R.V.COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belagavi)

R.V. Vidyaniketan Post, Mysore Road

Bengaluru – 560 059

Bachelor of Engineering (B.E)

Scheme and Syllabus

(2018 Scheme)

I & II Semester

(COMMON TO ALL B.E. PROGRAMS)

Abbreviations

Sl. No.	Abbreviation	Meaning
1.	**VTU**	Visvesvaraya Technological University
2.	**BS**	Basic Sciences
3.	**CIE**	Continuous Internal Evaluation
4.	**CS**	Computer Science and Engineering
5.	**CV**	Civil Engineering
6.	**CHY**	Chemistry
7.	**EC**	Electronics and Communication Engineering
8.	**EE**	Electrical and Electronics Engineering
9.	**ES**	Engineering Science
10.	**HSS**	Humanities and Social Sciences
11.	**ME**	Mechanical Engineering
12.	**PHY**	Engineering Physics
13.	**SEE**	Semester End Examination
14.	**MAT**	Engineering Mathematics

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R V COLLEGE OF ENGINEERNG, BENGALURU-560 059
(Autonomous Institution Affiliated to VTU, Belagavi)
FIRST SEMESTER CREDIT SCHEME FOR PHYSICS CYCLE
(Effective from the Academic year 2018-19)

(COMMON TO ALL B.E. PROGRAMS)							
Sl. No.	Course Code	Course Title	BoS	CREDIT ALLOCATION			
				Lecture	Tutorial	Practical	Total Credits
1.	18MA11	Engineering Mathematics-I	MAT	3	1	0	4
2.	18PH12	Engineering Physics	PHY	3	1	1	5
3.	18EE13	Elements of Electrical Engineering	EE	2	1	0	3
4.	18CV14	Elements of Civil Engineering and Mechanics	CV	2	1	0	3
5.	18EE15	Elements of Engineering Practices	EE	--	0	1	1
6.	18ME16	Computer Aided Engineering Drawing	ME	1	0	2	3
7.	18HS17	English Language Laboratory-1	HSS			1	1
Total number of Credits				**11**	**4**	**5**	**20**
Total Number of Hours / Week				**11**	**08**	**10**	

FIRST SEMESTER CREDIT SCHEME FOR CHEMISTRY CYCLE

(Effective from the Academic year 2018-19)

(COMMON TO ALL B.E. PROGRAMS)							
Sl. No.	Course Code	Course Title	BoS	CREDIT ALLOCATION			
				Lecture	Tutorial	Practical	Total Credits
1.	18MA11	Engineering Mathematics-I	MAT	3	1	0	4
2.	18CH12	Engineering Chemistry	CHY	3	1	1	5
3.	18CS13	Programing in C	CS	2	1	1	4
4.	18EC14	Elements of Electronics Engineering	EC	2	1	0	3
5.	18ME15	Elements of Mechanical Engineering	ME	2	1	0	3
6.	18HS16	English Language Laboratory-1	HSS	-	0	1	1
Total number of Credits				**12**	**5**	**3**	**20**
Total Number of Hours / Week				**12**	**10**	**06**	

R V COLLEGE OF ENGINEERNG, BENGALURU-560 059

(Autonomous Institution Affiliated to VTU, Belagavi)

SECOND SEMESTER CREDIT SCHEME FOR PHYSICS CYCLE

(Effective from the Academic year 2018-19)

(COMMON TO ALL B.E. PROGRAMS)							
Sl. No.	Course Code	Course Title	BoS	CREDIT ALLOCATION			
				Lecture	**Tutorial**	**Practical**	**Total Credits**
1.	18MA21	Engineering Mathematics-II	MAT	3	1	0	4
2.	18PH22	Engineering Physics	PHY	3	1	1	5
3.	18EE23	Elements of Electrical Engineering	EE	2	1	0	3
4.	18CV24	Elements of Civil Engineering and Mechanics	CV	2	1	0	3
5.	18EE25	Elements of Engineering Practices	EE	--	0	1	1
6.	18ME26	Computer Aided Engineering Drawing	ME	1	0	2	3
7.	18HS27	English Language Laboratory-II	HSS			1	1
Total number of Credits				**11**	**4**	**5**	**20**
Total Number of Hours / Week				**11**	**08**	**10**	

SECOND SEMESTER CREDIT SCHEME FOR CHEMISTRY CYCLE

(Effective from the Academic year 2018-19)

(COMMON TO ALL B.E. PROGRAMS)							
Sl. No.	Course Code	Course Title	BoS	CREDIT ALLOCATION			
				Lecture	**Tutorial**	**Practical**	**Total Credits**
1.	18MA21	Engineering Mathematics-II	MAT	3	1	0	4
2.	18CH22	Engineering Chemistry	CHY	3	1	1	5
3.	18CS23	Programing in C	CS	2	1	1	4
4.	18EC24	Elements of Electronics Engineering	EC	2	1	0	3
5.	18ME25	Elements of Mechanical Engineering	ME	2	1	0	3
6.	18HS26	English Language Laboratory-II	HSS	-	0	1	1
Total number of Credits				**12**	**5**	**3**	**20**
Total Number of Hours / Week				**12**	**10**	**06**	

Semester: I		
ENGINEERING MATHEMATICS – I (Theory)		
Course Code: 18MA11		**CIE Marks: 100**
Credits: L:T:P: 3:1:0		**SEE Marks: 100**
Hours: 36L + 24T		**SEE Duration: 3Hrs**
Course Learning Objectives: The students will be able to		
1	Understand the existence of polar coordinates as possible 2-D geometry, curves in polar coordinates and to approximate a function of single variable in terms of infinite series.	
2	Gain knowledge of multivariate functions, types of derivatives involved with these functions, Jacobian as transformation factor and their applications.	
3	Enhance the knowledge level to visualize integrals in higher dimensional coordinate systems, possible representation and evaluation of geometrical and physical quantities in terms of multiple integrals.	
4	Interpret concepts of vector functions, vector fields, differential calculus of vector functions in Cartesian coordinates and apply them for various engineering problems.	
5	Appreciate the significance of vector integration and its applicability to Electromagnetic theory, Mechanics and other allied areas.	
6	Use mathematical IT tools to analyze and visualize various concepts.	

