd Publishers, 3rd edition
3. Optical electronics and photonics, Safa o Kasaf, 2nd edition, Pearson
4. Introduction to shock waves in air, Prunty & Sean, Springer
5. Introduction to mechanics, M K Verma, University press

6. Electrical properties of materials, L Solymar, D Walsh, R R A Syms, 10th edition, Oxford university press
7. Introduction to solid state physics, Kittel C, Wiley
8. Fundamentals of solid state physics, Saxena-Gupta-Saxena, Pragati prakashan

COURSE OUTCOMES (COs): After completing the course, the students will be able to,

CO1	Describe the basic concepts of photonic devices, oscillations, waves, elasticity and crystallography.
CO2	Apply the concepts of lasers, shock waves, elasticity and crystallography to solve engineering problems.
CO3	Analyze the mechanical, electrical and structural properties of metallic and non-metallic materials.
CO4	Inculcate the ability to study independently the recent concepts of physics.

SEMESTER – I / II			
Course Name	**: Basics of Electrical Engineering**	**Course Code:**	**20EE13/23**
Number of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50**
Number of Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total Number of Lecture Hours	**: 40**	**SEE Duration:**	**03 Hours**
L:T:P	**: 3:0:0**	**CREDITS :**	**03**

COURSE OVERVIEW :

This subject gives the basic knowledge about the electrical quantities, electrical safety rules, construction and operation of electrical devices and its applications. It imparts the knowledge for the analysis of basic DC and AC circuits used in electrical and electronics devices and develop skill to identify and selection of generators or motors for required applications. It highlights the importance of transformers in transmission and distribution of electric power.

COURSE LEARNING OBJECTIVES (CLO) :

1. To discuss fundamental concepts and to analyse the behavior of electric circuits.
2. To explain principle of operation, construction and performance of electrical machines such as single phase transformer, DC machines, synchronous generator and three phase induction Motors.
3. To impart an overview about electrical wiring and protection mechanisms for domestic applications.

MODULES	TEACHING HOURS
MODULE 1: Measuring instruments and AC Fundamentals **Fundamentals of Electrical Measuring instruments**: Classification of Electrical Measuring Instruments, Types of Secondary Instruments, Principles of Operation of Electrical Instruments, Essentials of Indicating Instruments, Deflecting Torque, Controlling Torque, Damping Torque **AC Fundamentals:** Generation of sinusoidal voltage, Average value and Root mean square value of sinusoidally varying alternating quantity, phasor representation of alternating quantities, Form factor and Peak factor of sinusoidally varying alternating quantity**.** **Refer (Textbook-2)**	**8**
MODULE 2: Single Phase and Three Phase AC Circuits **Single Phase Circuits**: Analysis of AC circuits with R-L, R-C, R-L-C using phasor diagram for series and parallel configurations. Real power, reactive power, apparent power and power factor.	**8**

Three Phase circuits: Generation of three phase power, Advantages of 3-phase power over single phase. Three-phase balanced circuits, voltage and current relations in star and delta connections. **Refer (Textbook-2)**	
MODULE 3: Transformers and Induction Motors **Single Phase Transformers:** Necessity of transformer, Principle of operation, T**ypes of Transformers,** Electro Motive Force equation, losses, efficiency, Condition for maximum efficiency**.** **Three Phase Induction Motors:** Construction, Concept of Rotating Magnetic Field, Working of three-phase induction motor, Slip and its significance. Necessity of starter, Applications of Induction motors**.** **Refer (Textbook-1)**	**8**
MODULE 4:DC Machines and Synchronous Generators **DC Generators:** Construction and principle of operation, EMF equation (excluding Numerical Problems) **DC Motors:** Principle of operation, Back EMF, Torque equation, types of DC motors, Characteristics of dc motors (shunt and series motors only), Applications of DC motors. **Synchronous Generators or Alternators:** Constructional details, Principle of operation, frequency of generated voltage, EMF equation, concept of winding factor (excluding the derivation and calculation of distribution and pitch factors). Applications of **synchronous generators**. **Refer (Textbook-1)**	**8**
MODULE 5: Domestic Wiring and LT Switchgear **Domestic Wiring:** Single line diagram of electrical power system. Service mains, meter board and distribution board. **Elementary types of wiring,** Pipe and Plate earthing. **Elementary calculations for energy consumption of house hold appliances.** **Components of LT Switchgear**: Fuse, **concept of** electric shock, precautions against shock MCB, ELCB. **Refer (Textbook-1)**	**8**
NOTE: Out of 5 Modules only 2 Modules can have internal choice i.e., 40% internal choice and 60% compulsory for both CIE and SEE	
Text Books: 1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010. 2. Basic Electrical Engineering by V.K. Mehta and Rohit Mehta S. Chand & Company Pvt. Ltd.	
Reference Books: 1. Fundamentals of Electrical Engineering Rajendra Prasad PHI Third Edition 2014 2. Basic Electrical Engineering Abhijit Chakrabarti, Chandan Kumar Chanda,	

Sudiptanath TMH, 1st Edition 2010
3. Electrical Technology Edward Hughes Pearson 10th Edition, 2014

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of Electrical circuits, Machines and Domestic wiring installations.
CO2	Apply the basic knowledge of mathematics, science and electrical engineering to obtain the desired parameters of Electric circuits and Machines.
CO3	Analyze the performance of Electric circuits and Electrical machines.
CO4	Communicate effectively on safety aspects in domestic installations and comprehend the information related to professional engineering practice. (PO6 and PO10)

SEMESTER – I / II			
Course Name	**: BASICS OF CIVIL ENGINEERING**	**Course Code :**	**20CV14/24**
No. of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 40**	**SEE Duration :**	**03 Hrs**
L:T:P	**: 3:0:0**	**CREDITS :**	**3**

COURSE OVERVIEW

This course comprises of three components. In the modules 1& 4, role of the civil engineer in society, different specializations in civil engineering, types of structures, materials used in civil engineering for sustainable development are dealt.

The other modules emphasize on Engineering Mechanics. They deal with the laws and principles of Mechanics and its application to solve engineering problems as a rigid body subjected to different force systems.

The last module will focus on the structural components idealized as deformable body. A brief discussion on solid mechanics, stress strain behavior, different structural components and different types of deformations will be made.

COURSE LEARNING OBJECTIVES (CLO) : The objectives of this course is to allow students learn the basics of Civil Engineering, Building materials and infrastructural development, solve problems involving Forces, moments, stress and strain and learn about their applications in allied subjects.

MODULES	TEACHING HOURS
<u>MODULE 1</u>: Introduction to Civil Engineering Infrastructure: Role of Civil Engineer in the Infrastructural Development, Smart city, Safe city, Clean city; Domestic water and wastewater treatment. Specialization of Civil Engineering - Building Materials, Construction Technology, Environmental Engineering, Geotechnical Engineering, Geomatics, Hydraulics, Structural Engineering, Transportation Engineering, Construction Technology and Management, Water Resources and Irrigation Engineering.	**08**
<u>MODULE 2</u>: Resultant of concurrent and Non-concurrent Force System. **Introduction Engineering Mechanics:** Basic idealizations, Force and its characteristics, Introduction to SI units, Classification of force systems; Principle of transmissibility, Principle of physical independence of forces, Principle of superposition of forces, Resolution and composition of forces.	**08**

