KRISHNA CHAITANYA INSTITUTE OF TECHNOLOGY & SCIENCES, MARKPAUR

PROGRAMME OUTCOMES

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

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

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

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

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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

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

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

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

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of 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.

12**. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

DEPARTMENT OF CIVIL ENGINEERING

Program Specific Outcomes (PSOs)

PSO-1: The student has the ability to apply the knowledge of Physics, Chemistry, Mathematics, Programming Skills and Soft Skills to solve Civil Engineering problems

PSO-2: The student has the proficiency in streams of Civil Engineering to visualize and execute the systems for sustainable living.

PSO-3: The student has the practical knowledge and experimental skills to tackle Civil Engineering problems using technical and management skills, exhibiting professional ethics to meet the societal needs.

PSO-4: The program enables the faculty to develop academic proficiency by involving in research & innovation, interaction with industry and professional bodies through technical advice and Continuing Education Programs (CEP) to meet the needs of the user system.

DEPARTMENT OF CIVIL ENGINEERING

COURSE OUTCOMES -ACADEMIC YEAR - 2017-2018

S.No	Year /Sem	Course code	Course Name	Course Outcomes (After completion of the course student can able to:)
1	I/I	BS1101	Mathematics-I	**CO1:** utilize mean value theorems to real life problems solve the differential equations related to various engineering fields. **CO2:** familiarize with functions of several variables which is useful in optimization. **CO3:** Apply double integration techniques in evaluating areas bounded by region. **CO4:** Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems.
2	I/I	BS1102	Mathematics-II	**CO1:** Develop the use of matrix algebra techniques that is needed by engineers for practical applications **CO2:** Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel **CO2:** Evaluate approximating the roots of polynomial and transcendental equations by different algorithms **CO3:** Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals **CO4:** Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations.
3	I/I	BS1108	Engineering physics	**CO1:** Identify forces and moments in mechanical systems using scalar and vector techniques **CO2:** extend Newton's second law for inertial and non-inertial frame of reference **CO3:** explain simple harmonic motion and damped harmonic motions **CO4:** explain how sound is propagated in buildings analyze acoustic properties of typically used materials in buildings **CO4:** recognize sound level disruptors and their use in architectural acoustics **CO4:** Use of ultrasonic's in flaw detection using

				NDT technique **CO5:**Understand the elasticity and plasticity concepts **CO6:**Study different types of moduli and their relation **CO7:**Analyze the concepts of shearing force and moment of inertia **CO8:**Study Different types of laser systems **CO9:**Identify different types of sensors and their working principles
4	I/I	ES1104	Engineering Mechanics	**CO1:** The students are to be exposed to the concepts of force and friction , **CO2:** The students are to be exposed to application of free body diagrams. Solution to problemsusing graphical methods and law of triangle of forces. **CO3:** The students are to be exposed to concepts of centre of gravity **CO4:** The students are to be exposed to concepts of moment of inertia and polar moment of inertiaincluding transfer methods and their applications. **CO5:** The students are to be exposed to motion in straight line and in curvilinear paths, its velocityand acceleration computation and methods of representing plane motion. **CO6:** The students are to be exposed to concepts of work, energy and particle motion
5	I/I	ES1103	Engineering drawing	**CO1:** The student will learn how to visualize 2D & 3D objects.
6	I/I	HS1102	English lab	**CO1:** The student will learn Vowels, Consonants, Pronunciation, and Phonetic Transcription. **CO2:**The student will learn Past tense markers, word stress-di-syllabic words, Poly-Syllabic words **CO3:** The student will learn Rhythm & Intonation and Contrastive Stress.

7	I/I	BS1109	Engineering physics lab	**CO1:** Determination of Rigidity modulus of a material- Tensional Pendulum. **CO2:** Determination of Young's modulus by method of single cantilever oscillations. **CO3:** Determination of Acceleration due to Gravity and Radius of Gyration compound pendulum. **CO4:** Determination of spring constant of springs using coupled oscillators. **CO5:** Measurement of magnetic susceptibility by Gouy's method. **CO6:** Determination of Moment of Inertia of a Fly Wheel. **CO7:** Determination of particle size using Laser. **CO8:** Determination of ultrasonic velocity in liquid **CO9:** Determination of dielectric constant by charging and discharging method.
8	I/I	PR1101	Engineering Exploration Project	**CO1:** Use Design Thinking for problem solving methodology for investigating ill-defined problems. **CO2:** Undergo several design challenges and work towards the final design challenge
9	I/II	HS1201	English	**CO1:** understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information. **CO2:** ask and answer general questions on familiar topics and introduce one/other. **CO3:** employ suitable strategies for skimming and scanning to get the more general idea of a text and locate specific information. **CO4:** recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs. **CO5:** form sentences using proper grammatical structures and correct word forms.
10	I/II	BS1203	Mathematics – III	**CO1:** Interpret the physical meaning of different operators such as gradient, curl and divergence **CO2:** Estimate the work done against a field, circulation and flux using vector calculus **CO3:** Apply the Laplace transform for solving differential equations **CO4:** Find or compute the Fourier series of

				periodic signals **CO5:** Know and be able to apply integral expressions for the forwards and inverse Fourier transformto a range of non-periodic waveforms **CO6:** Identify solution methods for partial differential equations that model physical processes
11	I/II	BS1210	Engineering chemistry	**CO1:** Explain the preparation, properties and applications of some plastic materials. **CO2:** Interpret the mechanism of conduction in conducting polymers. **CO3:** Discuss natural and synthetic rubbers and their applications. **CO3:** Explain the theory of construction of battery and fuel cells. **CO4:** Categorize the reasons for corrosion and study some methods of corrosion control. **CO5:** Explain the techniques that detect and measure changes of state of reaction.
12	I/II	ES1201	Programming for problem solving using c	**CO1:**To write algorithms and to draw flowcharts for solving problems **CO2:** To use different operators, data types and write programs that use two way/ multi way section. **CO3:** To apply file I/O operations. **CO4:** To select the best loop construct for a given problem. **CO5:** To design and implement programs to analyze the different pointer applications. **CO6:**To decompose a problem into functions and to develop modular reusable code **CO7:**To convert flowcharts/algorithms to C Programs, compile and debug programs
13	I/II	ES1207	Computer aided engineering drawing	**CO1:** Student get exposed on working of sheet metal with help of development of surfaces. **CO2:** Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids. **CO3:**Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis.
14	I/II	ES1202	Programming for problem solving using c lab	**CO1:** Gains Knowledge on various concepts of a C language. **CO2:** Able to draw flowcharts and write algorithms.

				CO3: Able design and development of C problem solving skills. C04: Able to design and develop modular programming skills. CO5: Able to trace and debug a program.
15	I/II	BS1211	Engineering chemistry lab	CO1: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills
16	I/II	ES1203	Communication skills lab	CO1: The student will learn Telephonic Etiquette, Role Plays, and Poster Presentations. CO2:Oral Presentation skills, Public speaking, Data Interpretation. CO3: Group Discussions: Do's and Don'ts- Types, Modalities. CO4: Preparatory Techniques, Frequently asked questions, Mock Interviews.
17	I/II	ES1219	Workshop practice lab	CO1: To impart hands-on practice on basic engineering trades and skills.
18	I/II	MC1201	Environmental science	CO1: Overall understanding of the natural resources. . CO2: Basic understanding of the ecosystem and its diversity. CO3: Acquaintance on various environmental challenges induced due to unplanned anthropogenicactivities. CO4: An understanding of the environmental impact of developmental activities. CO5 Awareness on the social issues, environmental legislation and global treaties.
19	II/I	BS301	Complex Variables and Statistical Methods	CO1: apply Cauchy-Riemann equations to complex functions in order to determine whether a givencontinuous function is analytic CO2: find the differentiation and integration of complex functions used in engineering problems CO3: make use of the Cauchy residue theorem to