UNIT-I	
DIFFERENTIAL CALCULUS - I Basics of polar coordinates, polar curves, angle between radius vector and tangent, p-r equation (pedal equation). Curvature, radius of curvature – Cartesian & parametric forms (without proof), centre and circle of curvature (formulae only) and problems. Taylor's and Maclaurin's series for a function of single variable (statements only) and problems.	**08 Hrs**
UNIT-II	
DIFFERENTIAL CALCULUS - II Partial Differentiation – Basics, total derivatives-differentiation of composite and implicit functions, Maxima and minima of functions of two variables. Method of Lagrange multipliers with one subsidiary condition. Jacobians- properties and simple problems.	**07 Hrs**
UNIT-III	
INTEGRAL CALCULUS **Gamma and Beta functions**- Definitions, relationship between these functions and simple problems. **Multiple integrals**- Double and Triple integrals – Introduction and method of evaluation, problems. Double integrals - Change of order of integration and change of variables to polar coordinates. Applications – Area, volume and centre of gravity.	**07 Hrs**
UNIT-IV	
VECTOR DIFFERENTIATION Scalar and vector fields, vector differentiation, velocity and acceleration vectors, gradient, divergence, curl and Laplacian of scalar/vector fields, solenoidal and irrotational fields, physical interpretations, simple problems involving practical situations. Vector identities and problems.	**07 Hrs**

UNIT-V	
VECTOR INTEGRATION Line, surface and volume integrals. Green's theorem, Stoke's theorem and Gauss divergence theorem (all theorems without proof), solenoidal fields and irrotational fields. Applications to work done by a force and flux.	**07 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the understanding of the basics of polar coordinates and p-r equations, partial differentiation, multiple integrals, vector fields and vector differentiation.
CO2	Solve problems on radius of curvature, total derivatives of functions, double integrals by changing order of integration, velocity and acceleration vectors, line, surface and volume integrals.
CO3	Apply acquired knowledge to find infinite series form of functions, Jacobians, multiple integrals by changing variables, different operations using Del operator and to verify integral theorems.
CO4	Estimate extremal points of functions of two variables, area and volume using multiple integrals, solenoidal and irrotational fields.

Reference Books	
1.	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.
2.	Higher Engineering Mathematics, B.V. Ramana, 11th Edition, 2010, Tata McGraw-Hill, ISBN: 978-0-07-063419-0.
3.	Advanced Engineering Mathematics, E. Kreyszig, 10th Edition (Reprint), 2016, John Wiley & Sons, ISBN: 978-0470458365.
4.	Advanced Engineering Mathematics, C. Ray Wylie, Louis C. Barrett 6th Edition, 1995, McGraw-Hill Book Co., New York, ISBN: 978-0071135436.

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and experiential learning (EL). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for experiential learning is 20.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

High-3: Medium-2: Low-1

Semester: I/II		
ENGINEERING PHYSICS (Theory & Practice)		
Course Code: 18PH12/22		**CIE Marks: 100+50**
Credits: L:T:P: 3:1:1		**SEE Marks: 100+50**
Hours: 36L + 24T		**SEE Duration: 03+03 Hours**

Course Learning Objectives: The students will be able to

1	Understand the principles of Lasers, Optical fibers and its application in modern technology.
2	Understand the principles of Quantum mechanics and its applications to diverse fields like lasers and electrical properties of materials.
3	Analyze the Electrical properties of the conductors and semiconductors.
4	Explain the Elasticity and Dielectric properties of materials.
5	Solve differential equations of harmonic oscillators to analyze experimental situations applicable to engineering problems.

UNIT-I

LASERS **07 Hrs**

Interaction of radiation with matter, Einstein's coefficients (expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of He-Ne Laser. Application of Lasers in measurements of pollutants in atmosphere. Numerical problems.

OPTICAL FIBERS

Propagation mechanism, Angle of acceptance, Numerical aperture, Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and expression for attenuation coefficient, applications of optical fibers. Discussion of block diagram of point to point communication. Numerical problems.

UNIT-II

QUANTUM MECHANICS **07 Hrs**

Matter waves, de-Broglie's Hypothesis and wavelength of matter waves. Heisenberg's Uncertainty principle and application (Broadening of spectral lines). Setting up of one dimensional time independent Schrodinger's wave equation. Significance of Wave function, normalization. Application of SWE to particle in a one- dimensional infinite potential well (Particle in a box).Extension to three dimensional well. Free particle and square well potential. Numerical problems.

UNIT-III

ELECTRICAL CONDUCTIVITY IN METALS AND SEMICONDUCTORS **08 Hrs**

Review of Classical free electron theory, Quantum free electron theory, Density of states and Fermi factor. Fermi energy: carrier concentration in metals (derivation), variation of Fermi factor with temperature. Drawbacks of QFET, Hall Effect, derivation of Hall coefficient in metals. Band theory of solids (qualitative approach).

Intrinsic semiconductors: carrier concentration, derivation of electron concentration in conduction band, expression for hole concentration in valence band, intrinsic carrier concentration (derivation), Fermi level in intrinsic semiconductors. Energy gap of intrinsic semiconductors (derivation). Extrinsic semiconductors: Types of extrinsic semiconductors, doping methods (qualitative). Variation of carrier concentration in extrinsic semiconductors with temperature, variation of Fermi level in extrinsic semiconductors with temperature and impurity concentration. Hall effect for semiconductors. Numerical problems.

DIELECTRICS

Electric dipole, Dipole moment, Polarization of dielectric materials: Types of polarizations. Qualitative treatment of Internal field in solids: for one dimensional infinite array of dipoles (Lorentz field) and Claussius - Mossotti equation. Numerical problems.

UNIT-IV	
ELASTIC PROPERTIES OF MATERIALS Elasticity: Concepts of stress, strain, Hooke's law, Elasticity, plasticity, strain hardening, strain softening and failure (fracture/fatigue).Different elastic moduli and derivation of their inter relationships, Poisson's ratio. Bending of beams: Neutral surface and neutral plane, expression for bending moment of a beam (Derivation), expression for circular and rectangular cross section. Application example: single cantilever (Derivation). Torsion of cylinder: Expression for couple per unit twist of a solid cylinder (Derivation). Numerical problems.	**07 Hrs**
UNIT-V	
OSCILLATIONS Review of SHM, Free oscillations. Examples of Simple harmonic oscillators- a) Spring and Mass system, b) springs in series and parallel, c) Torsional pendulum-Expression for period of oscillation. Damped and forced oscillations: Theory of damped oscillations: overdamping, critical and under damping. Theory of forced oscillations and resonance, Sharpness of resonance, quality factor. Example for electrical resonance (LC, LCR circuit).Numerical problems.	**07 Hrs**
LABORATORY EXPERIMENTS	

1. Experiments with Lasers and Optical Fibers.
2. Experiments on Light Emitting Diodes (LED).
3. Experiments on Energy band gap of a thermistor, Fermi energy of a conductor, Hall Effect and Dielectric constant in a capacitor.
4. Experiments on spring constant in series and parallel combinations, single cantilever.
5. Experiments on Torsional pendulum and LCR circuit.
6. Innovative experiments using software.

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the fundamentals of lasers & optical fibers, quantum mechanics, electrical conductivity in metals and semiconductors, dielectrics, elastic properties of materials, oscillations and relate them to engineering applications.
CO2	Apply and Demonstrate lasers & optical fibers, quantum mechanics, electrical properties, dielectric properties, elastic properties of materials, oscillations through experiential learning.
CO3	Formulate and Evaluate lasers & optical fibers, quantum mechanics, electrical properties, dielectric properties, elastic properties of materials, oscillations towards specific engineering applications.
CO4	Design and Develop innovative experiments.