Resultant of Concurrent: Resultant, Free body diagram, Composition of coplanar - concurrent force system, Principle of resolved parts, Numerical problems. **Resultant of Non-Concurrent Force System:** Moment of a force, Couple, Moment of a couple, Characteristics of couple and its application, resultant of coplanar non-concurrent force system, Varignon's theorem; Numerical problems.	
MODULE 3: Equilibrium of Concurrent and Non-concurrent Force System Definition of Equilibrant; Conditions of static equilibrium for Concurrent force systems, Lami's theorem; Numerical problems. Conditions of static equilibrium for Non Concurrent force systems. Types of beams, loads and supports, Numerical problems.	**08**
MODULE 4 : Basics of Building Science **Types of structures:** Adobe, Masonry building, Framed structures, Steel structures, Tall buildings, Industrial building, Dams, Roads and Bridges **Components of a building:** Foundation, Wall, Roof, Staircase, Door, Window, Beam, Column, Slab, Chejja, Lintel, Truss **Materials:** Fine aggregate, Coarse aggregate, Cement, building blocks, Concrete; Their impact on environment; **Sustainability in Civil Engineering:** Rain water harvesting; Energy Efficient buildings; Sustainable construction materials;	**08**
MODULE 5: Introduction to Solid Mechanics Stress strain behavior of brittle and ductile materials, Engineering importance of Stress-Strain curves for materials, Determination of stress strain behavior and elastic properties of a materials from tension test, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight. Compound bars, state of simple shear, Concepts of Axial force, flexure, shear and torsion in deformable bodies (Definition & Sketch only); Numerical problems.	**08**

Text Books

1. R. C. Hibbeler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 2016.
2. N H Dubey, Engineering Mechanics - Statics and Dynamics, Tata McGraw Hill, 2013.
3. B. S. Basavarajaiah and P. Mahadevappa, Strength of Materials in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010.
4. B K Kolhapure, Elements of Civil Engineering and Engg. Mechanics, Eastern Book Promoters Belgaum, Gadag, 2018.

Reference Books

1. S Timoshenko, D. Young and J Rao, Engineering Mechanics, Tata-McGraw Hill,

Special Indian edition, 2006.
2. Beer FP and Johnson ER, Mechanics for Engineers - Dynamics and Statics, SI Metric edition, Tata McGraw Hill, 2008.
3. F P. Beer, E. R Johnston and J T De Wolf, Mechanics of Materials, Tata McGraw-Hill, Seventh Edition, SI Units, 2014.
4. D.H. Young and S.P. Timoshenko "Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint 2014).
5. Rangawala S. C. "Engineering Materials", Charotar Publishing House, Anand, India, 2009.
6. B C Punmia, A K Jain and A K Jain, Building Construction, Laxmi Publications (P) Ltd., New Delhi, 2008.
7. H S. Peavy, D R. Rowe, George T, Environmental Engineering, Mc-Graw Hill International Edition, New York, 2000.

COURSE OUTCOMES (COs):After the completion of course, student will be able to,

CO1	Understand the basic concepts of Civil Engineering, mechanics and need for sustainability in Civil Engineering.
CO2	Understand the basic concepts of stress, strain, rigid and deformable bodies and its importance in Civil Engineering
CO3	Apply the principles of mechanics to determine the effect of Forces on rigid bodies
CO4	Conduct survey to comprehend social responsibility with respect to safety and sustainability choosing suitable infrastructure components

SEMESTER – I/II			
Course Name	**: Engineering Graphics**	**Course Code :**	**20ME15/25**
No. of Lecture Hours / Week	**: 02**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 04**	**SEE Duration :**	**03 Hrs**
L:T:P	**:2:0:2**	**CREDITS :**	**03**

COURSE OVERVIEW :

Engineering graphics is commonly used mode of communication in industry as it is brief and clearer. Appropriate exposure to drawing helps the students to translate different ideas into practical applications. Acquisition of drafting skills as per standard conventions is used to make the drawing of a given object or component so that others can understand and interpret the drawing as intended by the draftsman. Hence drawing is regarded as a prerequisite for engineering graduates. This course provides the basic understanding of the fundamentals of Engineering Graphics, mainly visualization, graphics theory, standards and conventions of drawing, the tools of drawing and the use of drawings in engineering applications.

COURSE LEARNING OBJECTIVES (CLO) :

- Explain the principles of engineering graphics and their significance.
- Develop the ability of conveying the engineering information through drawings.
- Enable to use computer aided drafting software for generation of drawings

MODULES	TEACHING HOURS
MODULE 1: Computer Aided Sketching and Orthographic projections: Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand sketching, Computer screen layout of the software, Standard tool bar/menu and navigational tools, Co-ordinate system and reference planes, Selection of drawing size and scale, Commands for creation, editing of geometrical entities, Constraints, Dimensioning, Conventions and Lettering. Introduction, Planes of projection, Conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems)	**8**
MODULE 2: Orthographic Projections of Plane Surfaces (First Angle Projection Only)**:** Introduction, Projections of plane surfaces – triangle,	**8**

square, rectangle, pentagon, hexagon and circle; resting on HP in different positions by change of position method (No problems on punched plates and composite plates).	
MODULE 3: Projections of Solids: Introduction, Projections of regular tetrahedron, hexahedron (cube), prisms, pyramids, and cones in different positions resting on HP only (No problems on octahedrons , combination solid and freely suspended solids)	**8**
MODULE 4: Development of Lateral Surfaces of Solids : Introduction to section of solids (No problems on sections of solids), Development of lateral surfaces of right regular prisms, pyramids, cylinders and cones only. (No problems on lateral surfaces of trays, tetrahedrons, spheres, transition pieces and cut sections)	**8**
MODULE 5: Isometric projection: Introduction, Isometric scale, Isometric projection of plane surfaces, tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres and combination of solids (upto three solids).	**8**

Text Books:

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th Edition, 2005- Charotar Publishing House, Gujarat

Reference Books:

1. Computer Aided Engineering Drawing - S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi
2. Computer Aided Engineering drawing- Prof. M. H. Annaiah, New Age International Publisher, New Delhi. 2009

Other Assessment Tools: Quiz , Model building

COURSE OUTCOMES (COs):

CO1	Sketch the engineering drawings of different geometrical shapes by analyzing its dimensions and positions
CO2	Analyze and interpret engineering drawings to synthesize information of the object and provide some valid conclusions
CO3	Use CAD software to sketch engineering drawings
CO4	Demonstrate individual/team work in implementing the principles of engineering graphics to develop simple physical objects.

SEMESTER – I / II			
Course Name	**: Applied Physics Laboratory**	**Course Code :**	**20PH16/26**
Number of Lecture + Tutorial Hours / Week	**: 00**	**CIE Marks :**	**50**
Number of Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total Number of Lecture Hours + Practical Hours	**: 20**	**SEE Duration :**	**03 Hrs**
L:T:P	**: 0:0:2**	**CREDITS :**	**01**

COURSE OVERVIEW:

This course provides the basic knowledge required to understand the concepts and working of an instrument in engineering applications. It allows the comparison between experimental results with theoretical concepts. It enhances practical problem solving skills.

COURSE LEARNING OBJECTIVES.

1. To gain the practical knowledge by applying the analytical techniques to correlate with the Physics theory.
2. To analyze experimentally the mechanical, electrical and thermal properties of materials.
3. To understand the working of photonic devices.
4. To design simple circuits and hence to study the characteristics of semiconductor devices.

PRACTICAL MODULE	TEACHING HOURS
1. Determine the angle of acceptance and numerical aperture of a given optical fiber. 2. Determine the resonant frequency, self-inductance of the coil and quality factor using series and parallel LCR circuit. 3. Determine the Young's modulus of a given beam using single cantilever. 4. Determine the moment of inertia of irregular body using regular bodies (Circular or rectangular) and also rigidity modulus of the given material. 5. Determine the dielectric constant of the dielectric material placed between the plates of the capacitor by studying its charging and discharging through a resistor. 6. Draw the V-I characteristics of the photo-diode and calculate power responsivity.	**20**

7. Determine the Mach number and Mach angle of shock wave generated by shock tube. 8. Determine the Fermi energy of a given material. (Open Ended Experiment) 9. Determine the wavelength of semi-conductor laser. (Open Ended Experiment) 10. Identify the stiffest spring among the given set of springs. (Open Ended Experiment)	

Text Books:

1. Practical Physics, R K Shukla and Anchal Srivastava, New Age International (P) Ltd.
2. Practical physics, C L Arora, S. Chand Publication
3. Laboratory manual in applied physics, H Sathyaseelan, New Age international.