				evaluate certain integrals **CO4:** apply discrete and continuous probability distributions **CO5:** design the components of a classical hypothesis test
20	II/I	PC301	Strength of materials - i	**CO1:** The student will be able to understand the basic materials behavior under the influence of differentexternal loading conditions and the support conditions **CO2:** The student will be able to draw the diagrams indicating the variation of the key performancefeatures like bending moment and shear forces **CO3:** The student will have knowledge of bending concepts and calculation of section modulus and fordetermination of stresses developed in the beams and deflections due to various loading conditions **CO4:** The student will be able to assess stresses across section of the thin and thick cylinders to arrive atoptimum sections to withstand the internal pressure using Lame' sequation. .
21	II/I	PC302	Fluid mechanics	**CO1:** Understand the various properties of fluids and their influence on fluid motion and analyze avariety of problems in fluid statics and dynamics. **CO2:** Calculate the forces that act on submerged planes and curves. **CO3:** Ability to analyze various types of fluid flows. **CO4:** Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces **CO5:** Able Measure the quantities of fluid flowing in pipes.
22	II/I	ES301	Surveying and geometrics	**CO1:** Apply the knowledge to calculate angles, distances and levels **CO2:** Identify data collection methods and prepare field notes **CO3:** Understand the working principles of survey instruments, measurement errors and correctivemeasures **CO4:** Interpret survey data and compute areas

				and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies
23	II/I	PC303	Building materials, construction and planning	**CO1:** The student should be able to identify different building materials and their importance in building construction. **CO2:** The student is expected to differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions. **CO3:** The student should have learnt the importance of building components and finishing's. **CO4:** The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction.
24	II/I	PC304	Transportation Engineering – i	**CO1:** Plan highway network for a given area. **CO2:** Determine Highway alignment and design highway geometrics. **CO3:** Design Intersections and prepare traffic management plans **CO4:** Judge suitability of pavement materials and design flexible and rigid pavements
25	II/I	PC305	STRENGTH OF MATERIALS LAB	**CO 1** : Evaluate Properties of material by impact test **CO 2** : Evaluate Properties of material by hardness test. **CO 3** : Evaluate Properties of material by tensile test..
26	II/I	PC306	SURVEYING FILED WORK - I	**CO1:** Apply the principle of surveying for civil Engineering Applications. **CO2:** Calculation of areas, Drawing plans and contour maps using different measuring equipment at field level **CO3:** Write a technical laboratory report
27	II/I	MC301	Constitution of	**CO1:** Understand the concept of Indian

			india	constitution.
				CO2: Apply the knowledge on directive principle of state policy.
				CO3: Analyze the History, features of Indian constitution.
				CO4: Evaluate Preamble Fundamental Rights and Duties.
				CO5 Understand the structure of Indian government.
				CO6: Differentiate between the state and central government
				CO7: Explain the role of President and Prime Minister.
				CO8: Know the Structure of supreme court and High court
				CO9: Understand the local Administration.
				CO10: Analyze the role of Myer and elected representatives of Municipalities.
				CO11 Contrast and compare the role of Chief Election commissioner and Commission on erate.
				CO12: Evaluate various commissions of via SC/ST/OBC and women.
28	II/II	PC401	Strength of materials - ii	**CO1:** The student will be able to understand the basic concepts of Principal stresses developed ina member when it is subjected to stresses along different axes and design the sections.
				CO2: The student can asses stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions
29	II/II	PC402	Hydraulics and hydraulic machinery	**CO1:** Solve uniform and non uniform open channel flow problems.
				CO2: Apply the principals of dimensional analysis and similitude in hydraulic model testing.
				CO3: Understand the working principles of various hydraulic machineries and pumps.
30	II/II	ES401	Engineering gelogoy	**CO1:** Identify and classify the geological minerals
				CO2: Measure the rock strengths of various rocks
				CO3: Classify and measure the earthquake prone areas to practice the hazard zonation
				CO4: Classify, monitor and measure the Landslides

				and subsidence **CO5:** Prepares, analyses and interpret the Engineering Geologic maps **CO6:** Analyses the ground conditions through geophysical surveys. **CO7:** Test the geological material and ground to check the suitability of civil engineering projectconstruction. **CO8:** Investigate the project site for mega/mini civil engineering projects. Site selection for megaengineering projects like Dams, Tunnels, disposal sites etc.
31	II/II	PC403	Tranportation engineering – ii	**CO1:** Design geometrics in a railway track. **CO2:** Plan track layouts and control movement of trains **CO3:** Design airport geometrics and airfield pavements. Plan, construct and maintain Docks and Harbours
32	II/II	PC404	Environmental engineering- i	**CO1:** Estimation of design population and water demand **CO2:** Identify the water source and select proper intake structure **CO3:** Characterization of water for drinking, industry and construction **CO4:** Design of water treatment plant for a village/city **CO5:** Selection and design of an ideal distribution system
33	II/II	PC405	Engineering Geology Lab	**CO1:** Identify Megascopic minerals & their properties. **CO2:** Identify Megascopic rocks & their properties. **CO3:** Identify the site parameters such as contour, slope & aspect for topography. **CO4:** Know the occurrence of materials using the strike & dip problems.
34	II/II	PC406	Transportation Engineering Lab	**CO1:** Test aggregates and judge the suitability of materials for the road construction **CO2:** Test the given bitumen samples and judge their suitability for the road construction **CO3:** Obtain the optimum bitumen content for Bituminous Concrete **CO4:** Determine the traffic volume, speed and

				parking characteristics. **CO5:** Draw highway cross sections and intersections.
35	II/II	PC407	Fluid Mechanics and Hydraulic Machinery Lab	**CO1:** Select the suitable bearing based on the application of the loads and predict the life of the bearing. **CO2:** Design of IC Engines parts. **CO3:** Design of power transmission elements such as gears, belts, chains, pulleys, ropes, levers and power screws. **CO4:** Design spur & helical gear for different engineering applications.
36	II/II	MC401	Essence of Indian Knowledge Traditional / Professional Ethics and Human Values	**CO1:** Understand philosophy of Indian culture. **CO2:** Distinguish the Indian languages and literature among difference traditions. **CO3:** Learn the philosophy of ancient, medieval and modern India. **CO4:** Acquire the information about the fine arts inIndia. **CO5:** Know the contribution of scientists of different eras. **CO6:** The essence of Yogic Science for Inclusiveness ofsociety.
37	III/I	PC501	STRUCTURAL ANALYSIS	**CO1:** Distinguish between the determinate and indeterminate structures. **CO2:** Identify the behaviour of structures due to the expected loads, including the moving loads, actingon the structure. **CO3:** Estimate the bending moment and shear forces in beams for different fixity conditions. **CO4:** Analyze the continuous beams using various methods -, three moment method, slope deflectionmethod, energy theorems. **CO5:**Draw the influence line diagrams for various types of moving loads on beams/bridges. **CO6:**Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passingover the truss.
38	III/I	PC502	CONCRETE TECHNOLOGY	**CO1:** understand basic concepts of concrete. **CO2:** realize importance of quality of concrete.