Reference Books	
1.	Engineering Physics, R K Gaur and S L Gupta,8th Edition, reprint 2013, Dhanpat Rai Publications, ISBN: 9788189928223
2.	A Textbook of Engineering Physics, P G Kshirsagar, M. N. Avadhanulu, 9th Edition, reprint 2015, S. Chand, ISBN : 9788121908177
3.	Fundamentals of Physics- Resnick, Halliday and Walker, 9th Edition, 2011, John Wiley & Sons, ISBN: 9780470547915
4.	Physics for Degree students, C.L. Arora and Dr. P. S. Hemne, 1st Edition, reprint 2016, S Chand, ISBN: 9788121933506

Continuous Internal Evaluation (CIE): Total marks: 100+50=150

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and experiential learning (EL). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for experiential learning is 20.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are rewarded for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**1**	**1**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**3**	**1**	**2**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**2**	**3**	**1**	**2**	**-**	**-**	**-**	**1**	**-**	**1**
CO4	**3**	**2**	**3**	**1**	**3**	**-**	**1**	**-**	**3**	**3**	**-**	**2**

High-3: Medium-2: Low-1

Semester: I/II		
ELEMENTS OF ELECTRICAL ENGINEERING (Theory)		
Course Code:18EE13/18EE23		**CIE Marks: 100**
Credits: L:T:P: 2:1:0		**SEE Marks: 100**
Hrs: 25L + 24T		**SEE Duration: 3Hrs**

Course Learning Objectives: The students will be able to,	
1	Understand the basic concepts of the electrical AC and DC circuits.
2	Analyze the performance of electric machines and select the machine for a given application.
3	Design simple wiring schemes and compute energy consumption for domestic and industrial applications.
4	Demonstrate the principles of AC & DC machines.
5	Apply the basic electrical concepts in their chosen branch.

UNIT-I	
FUNDAMENTALS OF D.C. AND A.C. CIRCUITS Overview of Ohm's Law, Kirchhoff's Laws, series-parallel circuits, mesh current analysis, Parameters of sinusoidal quantities, power and energy, Generation of sinusoidal voltage, phasor representation of alternating quantities.	**04 Hrs**
UNIT-II	
ANALYSIS OF A.C. CIRCUITS Single phase analysis using phasor diagrams for R, L, C, R-L, R-C, R-L-C series circuits, concepts of Real power, reactive power, apparent power and Power factor. Three-phase star and delta balanced circuits, voltage and current relations and measurement of three phase power using two wattmeter methods.	**06 Hrs**
UNIT-III	
SINGLE PHASE TRANSFORMERS: Review of Faraday's Laws, self and mutually induced EMFs, EMF equation and principle of operation, Basic parts and rating of transformers, phasor diagram on No-load and R-L Load, losses, efficiency of a transformer. **Induction Motors**: Concept of rotating magnetic field, Construction and working of a three-phase induction motor, Slip and its significance, Necessity of a starter, Principle and operation of capacitor start-run single phase induction motor, Applications of induction motors.	**06 Hrs**
UNIT-IV	
D.C. MACHINES Fleming's Left hand rule and right hand rule application to electric machines. DC motors: Construction, principle of operation, Back EMF, Torque equation, Types and characteristics of dc motors; necessity of starter, Applications of DC motors. **Three Phase Synchronous Generators**: Construction, types, principle of operation, synchronous speed, EMF equation.	**05 Hrs**
UNIT-V	
DOMESTIC WIRING Service mains, meter board and distribution board, methods of wiring, Two-way and three-way control of devices, fuse and MCB, Electric shock, precautions, grounding and earthing, Common household electrical appliances, their ratings and energy calculations.	**04 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamentals of AC, DC, electromagnetism, AC circuits, transformers, Induction motors, DC machines, synchronous machines, electric wiring.
CO2	Analyze AC, DC circuits, working and construction of electrical machines.
CO3	Evaluate the performance of transformers, Induction motors, DC machines, synchronous machines.
CO4	Design and plan the layout of electrical wiring scheme for a residential building.

Reference Books:	
1.	Fundamentals of Electrical Engineering, Dr. Rajendra Prasad, PHI, 2nd Edition, 2009, ISBN-10: 8120339282, ISBN-13: 978-8120339286,
2.	Basic Electrical Engineering, D C Kulshreshtha, Tata McGraw Hill, Revised 1st Edition, ISBN10 0071328963, ISBN13 9780071328968
3.	Electrical Technology, E. Hughes International Students 9th Edition, 2005, ISBN-10: 013114397, ISBN-13: 9780131143975
4.	Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2010, ISBN-10: 0070681120, ISBN-13: 978-0070681125

Continuous Internal Evaluation (CIE)

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and experiential learning (EL). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for experiential learning is 20.

Semester End Evaluation (SEE)

Theory -100 Marks

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	**2**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**2**	**2**	**-**	**-**
CO3	**3**	**2**	**2**	**2**	**-**	**2**	**2**	**1**	**1**	**2**	**-**	**2**
CO4	**3**	**3**	**3**	**3**	**1**	**2**	**2**	**-**	**3**	**3**	**2**	**1**

High-3: Medium-2: Low-1

Semester: I/II		
ELEMENTS OF CIVIL ENGINEERING AND MECHANICS (Theory)		
Course Code: 18CV14/24		**CIE Marks: 100**
Credits: L:T:P:2:1:0		**SEE Marks: 100**
Hours: 24L + 24T		**SEE Duration: 3Hrs**
Course Learning Objectives: The students will be able to		
1	Understand the importance and basic concepts of Civil Engineering.	
2	Identify the components and materials used for building construction.	
3	Illustrate the behaviour of rigid bodies.	
4	Apply principles of mechanics for solving engineering problems.	

UNIT-I	
INTRODUCTION TO CIVIL ENGINEERING Scope of different fields of Civil Engineering-Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering. Effect of the infrastructural facilities on socio-economic development of a country. **BUILDING COMPONENTS:** Concept of Sub Structure, Masonry Foundation, Isolated RCC footing, Raft foundation, Pile foundation: End bearing piles and Friction piles. Concept of super structure, Components and types of walls, doors, windows, roofs, flooring and stairs.	**04 Hrs**
UNIT-II	
INTRODUCTION TO ENGINEERING MECHANICS Force System: Basic concepts, Particle equilibrium in 2-Dimensional force system, Rigid Body equilibrium, System of Forces: Varignon's theorem. **EQUILIBRIUM OF FORCES:** Free body diagram, Equations of Equilibrium of Coplanar Systems; Lami's Theorem. Moment of Force and its Application; Resolution & composition of forces, Couple and Resultant of Force System.	**05 Hrs**
UNIT-III	
SUPPORT REACTIONS Classification of beams, Types of Loads and Supports, Support Reactions in statically determinate beams, Numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined), uniformly distributed and uniformly varying loads and Moments.	**05 Hrs**
UNIT-IV	
FRICTION Types of friction, Limiting friction, Laws of Friction, Concept of Static friction, Motion of Bodies, wedge friction, ladder friction.	**05 Hrs**
UNIT-V	
CENTRE OF GRAVITY AND MOMENT OF INERTIA Centroid of simple figures: rectangle, triangle, semicircle, quarter circle, sector of circle from first principles, centroid of composite sections. (Centre of Gravity and its implications;) Moment of inertia: Definition, Moment of inertia of plane sections: rectangle, triangle, semicircle and quarter circle from first principles. Theorems of moment of inertia. Moment of inertia of composite sections; Numerical problems on centroid and moment of inertia (up to 3 components)	**05 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamental concepts of Mechanics and Civil Engineering Structures.
CO2	Apply the concepts of Engineering Mechanics in solving simple engineering problems.
CO3	Analyze the forces and geometrical properties of structural components
CO4	Demonstrate the applications of mechanics to solve engineering problems.