Reference Books:

1. Applied Physics Laboratory manual, Department of Physics, VVCE, Mysuru.
2. Experimental Physics: Modern Methods, R A Dunlap, Oxford University Press.
3. Electronics for Experimentation and Research, B K Jones, Prentice-Hall.
4. Basic Electronics: A Text-Lab Manual, P B Zbar and A P Malvino, Tata Mc-Graw Hill.
5. Practical Physics, G L Souires, Cambridge University.
6. Advanced Practical Physics, B L Worsnop and H T Flint, Asia Publishing House.

COURSE OUTCOMES (COs): After completing the course, the students will be able to,

CO1	Describe the operational principles of shock waves and semiconductor devices.
CO2	Analyze the behaviour of light in the phenomena of interference, diffraction and propagation through an optical fiber.
CO3	Conduct the experiments related to mechanical, electrical and thermal properties of materials effectively.
CO4	Develop basic communication skills through teamwork in performing open ended experiments.

SEMESTER – I / II			
Course Name	**: Electrical Engineering laboratory**	**Course Code :**	**20EE17/27**
Number of Lecture Hours / Week	**: 00**	**CIE Marks :**	**50**
Number of Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total Number of Practical Hours	**: 20**	**SEE Duration :**	**03 Hours**
L:T:P	**: 0:0:2**	**CREDITS :**	**01**

COURSE OVERVIEW :

This course gives the practical knowledge about the operation of various electrical equipment by giving due consideration to safety aspects.

COURSE LEARNING OBJECTIVES (CLO) :

1. To give practical exposure to various electrical equipment used in the electrical laboratory
2. To study the effect of various electrical parameters of a given electrical system
3. To understand the importance of team work, standard operating procedure and safety measures

Sl. No.	EXPERIMENTS	TYPE
1.	Demonstration of cutout section of machines.	Demonstration
2.	Study on effect of open and short circuit in simple circuit.	
3.	Measurement of three phases power using two wattmeter method.	Exercise
4.	Determination of Phase and line quantities in three phase star and delta connected loads.	
5.	Conduct an experiment to obtain the speed- torque characteristic of a DC Shunt motor.	
6.	Two-way and three-way control of lamp and formation of truth table.	
7.	Determine the slip of an Induction Motor.	
8.	Determination of current and Phase angle for a given circuit.	Structured enquiry
9.	Measurement of Resistance and Inductance of a choke coil.	
10.	Determination of efficiency at different loading conditions of a transformer.	
11.	An activity related to energy consumption , safety and norms of engineering practices at domestic installations	Open ended activity

COURSE OUTCOMES (COs)

CO1	Study the working principle of an electrical circuit/machine.

CO2	Analyze the performance of a given electrical circuit/machine.
CO3	Determine various parameters for the given electric circuit and arrive at valid conclusions.
CO4	Engage in independent study as an individual or a team by conducting a study on consumption of electrical energy and norms of electrical engineering practices in domestic installations.(PO8 and PO9)

SEMESTER – I / II			
Course Name	**: ENGINEERING EXPLORATION**	**Course Code :**	**20AL18/28**
No. of Lecture Hours / Week	**:**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 02**	**SEE Marks :**	**--**
Total No. of Lecture + Tutorial / Practical Hours	**: 24**	**SEE Duration :**	**--**
L:T:P	**:00:00:02**	**CREDITS :**	**1**

COURSE OVERVIEW : This is a unique interdisciplinary course that expose students to the different disciplines offered by VVCE and provides opportunity for the students to explore and exhibit their capacities by working out with interdisciplinary experiment based projects

COURSE LEARNING OBJECTIVES (CLO)

1. To introduce students to the different engineering disciplines with hands on experience
2. To infuse interdisciplinary mindset
3. To imbibe strong fundamentals in current technologies
4. To promote experimental project-based learning

PHASE 1 : DEMONSTRATION PHASE	**TEACHING HOURS**
1. Identifying the basic components pertaining to each engineering discipline and knowing its applications [Inside Engineering] 2. Wiring & Soldering of Simple circuits [1 hr] 3. 3D Printing [1 hr]	2 Lab Sessions [4hrs]
PHASE 2 : EXPLORATION PHASE 1. Construction of Bridges 2. Voice Controlled Car using Google Assistance 3. Solar Based Water Pumping System 4. Build your Dream Home 5. Build a Drone [2 Lab Sessions] 6. Web Page Development	7 Lab Sessions [14 hrs]
PHASE 3: OPEN ENDED PHASE (SAMPLE PROJECTS) 1. IOT controlled lamp in the constructed house with wiring 2. Fancy Light control using IOT with 3 D Printed model 3. Solar powered bulb to our New house 4. Construction of a Bridge with weak point display on Web page 5. IOT controlled Water fall model using pump	3 Lab Sessions [6 hrs]

NOTE:

1. One entire section will be considered as one batch
2. 10 Teams to be formed each consisting of 6 members
3. Instructions will be given for each of the above experimental based project and demonstration wherever required by the faculty and each team should be able to complete the assigned experimental work.

COURSE OUTCOMES (COs): At the end of this course, students will be able to

CO1	Identify various components/devices relating to different engineering disciplines and its functions
CO2	Select and apply appropriate resources to model the given problem
CO3	Comprehend the knowledge of different engineering disciplines with hands-on experience
CO4	Work effectively in teams to manage the assigned work and write effective reports as an individual

SEMESTER – I / II			
Course Name	**: ENVIRONMENTAL STUDIES**	**Course Code :**	**20HS11/21**
No. of Lecture Hours / Week	**: 01**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 00**	**SEE Marks :**	**-**
Total No. of Lecture + Tutorial / Practical Hours	**: 15**	**SEE Duration :**	**-**
L:T:P	**: 1:0:0**	**CREDITS :**	**-**

COURSE OVERVIEW

The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, Global warming, depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. This course focuses on Environment, ecosystem, natural resources and other issues related to it. It also deals with the Environmental legislation and waste management.

COURSE LEARNING OBJECTIVES (CLO) : This course will enable students to 1. Identify the major challenges in environmental issues 2. Develop skills, critical thinking and demonstrate socio-economic skills for Environment protection 3. Analyze the impact of specific issues and plan strategies for environmental management.

MODULES	TEACHING HOURS
MODULE 1: Environment: Multidisciplinary nature of Environmental studies, Components of Environment. **Ecosystem:** Types & Structure of Ecosystem: Forest, Desert, Wetlands, Riverine, Oceanic Biodiversity and its conservation.	**03**
MODULE 2: Natural Resources: Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water, Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** :Different types of energy, Conventional sources & Non -Conventional sources of energy : Solar energy, Wind Energy, Hydrogen as an alternative energy.	**03**
MODULE 3: Environmental Pollution: Water Pollution, Noise pollution, Land Pollution, Air pollution (Sources, Impacts, Preventive measures and Public Health Aspects).	**03**
MODULE 4 : Waste management : Solid Waste Management, E - Waste Management & Biomedical Waste Management - Sources, Characteristics	**03**

& Disposal methods. ISO – 14000. **Environmental Legislation :** Water Act (1974), Air Act (1981), Environmental Protection Act (1984)	
MODULE 5: Global Concerns: Global warming, Climate change, Acid rain, Ozone depletion, **Field work:** Visit to Environmental Engg. Lab, Zero Waste Management Plant and Solid waste management plant	**03**

Text Books

1. R Rajagopalan, "Environmental Studies – From Crisis to Cure " 2nd Edition, Oxford university press, New Delhi , 2013
2. S M Prakash , "Environmental Studies" 3rd Edition, Elite Publishing House, Mangalore, 2018
3. Benny Joseph (2005), "Environmental Studies" , Tata McGraw – Hill Publishing Company Limited.