				CO3: familiarize basic ingredients of concrete and their role in concrete and their behavior inthe field.
				CO4: test fresh concrete properties and hardened concrete properties.
				CO5: evaluate ingredients of concrete through lab tests. Design concrete mix by IS method.
				CO6:familiarize basic concepts of special concrete and their production and applications. Understand the behavior of concrete in various environments.
39	III/I	PC503	WATER RESOURCES ENGINEERING - I	CO1:be able to quantify major hydrologic components and apply key concepts to several practicalareas of engineering hydrology and related design aspects
				CO2: develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
				CO3:ability to develop design storms and carry out frequency analysis
				CO4:be able to determine storage capacity and life of reservoirs and develop unit hydrograph andsynthetic hydrograph.
				CO5: be able to estimate flood magnitude and carry out flood routing.
				CO6: be able to determine aquifer parameters and yield of wells.
				CO7: Ability to develop the hydrological models.
40	III/I	PC504	ENVIRONMENTAL ENGINEERING - II	CO1:Plan and design the sewerage systems by estimating the flow
				CO2:Design of Plumbing for an apartment, Gated community or Hotels or Individual houses and Select the appropriate appurtenances in the sewerage systems
				CO3: Estimation of BOD and COD and Suggest a suitable disposal method with respect to effluent standards, and Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the

					river
					CO4: Analyze sewage and design suitable treatment system for sewage treatment for a village/City.
					CO5: Design of sewage treatment systems like Septic tank soak pit system and FAB reactor for buildings and understanding tertiary treatment of sewage.
41	III/I	PE501	Construction Technology & Management		**CO1:**appreciate the importance of construction planning **CO2:**understand the functioning of various earth moving equipment **CO3:**Know the methods of production of aggregate products and concreting and usage ofmachinery required for the works. **CO4:**apply the gained knowledge to project management and construction techniques
42	III/I	OE501		WASTEWATER TREATMENT	**CO1:**Know the quality and quantity of water for various industries and Advanced water treatmentmethods **CO2:**Learn the common methods of treatment of wastewaters and Biological treatment methods **CO3:** Study of methods to reduce impacts of disposal of wasters into environment and CETPs. **CO4:**Study of methods of treatment of wastewaters from specific industries like steel plants,refineries, and power plants, that imply biological treatment methods **CO4:**Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants,and distilleries that imply biological treatment methods
43	III/I	PC506	CONCRETE TECHNOLOGY LAB		**CO1:** Determine consistency and fineness of cement. **CO2:** Determine setting times o f cement. **CO3:** Determine specific gravity and soundness of cement.

				CO4: Determine compressive strength of cement. CO5:Determine workability of cement concrete by compaction factor, slump and Vee – Beetests CO6: Determine specific gravity of coarse aggregate and fine aggregate by Sieve analysis. CO7: Determine flakiness and elongation index of aggregates. CO8: Determine bulking of sand. CO9: Understand non-destructive testing procedures on concrete.
44	III/I	PC507	SURVEYING FIELD WORK – II	CO1: Apply the principle of surveying for civil Engineering Applications. CO2: Calculation of areas, Drawing plans and contour maps using different measuring equipment at field level CO3: Write a technical laboratory report
45	III/II	PC601	DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES	CO1:Work on different types of design methods CO2:Carryout analysis and design of flexural members and detailing CO3:Design structures subjected to shear, bond and torsion CO4:Design different type of compression members and footings
46	III/II	PC602	Water Resources Engineering – II	CO1: be able to estimate irrigation water requirements CO2: ability to design irrigation canals and canal network. CO3: plan an irrigation system CO4: design irrigation canal structures CO5: plan and design diversion head works. CO6: analyze stability of gravity and earth dams CO7: design ogee spillways and energy dissipation works
47	III/II	PC603	Geotechnical Engineering - I	CO1: The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships. CO2: The student should be able to know the methods of determination of the various index properties of the soils and classify the soils. CO3: The student should be able to know the importance of the different engineering properties of the soil such as compaction,

				permeability, consolidation and shear strength and determine themin the laboratory.
				CO4: The student should be able to apply the above concepts in day-to-day civil engineering practice.
48	III/II	HS601	Menagirial economics and financial analysis	**CO1:** The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product. **CO2:** The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. **CO3:** The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. **CO4:**The Learner is able to prepare Financial Statements and the usage of various Accounting toolsfor Analysis. **CO5:**The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
49	III/II	PE601	Pre-stressed Concrete	**CO1:**At the end of this course the student will be able to **CO2:**Understand different methods of pre stressing **CO3:**Estimate effective pre stress including short and long term losses **CO4:**Analyze and design pre stressed concrete beams under flexure and shear **CO5:**Understand the relevant IS Code provisions for pre stressed concrete
50	III/II	OE601	PROJECT MANAGEMENT	**CO1:**appreciate the importance of construction planning **C02:**understand the functioning of various earth moving equipment **CO3:**know the methods of production of aggregate products and concreting **CO4:**apply the gained knowledge to project management and construction techniques
51	III/II	PC604	Cad lab	**C01:**Model the geometry of real-world

				structure Represent the physical model of structuralelement/structure **CO2:**Perform analysis **CO3:**Interpret from the Post processing results **CO4:**Design the structural elements and a system as per IS Codes
52	III/II	PC605	EVIRONMENTAL ENGINEERING LAB	**CO1:**Estimate some important characteristics of water, wastewater and soil in the laboratory **CO2:** Draw some conclusion and decide whether the water is suitable for Drinking/Construction /Agriculture/ Industry. **CO3:**Estimate Chloride, EC and Salinity of Soil and suggest their suitability for Construction/Agricultur e **CO4:**Estimation of the strength of the sewage in terms of BOD and COD and Decide whether the water body is polluted or not with reference to the stated parameters in the list of experiments **CO5:** Demonstration of various instruments used in testing of water and soil and study of Drinking water standards, WHO guidelines, Effluent standards and standards for Construction/ Agriculture/ Industry.
53	III/II	PR601	Socially Relevant Project	**CO1:**The student(s) are be able to provide a solutions the technological problems of society **CO2:**The student(s) is able suggest technological changes which suits current needs of society **C03:**The student(s) are able to explain new technologies available for problems of the society
54	III/II	MC601	Employability Skills	**CO1:**Aptitude skill, **CO2:**Soft skills, **CO3:**Skills required for campus placement interview

55	IV/I	PC701	Design & Drawing of Steel Structures	**CO1:** Work with relevant IS codes **CO2:** Carryout analysis and design of flexural members and detailing **CO3:** Design compression members of different types with connection detailing **CO4:** Design Plate Girder and Gantry Girder with connection detailing **CO5:** Produce the drawings pertaining to different components of steel structures
56	IV/I	PC702	Geotechnical Engineering – II	**CO1:** The student must be able to understand the various types of shallow foundations and decideon their location based on soil characteristics. **CO2:** The student must be able to compute the magnitude of foundation settlement and decide onthe size of the foundation accordingly. **CO3:** The student must be able to use the field test data and arrive at the bearing capacity. **CO4:** The student must be able to apply the principles of bearing capacity of piles and design themaccordingly.
57	IV/I	PC703	REMOTE SENSING AND GIS	**CO1:**Be familiar with ground, air and satellite based sensor platforms. **CO2:**interpret the aerial photographs and satellite imageries **CO3:**create and input spatial data for GIS application **CO4:**apply RS and GIS concepts for application in Civil Engineering
58	IV/I	PE701	Industrial Wastewater Treatment	**CO1:**Know the quality and quantity of water for various industries and Advanced water treatment methods **CO2:**Learn the common methods of treatment of wastewaters and Biological treatmentmethods **CO2:**Study of methods to reduce impacts of disposal of wasters into environment andCETPs.

				CO4:Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods CO5:Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugarplants, and distilleries that imply biological treatment methods
59	IV/I	OE701	Traffic safety	**CO1:** To understand fundamentals of Traffic Engg. **CO2:** To investigate and determine the collective factors & remedies of accident involved. **CO3:** To design and plan various road geometrics. **CO4:** To manage the traffic system from road safety point of view.
60	IV/I	PC704	Remote Sensing & GIS Lab	**CO1:** Work comfortably on GIS software **CO2:** Digitize and create thematic map and extract important features **CO3:**Develop digital elevation model **CO4:** Interpretation and Estimation of features from satellite imagery. **CO5:** Analyze and Modeling using GIS software.
61	IV/I	PC705	Geotechnical Engineering Lab	**CO1:** Determine index properties of soil and classify them. **CO2:** Determine permeability of soils. **CO3:** Determine Compaction, Consolidation and shear strength characteristics.
62	IV/I	PR701	Industrial Training/ Internship or Seminar	**CO1:** know the knowledge in work
63	IV/I	PR702	Project Work Phase-I	**CO1:** know the knowledge in work
64	IV/II	PC801	**Estimation Specifications and Contract**	**CO1:** The student should be able to determine the quantities of different components ofbuildings.