Reference Books	
1	Mechanics for Engineers – Statics, Ferdinand P.Beer and E.Russel Johnston Jr, McGraw Hill book Inc., U.S.A, 4th Edition, 2009, ISBN- 007100135.
2	Building Construction, Sushil Kumar, Standard Publishers, 20th Edition, 2016, ISBN: 9788180141683.
3	Engineering Mechanics, Statics and Dynamics", A.Nelson, Tata McGraw Hill Publication,1st Edition, 2010, ISBN -10-0-07-014614-4, ISBN-13: 978-0-07-014614-3.
4	Engineering Mechanics, Irving H. Shames, Prentice Hall, Fourth edition, 2005, ISBN: 10: 0133569160, *ISBN*13: 9780133569162.

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and experiential learning (EL). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for experiential learning is 20.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**1**	**1**	**-**	**-**	**2**
CO2	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**1**
CO3	**2**	**2**	**1**	**-**	**-**	**2**	**2**	**-**	**1**	**-**	**-**	**2**
CO4	**2**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**

High-3: Medium-2: Low-1

Semester: I/II		
ELEMENTS OF ENGINEERING PRACTICES (Practice)		
Course Code: 18EE15/25		**CIE Marks: 50**
Credits: L:T:P: 0: 0 : 1		**SEE Marks: 50**
Hrs: 24P		**SEE Duration(Lab):3Hrs**

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

1	Understand the domestic wiring concepts, effects of different types of load, compute energy consumed and design simple wiring circuits.
2	Identify the hand tools and instruments, acquire knowledge of measuring instruments.
3	Acquire practical skills in the trade and knowledge of job materials in various shops.
4	Provide the knowledge of core technical subjects for making and working of any type of project.

LABORATORY EXPERIMENTS

Electrical Engineering

1.	One-way, Two-way and Three-way control of incandescent lamp
2.	Power and Power factor measurement of i. Fluorescent lamp with and without capacitor. ii. LED lamp. iii. Compact Fluorescent Lamp (CFL). iv. Incandescent lamp.
3.	Power measurement of balanced Star (Two and three wattmeter method) and Delta connected load (two wattmeter method)
4.	Demonstration of domestic wiring.

Electronics Engineering

5.	Soldering of Electronic Components
6.	Soldering and Wiring of Half Wave Rectifier
7.	Truth Table Verification of Simple Logic Gates
8.	Study of Sensor Characteristics

Mechanical Engineering

9.	**Internal threading:** Drilling and Tapping operation to fasten bolt and nut in a given work piece.
10.	**Sheet metal work:** Preparation of sheet metal models: Cylinder and hexagonal prism with soldering.
11.	**Demonstration**: Demonstration on Cut section of IC Engine. Demonstration on Water turbines. Demonstration on Electric Arc Welding. **Pipe fitting (Plumbing):** Demonstration of external threading for a T-joint pipe fittings.

Laboratory Course Outcomes: The student should be able to:	
CO1	Analyse and design simple electric wiring circuits and compute energy consumed by different types of loads.
CO2	Learn the physical recognition of different Electrical & Electronics components like Resistances, Inductances, Capacitances and devices like diodes, transistors along with their ratings.
CO3	Understand sheet materials manufacturing operations, including their capabilities, limitations, and how to design economically.
CO4	Able to think in an innovative way to work with basics of Electrical, Electronics / Mechanical components.

Reference Books	
1	Fundamentals of Electrical Engineering, Dr. Rajendra Prasad , PHI, 3rd Edition 2009, ISBN-978-8120339286.
2	Manufacturing Engineering's Reference book, D.KOSHAL,1st Edition 2014,ISBN-9780080523958.
3	Soldering in Electronics Assembly, MIKE JUDD Keith Brindley,2nd Edition, ISBN-9780080517346.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are rewarded for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	2	1	-	-	2	1	1	1
CO2	3	2	1	2	2	-	-	-	1	1	1	1
CO3	3	1	1	2	2	-	-	-	1	1	1	1
CO4	3	3	3	3	2	-	-	-	2	2	1	1

High-3: Medium-2: Low-1

Semester: I/II		
COMPUTER AIDED ENGINEERING DRAWING (Practice)		
Course Code:18ME16/26		**CIE Marks: 50**
Credits: L:T:P:1:0:2		**SEE Marks:50**
Hours: 12L+24P		**SEE Duration: 03 Hours**

Course Learning Objectives: The students will be able to	
1	Understand the conventions and standards used in drawings.
2	Impart skills of visualizing three dimensional objects and represent the same in two dimensions as per international standards, by manual and computational methods.
3	Analyze and draw orthographic projections of points, lines, planes and simple three dimensional objects.
4	Prepare development of lateral surfaces of solids.
5	Comprehend concepts of isometric projections of solids and combination of solids.

UNIT-I	
INTRODUCTION TO COMPUTER AIDED SKETCHING Drawing Instruments, BIS conventions, size of drawing sheet, Dimensioning, line conventions, material conventions, Drawing scale, Types of Projections. Working with software – Basic commands for creation of drawings and dimensions.	**02 Hrs**
UNIT-II	
ORTHOGRAPHIC PROJECTIONS Projection of points in all the four quadrants. Projection of straight lines (First Angle Projection)true and apparent lengths, true and apparent inclinations to reference planes, mid-point problems, simple application problems. Projection of plane surfaces: Projections of regular plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle inclined to both the planes- using change of position method	**08 Hrs**
UNIT-III	
PROJECTIONS OF SOLIDS Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, and cones with axis inclined to both the planes	**06 Hrs**
UNIT-IV	
DEVELOPMENT OF LATERAL SURFACES OF SOLIDS Introduction to section planes and sectional views, Development of lateral surfaces of right regular prisms, cylinders, pyramids, cones and their frustums resting with base on HP only	**04 Hrs**
UNIT-V	
ISOMETRIC PROJECTION Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. combination of two simple solids	**04 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate competence in basics of orthographic projections of points, lines, planes and solids in three different views.
CO2:	Apply the concepts of orthographic projections for industrial drawings.
CO3:	Create isometric drawings of simple objects from orthographic views.
CO4:	Develop computer aided drawings of simple objects

Reference Books	
1.	Engineering Graphics, K R Gopalakrishna Subhash Publishers , Bangalore ; 32nd Edition;2013;ISBN: 5551234018577
2.	Engineering Drawing, N D Bhatt, V M Panchal Charutha Publishing House, Gujarat, 48th Edition, 2005, ISBN:9380358178
3.	Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, Luzadder Warren J., Duff John M Eastern, ISBN 13: 9780133350500
4.	A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belagavi