Reference Books

1. Raman Sivakumar, "Principles of Environmental Science and Engineering", 2nd edition, Cengage learning Singapur, 2005.
2. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006
3. Dr. Pratiba Sing, Dr. Anoop Singh and Dr. Piyush Malaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.
4. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006.

COURSE OUTCOMES (COs): After the completion of course student will be able to,

CO1	Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale
CO2	Acquire observation skills for solving problems related to the environment
CO3	Conduct survey to describe the realities of waste management system

CHEMISTRY CYCLE

SEMESTER – I			
Course Name	**: Advanced Mathematics-I**	**Course Code**	**: 20MA11**
Number of Lecture Hours / Week	**: 03**	**CIE Marks**	**: 50**
Number of Tutorial Hours / Week	**: 02**	**SEE Marks**	**: 50**
Total Number of Lecture Hours + Tutorial Hours	**: 40 + 20= 60**	**SEE Duration**	**: 03 Hrs**
L:T:P	**: 3:2:0**	**CREDITS**	**: 04**

COURSE OVERVIEW:

Advanced Mathematics-I is a course which provides Mathematical techniques in the advanced areas of Mathematics that are of utmost relevance to the engineering disciplines. The principal topics are partial differentiation, ordinary differential equations, integral calculus, Infinite series, numerical methods and linear algebra. The purpose of this course is to provide the skills and knowledge required to perform fundamental Mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, infinite series, numerical methods and linear algebra. The course aims at showing the relevance of Mathematics in engineering and applied sciences.

COURSE LEARNING OBJECTIVES (CLO) :

The objective is to enable the students to apply the knowledge of Mathematics in various fields of engineering by the following means:

1. Explain the concept of calculus, infinite series, numerical methods and linear algebra for applying it appropriately in solving engineering problems.
2. Explain how to analyze the engineering problems by making use of the concepts of calculus, infinite series, numerical methods and linear algebra.
3. Explain the usage of modern tool to understand the concepts and solve problems in calculus, infinite series, numerical methods and linear algebra.

MODULES	TEACHING HOURS
MODULE 1: Differential Calculus Partial Differentiation- basics, Euler's theorem of first kind (only problems), total derivatives, Jacobian, Maclaurin series of one and two variable, Differentiation under Integral sign.	**8**
MODULE 2: Ordinary Differential Equations Linear Equations: Bernoulli's equation, Exact Equations, Reducible to Exact (IF of the form $x^a y^b$), Orthogonal Trajectory (Cartesian only), and Newton's law of cooling. Non-Linear Equations: Solve for p, Clairaut's	**8**

form (singular, general solution).	
MODULE 3: Integral Calculus Multiple Integrals – Double integrals, changing the order of integration, changing Cartesian form to polar form. Special Functions- Beta and Gamma Functions, relation between beta and gamma function, properties, and its problems (related to reduction formula of definite integral).	**8**
MODULE 4: Numerical methods and Infinite Series **Numerical methods:** Types of errors in numerical methods, Solution of Algebraic and Transcendental Equation: Newton-Raphson. Finite Differences: Forward and Backward Interpolation, Lagrange's Interpolation. Numerical Integration- Simpson's 1/3rdrule. **Infinite Series:** Convergence of infinite series: D-Alembert's Ratio Test, Raabe's Test, Leibnitz's test, absolute and conditional convergent.	**8**
MODULE 5: Linear Algebra Vectors, linearly dependent and independent vectors, Solution to systems of Linear Equation: Rank, Consistency, Gauss Elimination, LU decomposition. Eigen values- Eigen vectors, Diagonalization, Gauss–Seidel Method, Rayleigh Power method.	**8**

Text Books

1. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. Gilbert Strang, Linear Algebra and its Applications, Wellesley Publishers

REFERENCE BOOK

1. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd. Publishers.

COURSE OUTCOMES (COs): At the end of this course, students will be able to

CO1	**Understand** the basic concepts of calculus for a single and multivariable function, ordinary differential equations, infinite series, numerical methods and linear algebra. (PO-1)
CO2	**Apply** the concept of calculus, ordinary differential equations, infinite series, numerical methods and linear algebra to solve the problems arising in engineering fields. (PO-1)
CO3	**Analyze** the solutions of engineering problems using the concepts of calculus, ordinary differential equations, infinites series, numerical methods and linear algebra. (PO-2)
CO4	Using **modern tool** to **solve/analyze** engineering problems from the concepts of calculus, numerical methods and linear algebra. (PO-5)

SEMESTER – I / II

Course Name	**: Applied Chemistry**	**Course Code :**	**20CH12/22**
No. of Lecture Hours / Week	**: 04**	**CIE Marks :**	**50**
Number of Tutorial Hours / Week	**: ---**	**SEE Marks :**	**50**
Total No. of Lecture	**: 50**	**SEE Duration :**	**03 Hrs.**
L:T:P	**: 4 : 0 : 0**	**CREDITS :**	**4**

COURSE OVERVIEW

Applied chemistry course strengthens the fundamental concepts of chemistry and then builds an interface with the engineering applications and examples in everyday life for the benefits of society.

COURSE LEARNING OBJECTIVES (CLO)

1. To enable students to acquire knowledge on principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

MODULES	TEACHING HOURS
MODULE 1: ELECTROCHEMISTRY AND BATTERIES **Electrochemistry:** Introduction, cell potential, derivation of Nernst equation for single electrode potential – numerical problems. Reference electrode- Introduction, construction, working and applications of Calomel electrode. Concentration cell: Construction, working and applications of electrolyte concentration cell – numerical problems. Ion selective electrode – Definition, construction, working and applications of Glass electrode. Determination of pH using Glass electrode. **Batteries:** Introduction, construction, working, applications and disposal of Ni-MH and Li-ion batteries.	**10**
MODULE 2: CORROSION AND METAL FINISHING **Corrosion**: Introduction, Electrochemical theory of corrosion, factors affecting the rate of corrosion – electrode potential, nature of corrosion product, ratio of anodic to cathodic area, pH and temperature. Types of corrosion: i) Differential metal corrosion ii) Differential aeration corrosion – waterline corrosion iii) Microbial corrosion. Corrosion control: Protective coating – Galvanization. Surface conversion coating – Anodization of aluminium. Cathodic protection – Sacrificial anode method. **Metal finishing**: Introduction, technological importance.	**10**

Electroplating – Electroplating of chromium (hard and decorative). Treatment of electroplating effluents. Electroless plating: Introduction, electroless plating of copper in the manufacture of double sided PCB.	
MODULE 2: CORROSION AND METAL FINISHING **Corrosion**: Introduction, Electrochemical theory of corrosion, factors affecting the rate of corrosion – electrode potential, nature of corrosion product, ratio of anodic to cathodic area, pH and temperature. Types of corrosion: i) Differential metal corrosion ii) Differential aeration corrosion – waterline corrosion iii) Microbial corrosion. Corrosion control: Protective coating – Galvanization. Surface conversion coating – Anodization of aluminium. Cathodic protection – Sacrificial anode method. **Metal finishing**: Introduction, technological importance. Electroplating – Electroplating of chromium (hard and decorative). Treatment of electroplating effluents. Electroless plating: Introduction, electroless plating of copper in the manufacture of double sided PCB.	**10**
MODULE 3: INSTRUMENTAL METHODS OF ANALYSIS AND ENERGY SYSTEMS **Instrumental methods of analysis:** Introduction, principle and instrumentation: Colorimetry – estimation of copper, Potentiometry – estimation of chloride, Conductometry – estimation of weak acid. **Energy system:** Introduction, definition of calorific value- high and low calorific value. Determination of calorific value of solid/liquid fuels using bomb calorimeter – numerical problems. **Fuel cells:** Construction, working and applications of methanol-oxygen fuel cell. Alternate fuels: Biodiesel and power alcohol. **Solar energy:** Introduction, construction, working and advantages of photovoltaic cells. Properties and applications of dye sensitized solar cells.	**10**
MODULE 4: WATER CHEMISTRY AND WASTE MANAGEMENT **Water chemistry:** Introduction, potable water parameters, determination of hardness of water by EDTA method. Determination of Chemical Oxygen Demand – numerical problems. Desalination of water by reverse osmosis. Purification of water by ultrafiltration. Sewage treatment: Primary treatment, secondary treatment by activated sludge method and tertiary treatment. **Waste management:** Introduction, sources, characteristics and disposal methods (scientific land filling, composting, recycling and reuse) of e-waste. Extraction of gold from e-waste. Recycling of plastic.	**10**
MODULE 5: CHEMISTRY OF NANO MATERIALS Introduction, size dependent properties of nanomaterials – Surface area, optical, catalytic and electrical property. Preparation of nano materials by	**10**