				CO2: The student should be in a position to find the cost of various building components. The student should be capable of finalizing the value of structures
65	IV/II	PE801	**Design & Drawing of Irrigation Structures**	**CO1:** At the end of the course the student will be able to To design various irrigation structures
66	IV/II	PE802	Ground Improvement Techniques	**CO1:** By the end of the course, the student should be able to possess the knowledge of variousmethods of ground improvement and their suitability to different field situations. **CO2:** The student should be in a position to design a reinforced earth embankment and check itsstability. **CO3:** The student should know the various functions of Geosynthetics and their applications in CivilEngineering practice. **CO4:** The student should be able to understand the concepts and applications of grouting.
67	IV/II	PR801	PROJECT WORK	**CO1:** Apply all levels of Engineering knowledge in solving the Engineering problems. **CO2:** Work together with team spirit. **CO3:** Use Civil Engineering software at least one. **CO4:** Document the projects

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Program Specific Outcomes (PSOs)

PSO-1: Able to utilize the knowledge of Power Electronics in collaboration with Electrical Machines to provide an engineering solution in the areas related to Electrical Drives.

PSO-2: To develop new cutting edge Technologies in Power Systems associated with efficient conversion and control of electrical power.

PSO-3: Able to use software for design, simulation and analysis of electrical systems.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OUTCOMES - ACADEMIC YEA -2017-2018

S.NO	YEAR/SEM	COURSE CODE	COURSE NAME	Course outcomes (**After completion of the course student can able to** :)
1	II/I	R1621021	ELECTRICAL CIRCUIT ANALYSIS-II	**C01:** Students are able to solve three-phase circuits under balanced and unbalanced Condition. **C02:** Students are able find the transient response of electrical networks for different types of excitations. **C03:** Students are able to find parameters for different types of network. **C04:** Students are able to realize electrical equivalent network for a given network transfer Function. **C05:** Students are able to extract different harmonics components from the response of a Electrical network. **C06:** To understand the application of Fourier series and Fourier transforms for analysis of electrical circuits.
2	II/I	R1621022	ELECTRICAL MACHINES – I	**C01:** Able to assimilate the concepts of electromechanical energy conversion. **C02:** Able to mitigate the ill-effects of armature reaction and improve commutation in dc Machines. **C03:** Able to understand the torque production mechanism and control the speed of dc Motors. **C04:** Able to analyze the performance of single phase transformers. **C05:** Able to predetermine

				regulation, losses and efficiency of single phase transformers. **C06:** Able to parallel transformers, control voltages with tap changing methods and achieve Three-phase to two-phase transformation.
3	II/I	R1621023	BASIC ELECTRONICS AND DEVICES	**C01:** Students are able to understand the basic concepts of semiconductor physics, which are useful to understand the operation of diodes and transistors. **C02:** Students are able to explain the operation and characteristics of PN junction diode and special diodes. **C03:** Ability to understand operation and design aspects of rectifiers and regulators. **C04:** Students are able to understand the characteristics of various transistor configurations. They become familiar with different biasing, stabilization and compensation techniques used in transistor circuits. **C05:** Students are able to understand the operation and characteristics of FET, Thyristors, Power IGBTs and Power MOSFETs. **C06:** Students are able to understand the merits and demerits of positive and negative feedback and the role of feedback in oscillators and amplifiers.

4	II/I	R1621024	ELECTROMAGNETIC FIELDS	**C01:** To Determine electric fields and potentials using gauss's lawor solving Laplace's or Poisson's equations, for various electric charge distributions. **C02:** To Calculate and design capacitance, energy stored in dielectrics. **C03:** To Calculate the magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations. **C04:** To determine the magnetic forces and torque produced by currents in magnetic field. **C05:** To determine self and mutual inductances and the energy stored in the magnetic field. **C06:** To calculate induced e.m.f., understand the concepts of displacement current and Poynting vector.
5	II/I	R1621025	THERMAL AND HYDRO PRIME MOVERS	**C01**: To make the student learn about the constructional features, operational details of various types of internal combustion engines through the details of several engine systems and the basic air standard cycles, that govern the engines**.** **C02:** To train the student in the aspects of steam formation and its utilities through the standard steam data tables and charts. **C03**: To impart the knowledge of gas turbine fundamentals, the governing cycles and the methods to improve the efficiency of gas turbines. **C04:** To teach the student about the fundamental of fluid dynamic equations and its applications fluid jets. **C05:** To make the student learn about

					the constructional features, operational details of various types of hydraulic turbines. **C06:** To train the student in the areas of types of hydro electric power plants, Estimation and calculation of different loads by considering various factors.
6	II/I	R1621026	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS		**C01:** The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. **C02:** One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. **C03:** The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. **C04:** The student is to learn different types of business organizations and business cycles **.** **C05:** The student is to learn introduction to accounting and financing analysis. **C06:** The student is to learn capital and capital budgeting.

7	II/I	R1621027	THERMAL AND HYDRO LAB	**C01:** To impart practical knowledge on the performance evaluation methods of various internal combustion engines. **C02:** To impart practical knowledge on the performance evaluation methods of flow measuring equipment. **C03**: To impart practical knowledge on the performance evaluation methods of hydraulic turbines. **C04:** To impart practical knowledge on the performance evaluation methods of hydraulic pumps. **C05:** To impart practical knowledge on the Calibration of Venturimeter. **C06:** : To impart practical knowledge on the boilers .
8	II/I	R1621028	ELECTRICAL CIRCUITS LAB	**C01:** Able to apply various thermos, determination of self and mutual inductances, two port parameters of a given electric circuits. **C02:** Able to draw locus diagrams. **C03:** Waveforms and phasor diagram for lagging and leading networks. **C04:** To verify and demonstrate various thermos, resonance and two port networks. **C05:** To verify and demonstrate transmission and hybrid parameters. **C06:** To verify and demonstrate parameters of a choke coil.

9	II/II	R1622021	ELECTRICAL MEASUREMENTS	**C01:** Able to choose right type of instrument for measurement of voltage and current for ac and dc. **C02:** Able to choose right type of instrument for measurement of power and energy – able to calibrate energy meter by suitable method. **C03:** Able to calibrate ammeter and potentiometer. **C04:** Able to select suitable bridge for measurement of electrical parameters. **C05:** Able to use the ballistic galvanometer and flux meter for magnetic measuring Instruments. **C06:** Able to measure frequency and phase difference between signals using CRO. Able to use digital instruments in electrical measurements.
10	II/II	R1622022	ELECTRICAL MACHINES – II	**C01:** Able to explain the operation and performance of three phase induction motor. **C02:** Able to analyze the torque-speed relation, performance of induction motor and induction generator. **C03:** Able to explain design procedure for transformers and three phase induction motors. **C04:** Implement the starting of single phase induction motors. **C05:** To perform winding design and predetermine the regulation of synchronous generators. **C06:** Avoid hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.

11	II/II	R1622023	SWITCHING THEORY AND LOGIC DESIGN	**C01:** The student able to learn about number system and codes. **C02:** The student able to learn about minimization techniques. **C03:** The student able to learn about combinational logic circuits design. **C04:** Able to analyze the PLDs **C05:** The student able to learn about SEQUENTIAL CIRCUITS I **C06:** The student able to learn about SEQUENTIAL CIRCUITS II
12	II/II	R1622024	CONTROL SYSTEMS	**C01:** Ability to derive the transfer function of physical systems and determination of Overall transfer function using block diagram algebra and signal flow graphs. **C02:** Capability to determine time response specifications of second order systems and to Determine error constants. **C03:** Acquires the skill to analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method. **C04:** Capable to analyze the stability of LTI systems using frequency response methods. **C05:** Able to design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams. **C06:** Ability to represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.