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 40 marks. At the end of the semester a test is conducted for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**-**	**1**	**2**	**2**	**-**	**-**	**1**	**1**	**1**	**2**
CO2	**3**	**2**	**3**	**2**	**2**	**2**	**-**	**1**	**1**	**1**	**-**	**1**
CO3	**1**	**2**	**3**	**3**	**2**	**2**	**-**	**1**	**1**	**1**	**-**	**1**
CO4	**1**	**2**	**3**	**3**	**3**	**2**	**-**	**1**	**1**	**0**	**1**	**2**

High-3: Medium-2: Low-1

Semester: I/II		
ENGINEERING CHEMISTRY (Theory & Practice)		
Course Code:18CH12/22		**CIE Marks: 150**
Credits: L:T:P: 3:1:1		**SEE Marks: 150**
Hours: 36T+24T		**SEE Duration: 3Hrs**

Course Learning Objectives: The students will be able to	
1	Understand and develop new electrochemical devices for the application of Engineering and Technology.
2	Organise the knowledge of chemistry to study and exploit the available energy and water resources.
3	Use the analytical techniques in quality assessment of chemical compounds.
4	Evaluate various corrosion situations and implement suitable corrosion control measures.
5	Apply the basic concepts of chemistry to develop materials for applications in the area of engineering and nanotechnology.

UNIT-I	
NATURAL RESOURCES AND THEIR MANAGEMENT **WATER CHEMISTRY:** Introduction, sources and impurities in water, Potable water; meaning and specifications (as per WHO standards), Hardness in water: causes, types. Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), Numerical problems on BOD and COD. Sewage treatment: Primary and secondary (activated sludge method) methods, Desalination of sea water by reverse osmosis using Polysulfone membrane. **CHEMICAL FUELS:**Introduction, classification, calorific value, types. Knocking in IC engines, octane number, cetane number, Power alcohol, unleaded petrol and biodiesel. **SOLAR ENERGY:** Introduction, photovoltaic cells- construction and working of silicon cells (Amorphous). Advantages & disadvantages of PV cells. Dye sensitized solar cells (using TiO_2, Ruthenium dye and Tri Iodide system).	**08 Hrs**
UNIT-II	
ELECTROCHEMICAL ENERGY SYSTEMS **THERMODYNAMICS OF CELLS:** Galvanic cell, cell representation, Gibbs Free energy and EMF. Cell potential, Nernst equation-Derivation and numerical problems. Applications of Nernst equation- Potentiometric Titrations. **TYPES OF ELECTRODES:** Metal-Metal-ion, Metal-gas, metal insoluble salt, Redox electrode, Ion selective electrode. Reference electrodes: Introduction, construction, working and applications of calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Numerical problems. **ENERGY STORAGE AND CONVERSION SYSTEMS:** Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Li-ion batteries-$LiCoO_2$ battery. **FUEL CELLS:** Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte.	**07 Hrs**

UNIT-III	
CORROSION SCIENCE AND ENGINEERING **CORROSION:** Introduction, electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, pH, conductivity and temperature. Common Types of corrosion- differential aeration (pitting and water line), Differential metal and Stress corrosion. **CORROSION CONTROL:** Introduction, metal coatings: Galvanization and Tinning. Inorganic coatings: Phosphating and Anodising. **METAL FINISHING:** Introduction, Technological importance. Electroplating: Introduction, Factors influencing the nature of electrodeposit (current density, metal ion concentration, temperature, pH, throwing power and organic additives). Electroplating: Introduction, electroplating of chromium. Electroless plating: Introduction, distinction between electroplating and electro less plating, electroless plating of copper, application of electroless plating in making of PCBs.	**07 Hrs**
UNIT-IV	
NANOMATERIALS AND ANALYTICAL TECHNIQUES **NANOMATERIALS:** Introduction, size dependent properties (Surface area, Optical, and Catalytic properties), Synthesis of nano-materials: Top down and bottom up approaches. Bottom up synthesis- Solution combustion and Sol-gel methods. **NANO SCALE MATERIALS:** Carbon nanotubes: Introduction, types, synthesis by modified CVD method, functionalization and applications. Graphene: Introduction, synthesis by modified Hummer's method. **INSTRUMENTAL METHODS OF ANALYSIS:** Theory, Instrumentation and applications of colorimetry, UV-Visible spectroscopy, conductometry and flame photometry.	**07 Hrs**
UNIT-V	
CHEMISTRY AND APPLICATIONS OF ORGANIC POLYMERS **POLYMERIC MATERIALS:**Introduction to polymer, Glass transition temperature (Tg), factors affecting Tg. Thermo plastic polymers: Polycarbonate & ABS preparation and specific applications in industries. Thermosetting polymers: Epoxy resin, phenol- formaldehyde resin, synthesis, properties and applications. **SMART POLYMERIC MATERIALS** **BIODEGRADABLE POLYMERS:** Introduction and their requirements. Synthesis and properties of Poly lactic acid, Applications of biodegradable polymers in medical industry. **CONDUCTING POLYMERS:** Introduction, requirements of conducting polymers, mechanism of conduction (taking polyacetylene as an example), synthesis of Poly aniline, use of conducting polymers in energy harvesting. **PHOTO CONDUCTING POLYMERS:** Synthesis of Poly vinyl carbazole and its applications in laser printing. **SYNTHETIC FIBRES:**Synthesis of carbon fibre from PAN, applications of carbon fibre in polymer composites.	**07 Hrs**

LABORATORY EXPERIMENTS
VOLUMETRIC ANALYSIS AND PREPARATIONS 1. Evaluation of quality of water in terms of total hardness by Complexometic titration. 2. Estimation of percentage of copper in brass by Iodometric titration. 3. Estimation of iron in the given sample of haematite ore solution by Redox titration. 4. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.(Self learning experiment) 5. Determination of Dissolved Oxygen in the given water sample by Winkler's method. (Demonstration experiment) 6. Preparation of polystyrene by bulk polymerization method. (Demonstration experiment) 7. Preparation of ZnO by solution combustion method. (Demonstration experiment). **INSTRUMENTAL METHODS OF ANALYSIS** 1. Determination of pKa of a weak acid using pH meter. 2. Potentiometric titration–Estimation of FAS using standard $K_2Cr_2O_7$ solution. (Self-learning experiment) 3. Colorimetric estimation of copper. 4. Conductometric estimation of HCl using standard NaOH solution. 5. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer (density of the liquid to be given). 6. Flame photometric estimation of sodium in the given saline solution. 7. Determination of relative and kinematic viscosities of given lubricatingoil at different temperatures using Redwood Viscometer. (Demonstration Experiment). 8. To find of Tg of polymer using DSC. (Demonstration Experiment).

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the principles of chemistry in engineering & technology
CO2	Apply the knowledge of chemistry in solving socio-economic and environmental issues.
CO3	Identify and analyze engineering problems to achieve practical solutions.
CO4	Develop solutions for problems associated with technologies.