sol-gel method. Synthesis of silver nanoparticles. Characterization technique - Scanning Electron Microscope. **Nanomaterials:** Introduction, properties and applications – Carbon Nanotubes, graphene, nanofibers, nanophotonics, nanoplasmonics, nanosensors, OLED's, quantum dots – TiO_2 and CdS semiconductor nanostructures for photovoltaics.	

Activity Based Learning

Safety and health precautions while handling chemical and Material Safety Data Sheet (MSDS) study.

Text Books:

1. P W Atkins, **Physical Chemistry**, Oxford Publications, 2018-11th Edition.
2. P C Jain & Monica Jain, **Engineering Chemistry**, Dhanpat Rai Publication, New Delhi, 2015-16th Edition.
3. R V Gadag & A Nityananda Shetty, **Engineering Chemistry**, I K International Publishing House Private Ltd. New Delhi, 2018-3rd Edition.
4. Hari Singh, **Nanostructured materials and nanotechnology**, Nalwa, academic press 2002- 1st Edition.

Reference Books:

1. O G Palanna, **Engineering Chemistry**, Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2017-2nd Edition.
2. **Wiley Engineering Chemistry**, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
3. Sulabha K Kulkarni, **Nanotechnology Principles and Practices**, Capital Publishing Company, 2014-3rd Edition.
4. Phanikumar, **Principles of nanotechnology**, Scitech publications, 2010-2nd Edition.

COURSE OUTCOMES (COs): Upon successful completion of this course, the students will be able to

CO.1	Interpret the principles of chemistry related to engineering and technology.
CO.2	Apply the knowledge of chemistry in solving engineering problems related to electrochemistry, corrosion, fuel cells and environmental contexts.
CO.3	Analyze the appropriate chemical techniques suitable for engineering applications to reach the substantiated conclusions.
CO.4	Describe the ill effects and safety standards of chemicals.

SEMESTER – I / II			
Course Name	**: Programming for Problem Solving**	**Course Code :**	**20CS13/23**
No. of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50**
No. of Practical Hours / Week	**: 00**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 40+00/00**	**SEE Duration :**	**03 Hrs.**
L:T:P	**:3:0:0**	**CREDITS :**	**03**

COURSE OVERVIEW :

Problem solving through programming tools is essential skill for software development. It requires understanding of fundamental concepts of the programming language. The course introduces the theory and practice of programming in C and object oriented programming to solve basic problems. It imparts understanding of the fundamental concepts of languages, problem-solving techniques and effective strategies for program design and implementation.

COURSE LEARNING OBJECTIVES (CLO) :

1. To understand basic programming concepts.
2. To provide problem solving techniques through programming.
3. To provide hands-on experience on the concepts.

MODULES	TEACHING HOURS
MODULE 1: INTRODUCTION to C PROGRAMMING Algorithms, flowcharts, pseudo codes, structure of a C program, writing the first C program, keywords, identifiers, basic data types, variables, constants, input / output statements, operators and expressions, type conversion and typecasting. Branching statements: Conditional branching statements: if, if-else, if-else-if, switch case. **Text Book 1: Ch. 7.1-7.5,8.1-8.15,9.1,9.2**	**8**
MODULE 2: LOOPING STATEMENTS and ARRAYS **Looping statements**: for, while, do-while statements, nested loops, break and continue statements, goto statement. **Arrays**: Declaration of arrays, accessing the elements of an array, storing values in arrays, operations on arrays – searching for a value in an array (Linear search, Binary search) and sorting the elements in an array (Bubble sort, Selection sort), two-dimensional arrays and operations. **Text Book 1: Ch. 9.3-9.6,11.1-11.9**	**8**
MODULE 3: FUNCTIONS and STRINGS	**8**

Functions: Introduction, declaration/prototype, definition, function call, return statement, passing parameters to functions, storage classes, recursion. **Strings:** Introduction–reading and writing strings, string operations, miscellaneous string and character functions. **Text Book 1: Ch. 10.1-10.7,10.9,10.10, 12.1,12.4(12.4.1-12.4.8),12.5**	
MODULE 4: STRUCTURES and POINTERS **Structures**: Introduction to structures, nested structures, arrays of structures, structures and functions. **Pointers:** Introduction to pointers, declaring pointer variables, passing arguments to function using pointers, pointers and arrays, dynamic memory allocation. **Text Book 1: Ch. 14.1-14.4,13.2,13.3,13.7,13.8,13.20**	**8**
MODULE – 5: INTRODUCTION to OBJECT ORIENTED PROGRAMMING The Object Oriented Programming paradigm, basic concepts of Object Oriented Programming, benefits of OOP, applications of OOP, a simple C++ program, structure of C++ program, specifying a class, A C++ program with Class. **Text Book 2: Ch. 1.4,1.5,1.6,1.8, 2.3,2.6,5.3,5.5**	**8**

Text Books:

1. Reema Thareja, Computer Fundamentals and Programming in C, 2nd edition, Oxford University Press, 2016.
2. E Balaguruswamy, Object Oriented Programming with C++, 6th edition, Tata McGraw-Hill, 2013.

Reference Books:

1. Brian Kernighan and Dennis Ritchie, The C Programming Language, 2nd edition, Prentice Hall, 2012.
2. Yashavant P. Kanetkar, Let Us C, 16th edition, BPB Publications, 2017.
3. Herbert Schildt: The Complete Reference C++, 4th edition, Tata McGraw-Hill, 2002.

COURSE OUTCOMES (COs): Students will be able to;

CO1	Understand the basic concepts of programming in C/C++.
CO2	Analyze the given code segment for syntactic and logical errors.
CO3	Apply concepts of procedure oriented programming to solve a given problem.
CO4	Apply concepts of object oriented programming.
CO5	Design and develop modularized solution for given requirements.
CO6	Explore programming environment for collaborative tasks.

SEMESTER – I / II			
Course Name	**: Basics of Mechanical Engineering**	**Course Code :**	**20ME14/24**
No. of Lecture Hours / Week	**: 3**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 0/0**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 40+0/0**	**SEE Duration :**	**03 hours**
L:T:P	**: 3:0:0**	**CREDITS :**	**3**

COURSE OVERVIEW :

The course deals with fundamentals of mechanical engineering to understand mechanical systems, equipment and processes required in various domains of engineering to solve real world problems.

COURSE LEARNING OBJECTIVES (CLO) :

1. Explain the principles, operations and processes of mechanical engineering.
2. Develop the ability to solve engineering problems.
3. To familiarize the impact of mechanical engineering practices on environment.