13	II/II	R1622025	POWER SYSTEMS-I	**C01:** Students are able to identify the different components of thermal power plants. **C02:** Students are able to identify the different components of nuclear Power plants. **C03:** Students are able to distinguish between AC/DC distribution systems and also Estimate voltage drops of distribution systems. **C04:** Students are able to identify the different components of air and gas insulated Substations. **C05:** Students are able to identify single core and multi core cables with different Insulating materials. **C06:** Students are able to analyze the different economic factors of power generation and tariffs.
14	II/II	R1622026	MANAGEMENT SCIENCE	**C01:** The student will acquire the knowledge on management functions. **C02**: Will familiarize with the concepts of functional management. **C03:** Will familiarize with the concepts of strategic management. **C04:** Will familiarize with the concepts of project management. **C05:** The student will acquire the knowledge on global leadership. **C06 :** The student will acquire the knowledge on organizational behavior.

15	II/II	R1622027	ELECTRICAL MACHINES – I LABORATORY	**C01:** To determine and predetermine the performance of DC machines. **C02:** To control the speed of DC motor. **C03:** To achieve three phase to two phase transformation. **C04:** To determine and predetermine the performance of Transformers. **C05:** To plot the magnetizing characteristics of DC shunt generator and understand the Mechanism of self-excitation. **C06:** To predetermine the efficiency and regulation of transformers and assess their Performance.
16	II/II	R1622028	ELECTRONIC DEVICES AND CIRCUITS LAB	**C01:** The students are required to perform the experiment to obtain the V-I characteristics of rectifiers and to determine the relevant parameters from the obtained graphs. **C02:** The students are required to perform the experiment to obtain the V-I characteristics of BJT and to determine the relevant parameters from the obtained graphs. **C03:** The students are required to perform the experiment to obtain the V-I characteristics of PN junction diode and to determine the relevant parameters from the obtained graphs. **C04:** The students are required to perform the experiment to obtain the V-I characteristics of zenor diode and to determine the relevant parameters from the obtained graphs. **C05:** The students are required to perform the experiment to obtain the V-I characteristics of SCR and to determine the relevant parameters from the obtained graphs.

				C06: The students are required to perform the experiment to obtain the V-I characteristics of UJT and to determine the relevant parameters from the obtained graphs.
17	III/I	R1631021	POWER SYSTEMS–II	**C01:** Able to understand parameters of various types of transmission lines during different operating conditions. **C02:** Able to understand the performance of short and medium transmission lines. **C03:** Student will be able to understand travelling waves on transmission lines. **C04:** Will be able to understand various factors related to charged transmission lines. **C05:** Will be able to understand sag/tension of transmission lines and performance of line Insulators. **C06:** To study the performance and modeling of long transmission lines.
18	III/I	R1631022	RENEWABLE ENERGY SOURCES	**C01:** Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's Surface. **C02:** Design solar thermal collectors, solar thermal plants. **C03:** Design solar photo voltaic systems. **C04:** Develop maximum power point techniques in solar PV and wind energy systems. **C05:** Explain wind energy conversion systems, wind generators, power generation. **C06:** Explain basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

19	III/I	R1631023	SIGNALS & SYSTEMS	**C01:** Characterize the signals and systems and principles of vector spaces, Concept of orthgonality. **C02:** Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform. **C03:** Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back. **C04:** Understand the relationships among the various representations of LTI systems. **C05:** Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships. **C06:** Apply z-transform to analyze discrete-time signals and systems.
20	III/I	R1631024	PULSE AND DIGITAL CIRCUITS	**C01:** Design linear and non-linear wave shaping circuits. **C02:** Apply the fundamental concepts of wave shaping for various switching and signal generating circuits. **C03:** Design different multivibrators and time base generators. **C04:** Utilize the non sinusoidal signals in many experimental research areas. **C05:** To understand the concept of Switching Characteristics of diode and transistor. **C06:** To learn the working of logic families & Sampling Gates.

21	III/I	R1631025	POWER ELECTRONICS	**C01:** Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's. **C02:** Design firing circuits for SCR. **C03:** Explain the operation of single phase full–wave converters and analyze harmonics in the input current. **C04:** Explain the operation of three phase full–wave converters. **C05:** Analyze the operation of different types of DC-DC converters. **C06:** Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation. **C07:** Analyze the operation of AC-AC regulators.
22	III/I	R1631026	ELECTRICAL MACHINES – II LABORATORY	**C01:** Able to assess the performance ofsingle phase and three phase induction motors. **C02:** Able to control the speed of three phase induction motor. **C03:** Able to predetermine the regulation of three–phase alternator by various methods. **C04:** Able to find the X_d/ X_qratio of alternator and asses the performance of three–phase synchronous motor. **C05:** To improve the power factor of single phase induction motor . **C06:**The student able to draw the V and Inverted V curves of a three—phase synchronous motor.

23	III/I	R1631027	CONTROL SYSTEMS LAB	**C01:** Able to analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchronous motors. **C02:** Able to design P,PI,PD and PID controllers. **C03:** Able to design lag, lead and lag–lead compensators. **C04:** Able to control the temperature using PID controller. **C05:** Able to determine the transfer function of D.C.motor. **C06:** Able to control the position of D.C servo motor performance.
24	III/I	R1631028	ELECTRICAL MEASUREMENTS LABORATORY	**C01:** To be able to measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance. **C02:** To be able to test transformer oil for its effectiveness. **C03:** To be able to measure the parameters of inductive coil. **C04:** The student able to learn measurement of Power by 3 Voltmeter and 3 Ammeter method. **C05:** The student able to learn calibration of LPF wattmeter by direct loading. **C06:** The student able to learn Testing of P.T. using absolute null method.

25	III/I		INTELLECTUAL PROPERTY RIGHTS AND PATENTS	**C01:** IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents. **C02:** Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements. **C03:** To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines. **C04:** Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments. **C05:** The student know about trademarks. **C06:** The student know about cyberlaw and cyber crime.
26	III/II	R1632021	POWER ELECTRONIC CONTROLLERS & DRIVES	**C01:** Explain the fundamentals of electric drive and different electric braking methods. **C02:** Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters. **C03:** Describe the converter control of dc motors in various quadrants of operation. **C04:** Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters. **C05:** Differentiate the stator side control and rotor side control of three phase induction motor. **C06:** Explain the speed control

				mechanism of synchronous motors.
27	III/II	R1632022	POWER SYSTEM ANALYSIS	**C01:** Able to draw impedance diagram for a power system network and to understand per unit quantities. **C02:** Able to form a Y_{bus} and Z_{bus} for a power system networks. **C03:** Able to understand the load flow solution of a power system using different methods. **C04:** Able to find the fault currents for all types faults to provide data for the design of protective devices. **C05:** Able to find the sequence components of currents for unbalanced power system network. **C06:** Able to analyze the steady state, transient and dynamic stability concepts of a power system.