Reference Books	
1.	Engineering Chemistry, O.G.Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, 4th Reprint 2017. ISBN: 978-0-07-014610-5,
2.	Engineering Chemistry, Shubha Ramesh et.al., Wiley India, 1st Edition, 2011, ISBN: 978-81-265-1988-0.
3.	Engineering Chemistry, S Satyanarayana and H C Shashidhara, Himalaya Publishing House, Edition-2011, ISBN-978-9-35-051498-6.
4.	Fundamentals of Analytical chemistry, Douglas A. Skoog et,al., 8th Edition, 2004, Thomson Asia Pvt Ltd. ISBN: 981-243-513-1.

Continuous Internal Evaluation (CIE): Total marks: 100+50=150

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and experiential learning (EL). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for experiential learning is 20.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are rewarded for 10 marks. Total marks for the laboratory is 50

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**-**	**-**	**-**		**2**	**2**	**-**	**-**	**1**	**-**	**-**
CO3	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**-**	**-**	**3**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**2**

High-3: Medium-2: Low-1

Semester: I/II		
PROGRAMMING IN C (Theory & Practice)		
Course Code:18CS13/23		**CIE Marks: 100+50**
Credits: L:T:P: 2:1:1		**SEE Marks: 100+50**
Hours: 24+24T		**SEE Duration: 03+03Hours**

Course Learning Objectives: The students will be able to	
1	Acquire basic principles of problem using computers.
2	Learn and use syntax of C programming language to solve basic science and engineering problems.
3	Select appropriate programming constructs, data structures and functions to build solutions to variety of problems.
4	Identify the scientific and business problems which can be solved using C programming.

UNIT-I	
INTRODUCTION TO COMPUTER CONCEPTSAND REASONING Introduction to Computer Hardware, Software and its Types. Skill development – Examples related to Arithmetical Reasoning and Analytical Reasoning. **ALGORITHMS AND FLOWCHARTS:** Fundamentals of algorithms and flowcharts with examples.	**01 Hrs**
INTRODUCTION TO C PROGRAMMING Programming paradigms, Basic structure of C program, Process of compiling and running a C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Pre-processor directives.	**02 Hrs**
HANDLING INPUT AND OUTPUT OPERATIONS AND OPERATORS Formatted input/output functions, Unformatted input/output functions with programming examples using different input/ output functions. **OPERATORS** Introduction to operator set, Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and decrement operators, Conditional operators, Bit-wise operators, Special operators.	**02 Hrs**
UNIT-II	
EXPRESSIONS Arithmetic expressions, evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity.	**02 Hrs**
PROGRAMMING CONSTRUCTS **DECISION MAKING AND BRANCHING** Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, The '*?:'* operator, The '*goto'* statement. **DECISION MAKING AND LOOPING** The 'for','while','do-while' statements with examples, Jumps in loops**.** **ARRAYS:** Introduction to Arrays, Types of arrays, Declaration arrays, Initializing dimensional arrays (One Dimensional and Multidimensional Array), Applications of Arrays.	**04Hrs**

UNIT-III	
STRING OPERATIONS Introduction, Declaration and Initializing String Variables using arrays, String operations and functions with examples. **FUNCTIONS:** Need for Functions, Types of functions (User Defined and Built –In), working with functions, Definition, declaration and its scope, Category of functions Storage classes (Automatic, Static, Extern, Register).	**02Hrs** **03Hrs**
UNIT-IV	
RECURSION Introduction, Example programs(Factorial, Fibonacci series, Ackerman function merge sort or quick sort and other examples) **POINTERS:** Introduction, Benefits of using pointers, Declaration and Initialization of pointers, Obtaining a value of a variable, Typecasting of a pointer, Arithmetic Operations using pointers, pointers and arrays, pointers and strings, pointers and functions.	**04 Hrs**
UNIT-V	
STRUCTURES AND UNIONS Introduction, Structure definition, Declaring structure variables, Accessing structure members, Structure initialization, Copying and comparing structure variables, Arrays of structure, Arrays within structures, Structure within structures, Structures and functions, Introduction to Unions.	**04 Hrs**

LABORATORY PROGRAMS	
PART A	
1	Familiarization with programming environment, concept of naming the program files, storing, compilation, execution and debugging. Taking any simple C-code.
2	Debug the errors and understand the working of input statements in a program by compiling the C-code.
3	Implement C Program to demonstrate the working of relational operator, logical, bitwise operator and analyze the output.
4	Simple computational problems using arithmetic expressions and use of each operator leading to implementation of a Commercial calculator with appropriate message: a) Read two values from the key board. b) Handle divide by zero error and print appropriate message. c) Handling the modulus operator for floating point numbers.

5	Compute the roots of the equation $ax^2 + bx + c = 0$and print result upto three-decimal places. The roots are real $-b \pm \sqrt{D}/2a$ if the discriminant $D = b^2-4ac$ is non-negative.If the discriminate is negative, then the roots are complex conjugate$-b/2a \pm \sqrt{-}Di/ 2a$.The program proceeds in the following steps: a) The program should accept input values for*a*, *b* and *c* from the keyboard. b) No solution, if both a and b are zero. The program terminates with appropriate message. c) Linear equation, if a = 0 but b ≠ 0 and the root is −c/b. The program prints out the root with appropriate message and the program terminates. d) Calculate the discriminant D and determines the corresponding roots. e) Display all possible roots of a quadratic equation with appropriate message.
6	Design and develop using an iterative problem solving approach for Taylor series approximation for five decimal digits to compute $Sin(x) = x - x^3/3! + x^5/5! - x^7/7! + x^9/9!.....X^n / n!$.
7	Develop a C program for one dimensional and two dimensional array manipulations (insertion, deletion, modification, search). Demonstrate a C program that reads N integer numbers and arrange them in ascending or descending order using bubble sort technique.
8	Develop and demonstrate a C program for Matrix multiplication: a) Read the sizes of two matrices and check the compatibility for multiplication. b) Print the appropriate message if the condition is not satisfied and ask user to enter proper input. c) Read the input matrix d) Perform matrix multiplication and print the result along with the input matrix.
9	Using functions develop a C program to perform the following and check whether the given string is a Palindrome by parameter passing concept: a) To read a string from the user. b) Print appropriate message for palindrome or not palindrome
10	Develop and implement Newton-Raphson method to find the square root of a given positive integer. Also Cross check with implementation of long-division method.
11	Write a C program to perform the following operations using recursive functions: i)GCD, LCM (Using GCD method) ii) Binary to Decimal Conversion
12	Develop and demonstrate addition of one dimensional and two dimensional array elements using Pointer concept.
13	Implement a C program to maintain a record of n students using an array of structures: a) Declare a structure with the structure members USN Number, Name, Marks and Grade by assuming appropriate data type. b) Read and write n students structure data. c) Compute average- marks, the students scoring above and below the average marks for a class of 60 students. Display the computed record.

PART B
Student will design, develop and implement an application using the appropriate data structure. Some example applications are listed below:
• The Encoding/decoding model of communication was first developed by cultural studies scholar Stuart Hall in 1973. It deals with the process of converting information into a coded format and then converting it back again from a coded format to the original information. Make use of matrices to implement encoding/decoding of messages. • Develop a C programming code with GUI for real time Bank application for customized transactions with appropriate validations for n number of customers. • Matrix rotation is one of the basic operations used in understanding the movement of robots. Assume a robot present position attributes are given by a MXM square matrix, robot is allowed to move 90 degrees clockwise, print the new matrix of position attributes after rotation using functions.