MODULES	TEACHING HOURS
MODULE 1: Thermodynamics and Refrigeration & Air Conditioning **Thermodynamics:** Introduction**,** thermodynamic system, properties of a system, processes and cycles, thermodynamic equilibrium, concept of Internal energy, enthalpy and entropy, laws of thermodynamics – Zeroth, First, Second and Third law. **Refrigeration & Air Conditioning:** Introduction, refrigerant properties, types of refrigerant, working of vapor compression refrigeration system, vapor absorption refrigeration system, window and split air conditioners, applications of air conditioning and simple numericals on COP of refrigerator.	**08**
MODULE 2: Turbines & Pumps **Turbines:** Introduction, classification, working principle of impulse & reaction turbines (Hydraulic turbines only), Pelton wheel turbine, Francis turbine and Kaplan turbine. **Pumps:** Introduction, classification, working principle of Reciprocating pump and Centrifugal pump, simple numericals on Pascal's law and centrifugal pump.	**08**

MODULE 3: IC Engines and Power Transmission **IC Engines:** Classification, parts & its nomenclature, 4 stroke petrol and diesel engines (P-V diagram of Otto & Diesel cycles), diesel engine vs petrol engine, simple numericals on engine performance parameters. Introduction, Importance and working principle of Electric vehicles. **Power Transmission:** Belt Drives: Working principle of flat belt drives (open and cross), V-belt drives, slip & creep, expression for velocity ratio, ratio of belt tension and power transmission [without derivations], simple numericals on velocity ratio and power transmission in belt drives, Gear drives: Types of gears – Spur, Helical, Bevel and Worm Gears.	**08**
MODULE 4: Machine Tools and Engineering Materials & Metal Joining Processes **Machine Tools:** Lathe: Working principle, Operations - Turning, Facing, Knurling, Thread Cutting, Taper Turning by swiveling of compound rest, Drilling Machine Tool: Working principle, Operations- Drilling, Reaming, Boring, Counter Boring, Counter Sinking and Tapping, simple numericals on machining parameters. **Engineering Materials:** Introduction, classification, composition, characteristics and application – Ferrous, non-ferrous and composite materials. **Metal Joining Processes:** Introduction-Welding, Soldering and Brazing, working principle of Electric Arc Welding, Welding defects.	**08**
MODULE 5: Automation & Robotics and Engineering System Design **Automation:** Definition of Automation, types of Automation, Computer Numerical Control (CNC) Machines: Basic elements of CNC, advantages and disadvantages. **Robotics:** Introduction, joints and links, end effectors, common robot configurations; Cartesian, Cylindrical, Polar and Spherical coordinates. Sensors in robotics, applications. **Engineering System Design:** Introduction – Design by evolution, inadequacies of traditional design, system approach to engineering problems, morphology of design, Identification and analysis of need, origination of design concept, preliminary design, evaluation of alternatives and design decisions.	**08**

Text Books:

1. A text Book of Elements of Mechanical Engineering by K. R. Gopalakrishna, Subhash Publishers, Bangalore, 2008
2. Elements of Mechanical Engineering by K.P. Roy, S K Hajra Choudhury, A K Hajra Choudhury, Media Promoters, 2012
3. An Introduction to Engineering Design Method by V Gupta and P Murthy, Tata

McGraw Hill, 2000

Reference Books:

1. Basic and Applied Thermodynamics by P K Nag, McGraw Hill Education (India) Pvt. Ltd, 2014
2. Material Science and Engineering by R K Rajput, S K Kataria & Sons-New Delhi, 2013
3. Workshop Technology, Volume I & II, - by S K Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy, 11th edition, Media Promotors and Publishers, Mumbai, 2001
4. Design & Planning of Engineering Systems by D D Meredith, K W Wong, R W Woodhead & K K Worthman, 2000
5. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Grover, Prentice hall of India Pvt. Ltd, 2002
6. Modern Electric, Hybrid Electric and Fuel Cell Vehicles by Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Li Emadi, CRC Press LLC, 2005

Other Assessment Tools:

1. Quiz
2. Case Studies

COURSE OUTCOMES (COs):

CO1	Describe the fundamental principles of energy, mechanical devices & basics of engineering materials.
CO2	Apply fundamental engineering concepts to solve problems related to mechanical systems and processes.
CO3	Analyze mechanical systems, processes and engineering materials to provide valid conclusions.
CO4	Interpret the impact of mechanical engineering practices in environmental context.

SEMESTER – I / II			
Course Name	**: Basics of Electronics and Communication Engineering**	**Course Code:**	**20EC15/25**
No. of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50 (40+10)**
No. of Tutorial Week	**: 00**	**SEE Marks :**	**50**
Total No. of Lecture Hours	**: 40**	**SEE Duration :**	**03 Hrs**
L:T:P	**: 3:0:0**	**CREDITS :**	**03**

COURSE OVERVIEW: This course presents the various binary systems suitable for representing information in digital systems. It also introduces the basic postulates of Boolean algebra and shows the correlation between Boolean expressions and their corresponding logic diagrams. It presents various types of diodes, its operation and applications such as rectifiers and regulators. It deals with Bipolar Junction Transistor, configurations, concept of biasing, characteristics and applications such as amplifiers and switch. It also deals with operational amplifiers, configurations and applications, oscillators and its types. It also presents the basics of communication systems, operation of mobile phones, sensors, transducers and types.

COURSE LEARNING OBJECTIVES (CLO) :

1. Understand basics of electronic devices, sensors, transducers and communication systems.
2. Demonstrate the ability to solve problems on analog and digital circuits.
3. Analyze the basics of electronic devices and communication systems.

MODULES	TEACHING HOURS
MODULE 1: Fundamentals of Digital Electronics Introduction to digital computers and digital systems, Binary addition, Binary subtraction using 1's and 2's complement method, Boolean theorems, Logic gates, Algebraic simplifications, NAND and NOR implementation. Combinational Circuits: Adders, Multiplexers, Decoders. Sequential Circuits: SR Latch and Clocked SR Flip-flop, JK Flip-flop	8
MODULE 2: Semiconductor devices **Semiconductor Diodes:** PN–junction diode, VI characteristics and parameters of a PN junction diode, Zener diode: Working, VI characteristics, Zener diode as voltage regulator**,** Half wave and Full wave rectifiers, Filter circuits. **Bipolar Junction Transistor**: Introduction, BJT circuit analysis, CE configurations and characteristics, BJT as a switch and amplifier.	8

MODULE 3: Operational Amplifiers and Oscillators **Operational Amplifiers:** Block diagram of an Operational amplifier, Characteristics of an ideal operational amplifier, Inverting and non-inverting amplifier, Applications of Op-amp: Voltage follower, Adder, Subtractor, Integrator and differentiator. **Oscillators:** Concept of feedback, Barkhausen's Criteria, Types of Oscillators, RC phase shift oscillator, Wein Bridge Oscillator.	8
MODULE 4: Sensors and Transducers **Sensors:** Introduction to sensors, characteristics and types of sensors. **Transducers:** Introduction to transducers, Differences between Active and Passive Transducers, Linear Variable Differential Transformer (LVDT) and Thermistors.	8
MODULE 5: Communication System Elements of Communication Systems, Modulation and need for modulation, Amplitude Modulation, Frequency Modulation and Phase Modulation (qualitative analysis only). **Cellular Communication:** Basic Cellular concepts, Block diagram and operation of Mobile phones.	8

Text Books:

1. Thomas L Floyd, "Electronic Devices", Pearson Education, 9th edition, 2012.
2. D P Kothari and I J Nagrath, "Basic Electronics", 2nd Edition, McGraw Hill, 2018.

Reference Books:

1. David A Bell, Operational Amplifiers and Linear ICs, 3rd Edition.
2. Robert L. Boylestad and Louis Nashelsky, "Electronics devices and Circuit theory", Pearson, 11th Edition, 2013.
3. Wayne Tomasi, "Advanced Electronic Communication System", Pearson, 6th Edition, 2014

COURSE OUTCOMES (COs):

CO1	Explain the operation of electronic devices and principles of communication systems.
CO2	Apply the concepts of electronic devices to solve analog and digital circuits.
CO3	Analyze the characteristics/performance parameters of electronic devices and circuits for different applications.
CO4	Use modern tool to demonstrate the working of basic electronic circuits.