28	III/II	R1632023	MICROPROCESSORS AND MICROCONTROLLERS	**C01:** To be able to understand the microprocessor capability in general and explore the evaluation of microprocessors. **C02:** To be able to understand the addressing modes of microprocessors. **C03:** To be able to understand the micro controller capability. **C04:** To be able to program mp and mc. **C05:** To be able to interface mp and mc with other electronic devices. **C06:** To be able to develop cyber physical systems.
29	III/II	R1632024	DATA STRUCTURES THROUGH C++	**C01:** Distinguish between procedures and object oriented programming. **C02:** Apply advanced data structure strategies for exploring complex data structures. **C03:** Compare and contrast various data structures and design techniques in the area of Performance. **C04:** Implement data structure algorithms through C++. • Incorporate data structures into the applications such as binary search trees, AVL and B Trees. **C05:** Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs. **C06:** Sorting implementation,how to solve dis order formats.
30	III/II	R163202A	UNIX AND SHELL PROGRAMMIN OPEN ELECTIVE	**C01:** Documentation will demonstrate good organization and readability. **C02:** File processing projects will require data organization, problem solving and research. **C03:** Scripts and programs will

				demonstrate simple effective user interfaces. **C04:** Scripts and programs will demonstrate effective use of structured programming. **C05:** Scripts and programs will be accompanied by printed output demonstrating completion of a test plan. **C06:** Testing will demonstrate both black and glass box testing strategies. **C07:** Project work will involve group participation.
31	III/II	R163202B	OOPs through Java	**C01:** Explain what constitutes an object-oriented approach to programming and identify potentialbenefits of object-oriented programming over other approaches. **C02:** Apply an object-oriented approach to developing applications of varying complexities. **C03:** To strengthen their problem solving ability by applying the characteristics of an object- oriented approach. **C04:** To introduce object oriented concepts in C++ and Java. **C05:** The student able to learn about pointers and functions. **C06:** The student able to write different prigrams.

| 32 | III/II | R163202C | VLSI DESIGN | **C01:** Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.
C02: Know three sets of design rules with which CMOS designs may be fabricated.
C03: Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.
C04: Know three sets of design rules with which nMOS designs may be fabricated.
C05: Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
C06: Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process. |
| 33 | III/II | R163202D | ROBOTICS | **C01:** The Student must be able to design automatic manufacturing cells with robotic control Using.
C02: The principle behind robotic drive system, end effectors, sensor, machine vision robot Kinematics and programming.
C03: To introduce the basic concepts, parts of robots and types of robots.
C04: To make the student familiar with the various drive systems for robot, sensors and Their applications in robots and programming of robots.
C05: To discuss about the various applications of robots, justification and |

				implementation of robot. **C06:** The student to know aboutManipulators.
34	III/II	R163202E	NEURAL NETWORKS AND FUZZY LOGIC	**C01:** Know different models of artificial neuron. **C02:** Use learning methods of ANN. **C03:** Use different paradigms of ANN. **C04:** Classify between classical and fuzzy sets. **C05:** Use different modules of Fuzzy logic controller. **C06:** Apply Neural Networks and fuzzy logic for real-time applications.
35	III/II	R163202F	ENERGY AUDIT, CONSERVATION & MANAGEMENT	**C01:** Explain energy efficiency, conservation and various technologies. **C02:** Design energy efficient lighting systems. **C03:** Calculate power factor of systems and propose suitable compensation techniques. **C04:** Explain energy conservation in HVAC systems. **C05:** Calculate life cycle costing analysis and return on investment on energy efficient technologies. **C06:**The student able to learn about basic Principles of Energy Audit and management.

36	III/II	R1632026	POWER ELECTRONICS LAB	**C01:** Able to study the characteristics of various power electronic devices and analyze gate drive circuits of IGBT. **C02:** Able to analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads. **C03:** Able to understand the operation of single phase AC voltage regulator with resistive and inductive loads. **C04:** Able to understand the working of Buck converter, Boost converter, single–phase square wave inverter and PWM inverter. **C05:** To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR. **C06:** Able to understand the working of single–phase square wave inverter and PWM inverter.
37	III/II	R1632027	MICRO PROCESSORS AND MICRO CONTROLLERS LAB	**C01:** Will be able to write assembly language program using 8086 micro based on arithmetic, logical, and shift operations. **C02:** Will be able to interface 8086 with I/O and other devices. **C03:** Will be able to do parallel and serial communication using 8051 & PIC 18 micro controllers. **C04:** To study programming based on 8086 microprocessor and 8051 microcontroller. **C05:** Will be able to converting packed BCD to unpacked BCD, BCD to ASCII conversion.

				C06: By using string operation and Instruction prefix.
38	III/II	R1632028	DATASTRUCTURES THROUGH C LAB	**C01:** Be able to design and analyze the time and space efficiency of the data structure **C02:** Be capable to identity the appropriate data structure for given problem. **C03:** Have practical knowledge on the application of data structures. **C04:** To develop skills to design and analyze simple linear and non linear data structures. **C05:** The Implementation of Breadth First Search Techniques and Implementation of Depth First Search Techniques. **C06:** To implementation of Dijkstra's Algorithm and implementation of Kruskal's Algorithm.

39	III/II	R1632029	PROFESSIONAL ETHICSAND HUMAN VALUES	**C01:** It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties**.** **C02:** It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively**.** **C03**: To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality. **C04**: Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties. **C05**:To know about Engineers' Responsibilities towards Safety and Risk. **C06:**The student get knowledge on Global Issues.
40	IV/I	R1641021	UTILIZATION OF ELECTRICAL ENERGY	**C01:** Able to identify a suitable motor for electric drives and industrial applications. **C02:** Able to identify most appropriate heating or welding techniques for suitable Applications. **C03:** Able to understand various level of illuminosity produced by different illuminating Sources. **C04:** Able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.

				C05: Able to determine the speed/time characteristics of different types of traction motors. **C06:** Able to estimate energy consumption levels at various modes of operation.
41	IV/I	R1641022	LINEAR IC APPLICATIONS	**C01:** Design circuits using operational amplifiers for various applications. **C02:** Analyze and design amplifiers and active filters using Op-amp. **C03:** Diagnose and trouble-shoot linear electronic circuits. **C04:** Understand the gain-bandwidth concept and frequency response of the amplifier configurations. **C05:** Understand thoroughly the operational amplifiers with linear integrated circuits. **C06:** To learn the internal structure, operation and applications of different analog ICs.
42	IV/I	R1641023	POWER SYSTEM OPERATION AND CONTROL	**C01:** Able to compute optimal scheduling of Generators. **C02:** Able to understand hydrothermal scheduling. **C03:** Understand the unit commitment problem. **C04:** Able to understand importance of the frequency. **C05:** Understand importance of PID controllers in single area and two area systems. **C06:** Will understand reactive power

				control and compensation for transmission line.
43	IV/I	R1641024	SWITCHGEAR AND PROTECTION	**C01:** Able to understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF_6 gastype.
				C02: Ability to understand the working principle and operation of different types of electromagnetic protective relays.
				C03: Students acquire knowledge of faults and protective schemes for high power generator and transformers.
				C04: Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
				C05: Able to understand different types of static relays and their applications.
				C06: Able to understand different types of over voltages and protective schemes required for insulation co–ordination.

44	IV/I	R164102A	ELECTRICAL MACHINE MODELING & ANALYSIS	**C01:** Develop modeling of dc machine. **C02:** Apply mathematical modeling concepts to 3-phase Induction machines. **C03:** Design control strategies based on dynamic modeling of 3-ph Induction machines and 3-phase synchronous machine. **C04:** Analyze BLDC Machine and switched reluctance machine based on mathematical modeling of BLDCM and SRM. **C05:** Establish unified theory of rotating machines. **C06:** To understand the concept of phase transformation.
45	IV/I	R164102B	ADVANCED CONTROL SYSTEMS	**C01:** State space representation of control system and formulation of different state models are reviewed. **C02:** Able to design of control system using the pole placement technique is given after introducing the concept of controllability and observability. **C03:** Able to analyse of nonlinear system using the describing function technique and phase plane analysis. **C04:** Able to analysethe stability analysis using lypnov method. **C05:** Minimization of functionals using calculus of variation studied. **C06:** Able to formulate andsolve the LQR problem and riccatti equation.

46	IV/I	R164102C	PROGAMMABLE LOGIC CONTROLLERS & APPLICATIONS	**C01:** Understand the PLCs and their I/O modules. **C02:** Develop control algorithms to PLC using ladder logic. **C03:** Manage PLC registers for effective utilization in different applications. **C04:** Design PID controller with PLC. **C05:** To have knowledge on PLC. **C06:** acquire the knowledge on programming of PLC.
47	IV/I	R164102D	INSTRUMENTATION	**C01:** ☐Able to represent various types of signals. **C02:** Acquire proper knowledge to use various types of Transducers. **C03:** Able to monitor and measure various parameters such as strain, velocity, temperature, pressure etc. **C04:** Acquire proper knowledge and working principle of various types of digital voltmeters. **C05:** Able to measure various parameter like phase and frequency of a signal with the help of CRO. **C06:** Acquire proper knowledge and able to handle various types of signal analyzers.