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the fundamental computer concepts and syntax of C programming.
CO2	Apply logical skills to design and develop algorithms/flow charts to solve real-world problems.
CO3	Analyze the logic of the program and output obtained using different sets of input.
CO4	Design and develop programs using appropriate data structures and functions in C language.

Reference Books	
1.	Programming in C, P. Dey, M. Ghosh, 2nd Edition, 2012, Oxford University press, ISBN -13: 978-0198065289.
2.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2nd Edition, 2015, Pearson Education India, ISBN -13: 978-9332549449.
3.	Let Us C, Yashavant P. Kanetkar., 16th Edition, 2018, BPB Publications, ISBN-13: 978-9387284494.
4.	C: The Complete Reference, H. Schildt, 4th Edition, 2017, McGraw Hill Education, ISBN-13: 978-0070411838.

Continuous Internal Evaluation (CIE): Total marks: 100+50=150

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and experiential learning (EL). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for experiential learning is 20.

Laboratory- 50 Marks

The lab component consists of two parts. Students will be given one program based on the concepts of C programming of all the units defined in the theory syllabus from PART A. The total marks for solving program is 50 marks.20% of the total marks (10) for write up and 60% of the total marks (30) will be for execution and 20% of the total marks (10) for viva voce for each program. The marks obtained will be reduced to 10 marks.

From the PART B, students have to identify the application design, develop and demonstrate the application and submit the work as per the guidelines which will be evaluated for 10 marks based on the defined rubrics.
The Cumulative Continuous Evaluation (CCE) will be for 30 marks. So the total marks will be 50.

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Students will be given one program based on the concepts of C programming of all the units defined in the theory syllabus. The total mark for solving program is 50 marks. 20% of the total marks (10) for write up, 60% of the total marks (30) will be for execution and 20% of the total marks (10) is for viva voce for each program. The total marks will be 50.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**1**
CO2	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**1**	**-**	**1**
CO3	**3**	**3**	**3**	**3**	**2**	**-**	**2**	**1**	**2**	**2**	**1**	**2**
CO4	**3**	**3**	**3**	**3**	**2**	**-**	**1**	**-**	**2**	**2**	**1**	**2**

High-3: Medium-2: Low-1

SEMESTER – I/II		
ELEMENTS OF ELECTRONICS ENGINEERING (Theory)		
Course Code:18EC14/24		**CIE Marks: 100**
Credits: L:T:P: 2:1:0		**SEE Marks: 100**
Hours: 28L+24T		**SEE Duration: 3Hrs**

Course Learning Objectives: The students will be able to	
1	Understand the operation of simple devices like Diode, Zener Diode, Bipolar Transistor and MOSFET.
2	Design simple rectifier, Zener regulator circuits, biasing circuits for obtaining the desired operating point to meet the required specifications
3	Design simple circuits like, comparators and summers using operational amplifiers.
4	Compile the different building blocks in digital electronics and implement simple logic functions after simplifying logic expressions.

UNIT-I	
SEMICONDUCTOR DIODES AND APPLICATIONS P-N junction Diode, Parameters, Characteristics, Full wave Bridge rectifier, Capacitor filter , Zener diode as a voltage regulator, Block Diagram of a DC Power supply, working of photo diode and LED	**06 Hrs**
UNIT-II	
BJT AND APPLICATIONS BJT operation and characteristics, Voltage Divider Biasing, BJT as an amplifier and as a switch. **FEEDBACK AMPLIFIERS** Basic Principles and advantages of Negative Feedback.	**06 Hrs**
UNIT-III	
MOSFET Difference between BJT & MOSFET, Construction, Operation, Characteristics of Enhancement type MOSFET, MOSFET as an amplifier and as a switch, CMOS inverter, CMOS NAND, CMOS NOR: Circuit and operation. Block diagram of a general communication system, Need for modulation and types of modulation	**05 Hrs**
UNIT-IV	
DIGITAL ELECTRONICS FUNDAMENTALS Difference between analog and digital signals, Boolean Algebra and Simplification using Boolean theorems and postulates, K-map **DIGITAL ELECTRONICS CIRCUITS** Basic and Universal Gates, Half adder, Full adder, Multiplexer, De-multiplexer, Encoder, Decoder	**06 Hrs**
UNIT-V	
OPERATIONAL AMPLIFIERS AND APPLICATIONS Introduction to Op-Amp, Op-Amp parameters: Gain, Bandwidth, Input & Output impedances, CMRR, PSRR, Slew Rate, Input Offset voltage, Applications: Inverting amplifier, Non-Inverting Amplifier, Voltage Follower, Summer, Difference amplifier, Integrator, Differentiator and Comparator with equations, Pin Configuration and parameters of 741 Op-Amp.	**05 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze the operation and the characteristics of the Electronic devices for various applications.
CO2	Apply and analyze circuits for applications of various Electronic systems
CO3	Demonstrate the different building blocks of Electronics systems
CO4	Evaluate the performance of the electronic circuits to meet given specifications using modern IT tools

Reference Books	
1.	Electronic Devices and Circuit Theory, Robert L Boylestad, Louis Nashelsky, 10th Edition, 2009, Prentice Hall India publication, ISBN: 978-317-2700-3.
2.	Electronic Devices and Circuits, David A. Bell, 5th Edition, 2008, Oxford University Press, ISBN:9780195693409
3.	Basic Electronics, D P Kothari,I J Nagrath, 2nd Edition, MCGraw Higher Ed, ISBN: 9789352606467
4.	Digital Logic and Computer Design, Morris Mano, 54th Edition, 2007, Prentice Hall India publication, ISBN: 978-81-317-1450-8.

Continuous Internal Evaluation (CIE); Theory (100 Marks)

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Semester End Evaluation (SEE); Theory (100 Marks)

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CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**1**
CO4	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**1**

High-3: Medium-2: Low-1

Semester: I/II		
ELEMENTS OF MECHANICAL ENGINEERING (Theory)		
Course Code:18ME15/25		**CIE Marks: 100**
Credits: L:T:P:2:1:0		**SEE Marks: 100**
Hours: 28L+24T		**SEE Duration: 03 Hours**

Course Learning Objectives: The students will be able to,

1	Understand basic laws of thermodynamics and different methods of energy generation
2	Understand the working of two stroke, four stroke IC engine, refrigeration system and estimate the performance parameters
3	Familiarize with basic machine tools and their operations
4	Familiarize with basics of joining process, power transmission elements and CNC machines.