SEMESTER – I / II

Course Name	**:Applied Chemistry Laboratory**	**Course Code :**	**20CH16/26**
No. of Practical Hours / Week	**: 02**	**CIE Marks :**	**50**
Total No. of Practical Hours	**: 20**	**SEE Marks :**	**50**
L:T:P	**: 0 : 0 : 2**	**SEE Duration :**	**03 hrs**
		CREDITS :	**1**

COURSE OVERVIEW

1. Practical awareness is inculcated to enhance the ability of understanding and problem solving, builds confidence in obtaining accurate results and reinforces the safety in use of chemicals.

COURSE LEARNING OBJECTIVES (CLO)

1. Execution of instrumental methods enhances the technical competence.
2. Conducting the experiments through classical methods ensures the uplift of knowledge in quantitative analysis of materials.

MODULES	**TEACHING HOURS**
PRACTICAL MODULE 1. Estimation of total hardness of water by EDTA complexometric method. (**Module 4**) 2. Determination of chemical oxygen demand (COD) of waste water sample. (**Module 4**) 3. Estimation of iron in Thermo Mechanical Treated (TMT) bars using $K_2Cr_2O_7$ solution **(Module 2)** 4. Colorimetric estimation of copper in printed circuit boards (PCB). (**Module 2 & 3**) 5. Conductometric estimation of acetic acid in vinegar. (**Module 3**) 6. Potentiometric estimation of halide ions (chlorides) in water. (**Module 3**) 7. Determination of pKa value of soft drinks (chemically synthesized) using pH meter. (**Module 1**) 8. Determination of viscosity of biofuels. **(Module 3)** 9. Design an experiment to extract caffeine from sample of interest and conclude from the results. **(Open ended)** 10. Estimate casein in different milk samples and draw conclusion over the growth protein. (**Open ended**)	**20**

Text Books:

1. G H Jeffery, J Bassett, J Mendham and R C Denney, **Vogel's text book of Quantitative Chemical analysis**, 1989- 5th Edition.

Reference Books:

1. O P. Vermani & Narula, **Theory and practice in applied chemistry**, New age International Publishers 2017-2nd Edition.
2. Gary D. Christian**, Analytical chemistry**, Wiley India, 2007- 6th Edition,

COURSE OUTCOMES (COs): Upon successful completion of this course, students will be able to

CO1	Explain the principles of quantitative analysis related to societal issues.
CO2	Apply the knowledge of practical concepts in solving engineering problems.
CO3	Analyze the appropriate chemical techniques suitable for engineering applications.
CO4	Conduct quantitative analysis of sample and study its applicability in team.

SEMESTER – I / II			
Course Name :	**Computer Programming Laboratory**	**Course Code:**	**20CS17/27**
No. of Lecture Hours / Week	**: 00**	**CIE Marks :**	**50**
No. of Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 00/32**	**SEE Duration :**	**03**
L:T:P	**: 0:0:2**	**CREDITS :**	**01**

COURSE OVERVIEW :

The laboratory course aims at introducing students to the field of programming using C/C++. The students will be able to enhance their analyzing and problem solving skills. This course is designed to encourage the students in solving open ended problems.

COURSE LEARNING OBJECTIVES (CLO):

1. Introduce the basic concepts of C/C++ programming languages.
2. Familiarize the process of debugging and execution.
3. Illustrate solutions to the given problem using C/C++ programming language.

PART - A

1. Write a C program to find the roots of a quadratic equation $ax^2+bx+c=0$.
2. Write a C program to find the GCD and LCM of given two numbers using Euclid's method.
3. Write a C program to perform binary search for a given key integer in a single dimensional array of numbers in ascending order and report success or failure in the form of a suitable message.
4. Write a C program using functions to read two matrices A (M x N) and B (P x Q) and to compute the product of A and B if the matrices are compatible for multiplication.
5. Write a C program to convert a binary number to decimal using recursive function.
6. Write a C program to find if a given string is a palindrome or not.
7. Write a C program to enter the information like name, register number, marks in 6 subjects of N students into an array of structures, find the average & display grade based on average for each student.

80 -100	Distinction
60-79	First Class
40 -59	Second Class
<40	Fail

8. Write a C program to read N integers into an array A and find the sum, mean and standard deviation of elements using pointers.

9. Write a C++ program to implement Fibonacci series.
10. Design, develop, and execute a program in C++ based on the following requirements: An Employee class is to contain the following data members and member functions:
11. Data members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer) , All_Allowances (an integer), IT (an integer), Net_Salary (an integer).
12. Member functions: to read the data of an employee, to calculate Net_Salary and to print the values of all the data members. (All_Allowances = 123% of Basic; Income Tax (IT) = 30% of the gross salary (= basic_Salary _ All_Allowance); Net_Salary = Basic_Salary + All_Allowances – IT).

PART - B

Open Ended Enquiry problems

The student can choose to solve any three open-ended problems from the specified set pertaining to departments of ME/ECE/CV.

COURSE OUTCOMES (COs): Students will be able to:

CO1	Write algorithm/flowchart for the given problem statement.
CO2	Demonstrate debugging skills to obtain desired output.
CO3	Implement solution to the given problem using C/C++ programming.

SEMESTER – I / II			
Course Name	**: Communicative English**	**Course Code :**	**20HS12/22**
No. of Lecture Hours / Week	**: 0**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 2**	**SEE Marks :**	**-**
Total No. of Lecture + Tutorial / Practical Hours	**: 30**	**SEE Duration :**	**-**
L:T:P	**: 0-2-0**	**CREDITS :**	**1**

COURSE OVERVIEW

Communication skills are required for both professional life to personal life and everything that falls in between. Good communication skills are essential to understand and exchange information more accurately and quickly. Effective communication builds confidence and helps in personality development of an individual.

MODULES	TEACHING HOURS
MODULE 1: Introduction to Communication Skills & Basic English Grammar: Introduction to communication, Activities - Making introductions, Sharing personal information, Describing feelings and opinions. Parts of Speech - Nouns, Pronouns, Adjectives, Verbs, Adverbs, Prepositions, Conjunctions and Interjections. Articles, Subject Verb Agreement.	**6**
MODULE 2: Listening Skills: Hearing vs. Listening, Types of listening, Determinants of good listening, Active listening process, Barriers to listening, Activities - Listening for pronunciation practice, Listening for personal communication, Listening for communication - language functions.	**6**
MODULE 3: Speaking Skills: Basics of speaking, elements of speaking, Organizing speech, Introduction to Phonetics, Vowels and Diphthongs, Consonants, Sounds mispronounced, Silent and Non silent letters, Pronunciation, Word accent, Stress shift, One word substitutes, Strong and weak forms of words, Word formation - prefixes and suffixes. Presentation skills, Stages of presentation, Elements of presentation, Effective use of audio-visual aids, Individual and Group presentations. Activities - JAM sessions, Extempore.	**6**
MODULE 4: Reading Skills: Developing reading as a habit, Techniques of reading - skimming and scanning, Reading for gist, Reading for specific information, Intensive and extensive reading, Activities - understanding	**6**

students' attitudes towards reading, countering common errors in reading, developing efficiency in reading.	
MODULE 5 : Writing Skills: Basics of writing, ABC of writing, Hallmarks of good writing, 7 C's of effective writing, Proper use of punctuation, apostrophes, hyphens, capitalization, colon, semicolon, dash, exclamation, period, Common errors. Essay Writing - Techniques and Structure, Types of Essay, Letter Writing - Components of a formal letter, formats and types of business letters, Email Etiquette - Components of an email, thumb rules for email writing, types of email.	**6**