48	IV/I	R164102E	OPTIMIZATION TECHNIQUES	**C01:** State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem. **C02:** Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution. **C03:** Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions. **C04:** Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions. **C05:** Able to apply Genetic algorithms for simple electrical problems. **C06:** Able to solve practical problems using PSO.
49	IV/I	R164102F	ELECTRIC POWER QUALITY	**C01:** Differentiate between different types of power quality problems. **C02:** Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system. **C03:** Analyze power quality terms and power quality standards. **C04:** Explain the principle of voltage regulation and power factor improvement methods. **C05:** Demonstrate the relationship

				between distributed generation and power quality. **C06:** Explain the power quality monitoring concepts and the usage of measuring instruments.
50	IV/I	R164102G	SPECIAL ELECTRICAL MACHINES	**C01:** Distinguish between brush dc motor and brush less dc motor**.** **C02:** Explain the performance and control of stepper motors, and their applications. **C03:** Explain theory of operation and control of switched reluctance motor. **C04:** Explain the theory of travelling magnetic field and applications of linear motors. **C05:** Understand the significance of electrical motors for traction drives. **C06:** To describe the operation and characteristics of permanent magnet dc motor.
51	IV/I		ELECTRICAL SIMULATION LAB	**C01:** Able to simulate integrator circuit, differentiator circuit. **C02:** Able to simulate transmission line by incorporating line models. **C03:** Able to perform transient analysis of RLC circuit and single machine connected to infinite bus(SMIB). **C04:** Able to simulate integrator circuit Boost converter, Buck Converter. **C05:** Able to simulate integrator circuit , full convertor and PWM inverter.

				C06: Able to simulate transmission line by load and transformer models.
52	IV/I		POWER SYSTEMS LAB	**C01:** The student is able to determine the parameters of various power system components which are frequently occur inpower system studies and he can execute energy mana- gment systems functions at load dispatch center. **C02:** To impart the practical knowledge of functioning of various power system components and determination of various parameters. **C03:** To impart the practical knowledge of simulation of load flows. **C04:** To impart the practical knowledge of transient stability **C05:** To impart the practical knowledge of LFC **C06:** To impart the practical knowledge of Economic dispatch.

53	IV/II	R1642021	DIGITAL CONTROL SYSTEMS	**C01:** The students learn the advantages of discrete time control systems and the "know how" of various associated accessories. **C02:** The learner understand z–transformations and their role in the mathematical analysis of different systems(like Laplace transforms in analog systems). **C03:** The stability criterion for digital systems and methods adopted for testing the same are explained. **C04:** Finally, the conventional and state space methods of design are also introduced. **C05:** To examine the stability of the system using different tests. **C06:** To study the design of state feedback control by "the pole placement method."
54	IV/II	R1642022	H.V.D.C. TRANSMISSION	**C01:** Learn different types of HVDC levels and basic concepts. **C02:** Know the operation of converters. **C03:** Acquire control concept of reactive power control and AC/DC load flow. **C04:** Understand converter faults, protection and harmonic effects. **C05:** Design low pass and high pass filters. **C06:** To analyze the converter configuration.

55	IV/II	R1642023	ELECTRICAL DISTRIBUTION SYSTEMS	**C01:** Able to understand various factors of distribution system. **C02:** Able to design the substation and feeders. **C03:** Able to determine the voltage drop and power loss. **C04:** Able to understand the protection and its coordination. **C05:** Able to understand the effect of compensation forp.f improvement. **C06:** Able to understand the effect of voltage control.
56	IV/II		HIGH VOLTAGE ENGINEERING	**C01:** To be acquainted with the performance of high voltages with regard to different configurations of electrode systems. **C02:** To be able to understand theory of breakdown and withstand phenomena of all types of dielectric materials. **C03:** To acquaint with the techniques of generation of AC,DC and Impulse voltages. **C04:** To be able to apply knowledge for measurement of high voltage and high current AC,DC and Impulse. **C05:** To be in a position to measure dielectric property of material used for HV equipment. **C06:** To know the techniques of testing various equipment's used in HV engineering.

57	IV/II	R164202B	FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS	**C01:** Understandpower flow control in transmission lines using FACTS controllers. **C02:** Explain operation and control of voltage source converter. **C03:** Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines. **C04:** Explain the method of shunt compensation using static VAR compensators. **C05:** Understand the methods of compensations using series compensators. **C06:** Explain operation of Unified Power Flow Controller (UPFC).
58	IV/II		POWER SYSTEM REFORMS	**C01:** Will understand importance of power system deregulation and restructuring. **C02:** Able to compute Available Transfer Capability**.** **C03:** Will understand transmission congestion management. **C04:** Able to compute electricity pricing in deregulated environment. **C05:** Will be able to understand power system operation in deregulated environment. **C06:** Will understand importance of ancillary services.

HOD-EEE

KRISHNA CHAITANYA INSTITUTE OF TECHNOLOGY & SCIENCES

Devarajugattu (Post), Peddaraveedu (Mandal), Prakasam Dist. - 523 320.
(Approved by A.I.C.T.E., New Delhi, & Affiliated to JNTUK, Kakinada)
NAAC ACCREDITED INSTITUTION

B.Tech (MECHANICAL ENGINEERING)

PROGRAM SPECIFIC OUTCOMES (PSOS)

PSO-1: An ability to apply the engineering and fundamental knowledge in the areas of pneumatics, electro- pneumatics, robotics, automation, additive manufacturing, engineering and management to develop the solutions of mechanical engineering problems.

PSO-2: Graduates shall have an ability to enhance their technical and professional skills to utilize their knowledge in specification of fabrication, testing, operation of basic mechanical system/process and have the ability to apply the learned principles to the design, analysis, development and implementation of advanced mechanical systems.

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OUTCOMES - ACADEMIC YEAR -2017-2018

S.NO	Year /sem	Course code	Course Name	Course Outcomes (After completion of the course student can able to:)
1	I/I	BS1101	Mathematics-I	**CO1:** utilize mean value theorems to real life problems solve the differential equations related to various engineering fields. **CO2:** familiarize with functions of several variables which is useful in optimization. **CO3:** Apply double integration techniques in evaluating areas bounded by region. **CO4:** Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems.
2	I/I	BS1102	Mathematics-II	**CO1:** Develop the use of matrix algebra techniques that is needed by engineers for practical applications **CO2:** Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel **CO2:** Evaluate approximating the roots of polynomial and transcendental equations by different algorithms **CO3:** Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals **CO4:** Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations.
3	I/I	BS1108	Engineering physics	**CO1:** Identify forces and moments in mechanical systems using scalar and vector techniques **CO2:** extend Newton's second law for inertial and non-inertial frame of reference **CO3:** explain simple harmonic motion and damped harmonic motions **CO4:** explain how sound is propagated in buildings analyze acoustic properties of typically used materials in buildings

					CO4:recognize sound level disruptors and their use in architectural acoustics
					CO4:Use of ultrasonic's in flaw detection using NDT technique
					CO5:Understand the elasticity and plasticity concepts
					CO6:Study different types of moduli and their relation
					CO7:Analyze the concepts of shearing force and moment of inertia
					CO8:Study Different types of laser systems
					CO9:Identify different types of sensors and their working principles
					CO10: summarize various types of polarization of dielectrics.
					CO11: classify the magnetic materials based on susceptibility and their temperature dependence.
					CO12: Apply the concept of magnetism to magnetic devices.
					CO13: interpret Lorentz field and Claussius Mosotti relation in dielectrics.
4	I/I	ES1101	Programming for problem solving using c		CO1:To write algorithms and to draw flowcharts for solving problems CO2: To use different operators, data types and write programs that use two way/ multi way section. CO3: To apply file I/O operations. CO4: To select the best loop construct for a given problem. CO5: To design and implement programs to analyze the different pointer applications. CO6:To decompose a problem into functions and to develop modular reusable code CO7:To convert flowcharts/algorithms to C Programs, compile and debug programs
5	I/I	ES1103	Engineering drawing		CO1: The student will learn how to visualize 2D & 3D objects.
6	I/I	HS1102	English lab		CO1: The student will learn Vowels, Consonants, Pronunciation, and Phonetic Transcription. CO2:The student will learn Past tense markers, word stress-di-syllabic words, Poly-Syllabic words CO3: The student will learn Rhythm &