UNIT-I	
BASIC CONCEPTS OF THERMODYNAMICS- Introduction, states, concept of work, heat, temperature; Zeroth, First and Second Law of thermodynamics, simple numerical on First Law of thermodynamic **PROPERTIES OF STEAM** Steam generation, properties of steam in different phases, computation of properties of steam using steam tables- simple numerical.	**05 Hrs**
UNIT-II	
HYDRAULIC and GAS TURBINES Working Principleof Pelton, Francis and Kaplan turbines and their comparisons. Open and Closed Cycle Gas turbine, functions of gas turbine cycle components such as turbine, combustion chamber, compressor and condenser **REFRIGERATION** Concept of refrigeration, refrigeration effect, ton of refrigeration, refrigerants and their properties, Working principle of vapour compression refrigeration system.	**06 Hrs**
UNIT-III	
INTERNAL COMBUSTION ENGINES Classification of I C engine, working of 2-stroke and 4- stroke petrol and diesel engines, P - V diagrams of Otto cycle and Diesel cycle. Computation of performance parameters - indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption (simple numerical)	**07 Hrs**
UNIT-IV	
MACHINE TOOLS Lathe: Classification, specification, lathe operations-turning, thread cutting and knurling. Drilling: Classification, working of radial drilling machine, drilling operation-reaming, boring, counter boring, counter sinking and tapping Milling: Classification, working of horizontal milling machine, milling operation-Plain milling, angular milling, form milling, straddle milling andgang milling. **(Note: No sketch and explain machine tools)**	**05 Hrs**

UNIT-V	
JOINING PROCESS Classification and methods of joining process- Arc and Gas welding, Soldering **POWER TRANSMISSION** Types of belt drives, Flat belt drives- Open and cross belt drive (No derivation), velocity ratio, creep, slip and idler pulley (No numerical) Classification of gears, velocity ratio for simple and compound gear trains (No derivation and numerical) **COMPUTER NUMERICAL CONTROL (CNC)** Concepts and elements of CNC machine. Advantages and disadvantages of CNC machines over conventional machines	**05 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1:	Apply the principles of thermodynamics to evaluate the properties of steam and explain the concepts of energy generation.
CO2:	Differentiate types of IC engines, analyze and compute performance parameters of IC engines and explain the principle of refrigeration system.
CO3:	Explain different types of machine tools and their applications in performing various machining operations through conventional and computer control methods
CO4:	Apply the knowledge of joining processes and power transmission elements in various engineering applications.

Reference Books	
1.	Elements of Mechanical Engineering, K R Gopalakrishna, 30th Edition, Subhas Publications, 2014, ISBN 13-1234567153375.
2.	A text book of Elements of Mechanical Engineering, S Trymbaka Murthy, I K International Publishing House Pvt. Ltd , 2008, ISBN-3980578571
3.	Basic and applied Thermodynamics, P.K.Nag, 2nd Edition, 2017, McGraw Hill Education, ISBN- 100070151318
4.	Principles of modern manufacturing, Mikell P. Groover,SI Version, Wiley India, 2018, ISBN-108126573058

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Semester End Evaluation (SEE); Theory (100 Marks)

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CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	-	1	1	-	-	-	2	-	2
CO2	3	2	2	1	1	1	-	1	1	1	-	2
CO3	3	1	1	-	1	1	-	1	2	1	1	2
CO4	2	1	1	-	1	1	1	1	1	1	1	2

High-3: Medium-2: Low-1

Semester: II		
ENGINEERING MATHEMATICS – II (Theory)		
Course Code: 18MA21		**CIE Marks: 100**
Credits: L:T:P: 3:1:0		**SEE Marks: 100**
Hours: 36L + 24T		**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
1	Understand the basics of Matrix theory, Eigen values and Eigen vectors, solution of system of linear equations.	
2	Recognize and model differential equations, apply analytical techniques to compute solutions for engineering problems.	
3	Compute the solution of linear partial differential equations that arise in physical situations.	
4	Learn to find the approximate solutions using numerical methods in the absence of analytical solutions of various systems of equations.	
5	Use mathematical IT tools to analyze and visualize various concepts.	

UNIT-I	
ELEMENTARY LINEAR ALGEBRA Rank of matrices - Rank of a matrix by Echelon form, consistency of system of linear equations - homogeneous and non-homogeneous equations, Gauss elimination, Gauss – Jordan and Gauss - Seidel methods. Eigen values and Eigen vectors-properties, largest Eigen value by Rayleigh's power method. Diagonalization of a square matrix of order two.	**07 Hrs**
UNIT-II	
LINEAR ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER Standard form of higher order linear differential equation with constant coefficients, concept of different types of solutions. Solution of homogeneous equations – complementary functions. Non homogeneous equations- Concept of Inverse differential operator, methods of finding particular integral based on input function(force function), method of variation of parameters. Equations with functional coefficients – Cauchy and Legendre equations, solutions. Applications- Simple harmonic motion, LRC circuits.	**08 Hrs**
UNIT-III	
PARTIAL DIFFERENTIAL EQUATIONS Formation of partial differential equations by elimination of arbitrary constants/functions, solution of Lagrange's linear equation. Solution of partial differential equations by method of separation of variables. Solution of Wave and Heat equations in one dimension and Laplace equation in two dimensions by the method of separation of variables - problems.	**07 Hrs**
UNIT-IV	
NUMERICAL METHODS - I Algebraic and Transcendental equations – Roots of equations, intermediate value property. Regula-Falsi and Newton - Raphson methods. Methods of solving first order ordinary differential equation (ODE) – Taylor series method, modified Euler method, 4^{th}order Runge-Kutta method, Milne predictor – corrector method.	**07 Hrs**

UNIT-V	
NUMERICAL METHODS - II Finite differences, concept of forward and backward differences, introduction to interpolation (extrapolation). Newton-Gregory(N-G) forward and backward interpolation formulae, Lagrange interpolation formula, application oriented problems. Numerical differentiation based on N-G forward and backward interpolation, simple applications – velocity, acceleration. Numerical integration- Newton-Cotes approach – Simpson's $1/3^{rd}$, $3/8^{th}$ rules and Weddle's rule, Gauss Quadrature approach – 2-point and 3-point formulae.	**07 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the understanding of rank of a matrix, classification and types of solutions of higher order linear ordinary differential equations and partial differential equations, necessity of numerical methods and few basic definitions.
CO2	Solve system of equations using Gauss elimination and Jordan methods, homogeneous linear differential equations & Lagrange linear pde, interpolate data using finite differences and use intermediate value property.
CO3	Apply acquired knowledge to find solution of equations using Gauss - Seidel method, derivatives and integrals of numerical data and solve differential equations numerically.
CO4	Estimate the solutions of problems involving applications of differential equations using both analytical and numerical methods.

Reference Books	
1.	Higher Engineering Mathematics, B.S. Grewal, 44^{th} Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.
2.	Higher Engineering Mathematics, B.V. Ramana, 11^{th} Edition, 2010, Tata McGraw-Hill, ISBN: 978-0-07-063419-0.
3.	Advanced Engineering Mathematics, E. Kreyszig, 10^{th} Edition (Reprint), 2016, John Wiley & Sons, ISBN: 978-0470458365.
4.	Advanced Engineering Mathematics, C. Ray Wylie, Louis C. Barrett 6^{th} Edition, 1995, McGraw-Hill Book Co., New York, ISBN: 978-0071135436.

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CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

High-3: Medium-2: Low-1

PROGRAM OUTCOMES (PO)

PO1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **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.

PO6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **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.

PO11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **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.