COURSE OUTCOMES (COs) : At the end of this course students will be able to

CO1	Comprehend information, document reports and deliver effective oral presentations
CO2	Access sources for new information to comprehend technical literature
CO3	Demonstrate effective individual and team work to accomplish effective communication goal

Reference Books:

1. High School English Grammar & Composition by Wren & Martin, S Chandh Publisher - 2015.
2. Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press - 2015.
3. Technical Communication - Principles and Practice by Meenakshi Raman and Sangeetha Sharma, Oxford University Press - 2017
4. English Language Communication Skills - Lab Manual cum Workbook by Rajesh Kumar Singh, Cengage learning India Pvt Limited - 2018

SEMESTER – I / II	
Course Name : Social Innovation	**Course Code : 20HS13/23**

No. of Lecture Hours / Week	**: 00**	**CIE Marks :**	**50**
No. of Practical Hours / Week	**: 02**	**SEE Marks :**	**0**
Total No. of Practical Hours	**: 20**	**SEE Duration :**	**0**
L:T:P	**: 0:0:2**	**Credits :**	**0**

COURSE OVERVIEW :

1. Identify the relevant theory and practical evidence for analyzing a local social problem.
2. Improve individuals consulting skills, communication, team work, planning issue analysis, formulation of strategy and tactical recommendations of acceptable and affordable solutions.

COURSE LEARNING OBJECTIVES (CLO) :

1. To sensitize students about social practices that aim to meet social needs in a better way than the existing
2. To develop a creative solution for existing local social problems.
3. To communicate effectively as an individual and as a member in diverse team.

Social Innovation	**Practical hours**
Phase I : Introduction and framework **Introduction:** Social Innovations are social practices that aim to meet social needs in a better way than the existing solutions. These are new strategies, concepts and ideas that meet social needs of all kinds to extend and strengthen civil society. **Frame work:** 1. Class wise formation of teams at the commencement of the semester. 2. Each team should be assigned with a faculty member who can guide these students during this course. 3. Each group will be briefed about the objectives and outcomes of social innovation. 4. Students are informed to visit in and around Mysuru city to identify the social problems associated with day to day life. 5. Students may also choose any activities suggested by AICTE under AICTE activity point programme.	**6**
Phase II : Group work – understanding social problems 1. Each group students will be provided with a platform to discuss social problems with their respective guides and also with other teams of the same section. 2. A proper guidance is provided to students, so that they can come up	**6**

with suitable solutions for the social problems.	
Phase III : Designing solution and presentation 1. Students should theoretically design solutions to help common people problems. 2. Students have to submit the report of their work. 3. Students have to give presentation on their ideas and implementation to solve society related problems. 4. Students have to present future scope of their work.	**8**

Text Book:

1. "Creating a World Without Poverty" by Muhammad Yunus

Reference Books:

1. "Rippling", How social entrepreneurs spread innovation throughout the world by Beverly Schwartz
2. "The Power of Social Innovation" by Stephen Goldsmith
3. "Social Innovation" by Alex Nicholls and Alex Murdock
4. "New Frontiers in Social Innovation Research" by Alex Nicholls
5. "When Everybody Designs", an introduction to design for social innovation by Ezio Manzini
6. Social Innovation and Entrepreneurship: Case studies, Practices and Perspectives" by Francesco Molinari and Brendan Galbraith
7. "Social Entrepreneurship (What Everyone Needs To Know)" by Bornstein and Davis
8. "Social Entrepreneurship: Working towards Greater Inclusiveness" by Rama Krishna Reddy Kummitha

COURSE OUTCOMES (CO) : At the end of the course, students will be able to,

CO1	Identify a local societal problem and develop a strategy to solve the problem (L2)
CO2	Design economically cost effective and novel solutions to help common people problems. (L6)
CO3	Develop communication skills as an individual and as a member in diverse team. (L6)

SEMESTER – II

Course Name:	**: Advanced Mathematics-II**	**Course Code :**	**20MA21**
Number of Lecture Hours / Week	**: 03**	**CIE Marks :**	**50**
Number of Tutorial / Hours / Week	**: 02**	**SEE Marks :**	**50**
Total Number of Lecture Hours + Practical Hours	**: 40+ 20 = 60**	**SEE Duration :**	**03 Hrs**
L:T:P	**: 3:2:0**	**CREDITS :**	**04**

COURSE OVERVIEW:

Advanced Mathematics II is a course which provides Mathematical techniques in the advanced areas of Mathematics that are of utmost relevance to engineering disciplines. The major focuses of the course are vector calculus, higher order differential equations, Laplace transforms and linear algebra. The purpose of this course is to provide the skills and knowledge required to perform fundamental Mathematical procedures and processes for solution of engineering problems, particularly the use of calculus and linear algebra. The course aims to show the relevance of Mathematics to engineering and applied sciences.

COURSE LEARNING OBJECTIVES (CLO)

The objective is to enable the students to apply the knowledge of Mathematics in various fields of engineering by the following means:

a) Explain the concept of vector calculus, higher order differential equations, Laplace transforms, and linear algebra to apply appropriately in solving engineering problems.

b) Explain how to analyze the system in various engineering domain using vector calculus, higher order differential equations, Laplace transforms and linear algebra.

c) Explain the usage of modern tool to understand the concepts and solve problems in vector calculus, higher order differential equations, Laplace transforms and linear algebra.

MODULES	TEACHING HOURS
MODULE 1: Higher Order Differential Equations Inverse Differential Operator: Particular integral of the form e^{ax}, Sinax, polynomials and $e^{ax}V(x)$(up to third order) and Variation of Parameters. Differential Equation with variable coefficient: Cauchy and Legendre differential equations. Problems on LRC circuit.	**8**
MODULE 2: Power Series Solutions Frobenius method of Power Series (only second order) solution to differential equations, Bessel's Differential Equation leading to $J_n(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, Legendre's Differential Equations, Rodrigues formula(without proof)-Legendre's Polynomial.	**8**

MODULE 3: Vector Calculus VPDO- Gradient of a scalar field (angle between two surfaces & Directional Derivatives), Divergence and Curl of Vector field and its properties (Solenoidal and Irrotational). Line integrals, Green's theorem, Stoke's theorem, and Gauss Divergence theorem.	**8**
Module 4: Laplace Transform Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions and unit-step function (problems only). Inverse Laplace Transform: Inverse Laplace transforms by method of partial fractions, Convolution theorem to find the inverse Laplace transforms. Solution of linear differential equations using Laplace transforms.	**8**
MODULE 5: Advanced Linear Algebra Vector Space, basis and span, subspace, linear Transformation(LT), Matrix representation of LT, Change of basis, Rank nullity theorem, inverse LT.	**8**

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. Gilbert Strang, Linear Algebra and its Applications, Wellesley Publishers.

Reference Books

1. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata Mc.Graw Hill Publications.
2. Peter V. O'Neil, *Engineering Mathematics*, CENGAGE Learning India Pvt. Ltd. Publishers.

COURSE OUTCOMES (COs): At the end of the course the students will be able to

CO1	**Understand** the basic concepts of Vector Calculus, Higher Order Differential Equations, Laplace transforms and Linear Algebra(PO-1)
CO2	**Apply** the concept of Vector Calculus, Higher Order Differential Equation, Laplace transforms and Linear Algebra to solve the problems arising in engineering fields. (PO-1)
CO3	**Analyze** the system in various Engineering Domain using the Vector Calculus, Higher Order Differential Equation, Laplace transforms and Linear Algebra. (PO-2)
C04	Use modern tool to **solve/analyze** engineering problems from the concepts Vector Calculus, Higher Order Differential Equation, Laplace transforms and Linear Algebra, which supports the Engineering Domain.(PO-5)