				Intonation and Contrastive Stress.
7	I/I	BS1109	Engineering physics lab	**CO1:** Determination of Rigidity modulus of a material- Tensional Pendulum. **CO2:** Determination of Young's modulus by method of single cantilever oscillations. **CO3:** Determination of Acceleration due to Gravity and Radius of Gyration compound pendulum. **CO4:** Determination of spring constant of springs using coupled oscillators. **CO5:** Measurement of magnetic susceptibility by Gouy's method. **CO6:** Determination of Moment of Inertia of a Fly Wheel. **CO7:** Determination of particle size using Laser. **CO8:** Determination of ultrasonic velocity in liquid **CO9:** Determination of dielectric constant by charging and discharging method.
8	I/I	ES1102	Programming for problem solving using c lab	**CO1:** Gains Knowledge on various concepts of a C language. **CO2:** Able to draw flowcharts and write algorithms. **CO3:** Able design and development of C problem solving skills. **C04:** Able to design and develop modular programming skills. **CO5:** Able to trace and debug a program.
9	I/I	MC1104	Constitution of India	**CO1:** Understand the concept of Indian constitution. **CO2:** Apply the knowledge on directive principle of state policy. **CO3:** Analyze the History, features of Indian constitution. **CO4:** Evaluate Preamble Fundamental Rights and Duties. **CO5** Understand the structure of Indian government. **CO6:** Differentiate between the state and central government **CO7:** Explain the role of President and Prime Minister. **CO8:** Know the Structure of supreme court and

					High court
					CO9: Understand the local Administration.
					CO10: Analyze the role of Myer and elected representatives of Municipalities.
					CO11: Contrast and compare the role of Chief Election commissioner and Commission on erate.
					CO12: Evaluate various commissions of via SC/ST/OBC and women.
10	I/II	HS1201	English		**CO1:** understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information. **CO2:** ask and answer general questions on familiar topics and introduce one/other. **CO3:** employ suitable strategies for skimming and scanning to get the more general idea of a text and locate specific information. **CO4:** recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs. **CO5:** form sentences using proper grammatical structures and correct word forms.
11	I/II	BS1210	Engineering chemistry		**CO1:** Explain the preparation, properties and applications of some plastic materials. **CO2:** Interpret the mechanism of conduction in conducting polymers. **CO3:** Discuss natural and synthetic rubbers and their applications. **CO3:** Explain the theory of construction of battery and fuel cells. **CO4:** Categorize the reasons for corrosion and study some methods of corrosion control. **CO5:** Explain the techniques that detect and measure changes of state of reaction.
12	I/II	BS1204	Engineering mechanics		**CO1:** The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters. **CO2:** He should be able to determine centroid for lines, areas and center of gravity for volumes and their composites. **CO3:** He should be able to determine area and

				mass movement of inertia for composite sections. **CO4:** He should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.
13	I/II	ES1206	Basic electrical & electronics engineering	**CO1:** Analyze various electrical networks. **CO2:** Understand operation of DC generators, 3-point starter and DC machine testing by Swinburne's Test and Brake test. **CO3:** Analyze performance of single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase induction motors. **CO4:** Analyze operation of half wave, full wave bridge rectifiers and OP-AMPs. **CO5:** Understanding operations of CE amplifier and basic concept of feedback amplifier.
14	I/II	ES1207	Computer aided engineering drawing	**CO1:** Student get exposed on working of sheet metal with help of development of surfaces. **CO2:** Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids. **CO3:** Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis.
15	I/II	HS1203	Communication skills lab	**CO1:** The student will learn Telephonic Etiquette, Role Plays, and Poster Presentations. **CO2:** Oral Presentation skills, Public speaking, Data Interpretation. **CO3:** Group Discussions: Do's and Don'ts-Types, Modalities. **CO4:** Preparatory Techniques, Frequently asked questions, Mock Interviews.
16	I/II	BS1211	Engineering chemistry lab	**CO1:** The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus

				acquire some experimental skills
17	I/II	ES1208	Basic electrical & electronics engineering lab	**CO1:** Determine the ripple factor of half wave & full wave rectifiers. **CO2:** Draw the characteristics of PN junction diode & transistor **CO3:** Control the speed of dc shunt motor using Armature voltage and Field flux control methods. **CO4:** Estimate the efficiency and regulation at different load conditions.
18	II/I	BSC	Vector calculus & Fourier transforms	**CO1:** Interpret the physical meaning of different operators such as gradient, curl and divergence **CO2:** Estimate the work done against a field, circulation and flux using vector calculus **CO3:** Apply the Laplace transform for solving differential equations. **CO4:** Find or compute the Fourier series of periodic signals. **CO5:** Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms. **CO6:** Identify solution methods for partial differential equations that model physical processes.
19	II/I	PCC-ME	Mechanics of solids	**CO1:** Model & Analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium. **CO2:** Understand the apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment. **CO3:** Students will learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyze beams and draw correct and complete shear and bending moment diagrams for beams. **CO4:** Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior. **CO5:** Design and analysis of Industrial

				components like pressure vessels.
20	II/I	PCC-ME	Materials science & metallurgy	**CO1:** Understand the crystalline structure of different metals and study the stability of phases in different alloy systems. **CO2:** Study the behavior of ferrous and non ferrous metals and alloys and their application in different domains **CO3:** Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals. **CO4:** Grasp the methods of making of metal powders and applications of powder metallurgy **CO5:** Comprehend the properties and applications of ceramic, composites and other advanced methods.
21	II/I	PCC-ME	Production technology	**CO1:** Able to design the patterns and core boxes for metal casting processes. **CO2:** Able to design the gating system for different metallic components. **CO3:** Know the different types of manufacturing processes. **CO4:** Be able to use forging, extrusion processes. **CO5:** Learn about the different types of welding processes used for special fabrication. **CO6:** Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, and rubber pad forming, advantages and limitations.
22	II/I	PCC-ME	Thermodynamics	**CO1:** Basic concepts of thermodynamics. **CO2:** Laws of thermodynamics. **CO3:** Concept of entropy. **CO4:** Property evaluation of vapors and their depiction in tables and charts. **CO5:** Evaluation of properties of perfect gas mixtures.
23	II/I	PCC-ME	Machine drawing	**CO1:** Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings. **CO2:** Draw different types of bearings showing different components. **CO3:**Assemble components of a machine part and draw the sectional assembly drawing showing the dimensions of all the components of the assembly as per bill of materials.

				CO4: Select and represent fits and geometrical form of different mating parts in assembly drawings. **CO5:** To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements.
24	II/I	PCC-Lab1	Metallurgy& mechanics of solids lab	CO1: Preparation and study of the Microstructure of pure metals like Iron, Cu and Al. CO2: Preparation and study of the Microstructure of Mild steel, Medium carbon steels, High carbon steels. CO3: Study of the Micro Structures of Cast Irons. CO4: Study of the Micro Structures of Non-Ferrous alloys. CO5: Study of the Micro structures of Heat treated steels. CO6: Harden ability of steels by Jominy End Quench Test. CO7: To find out the hardness of various treated and untreated steels. CO8: Analyze the Direct tension test CO9: Analyze the Bending test. CO10: Analyze the Simple supported. CO11: Analyze the Cantilever beam. CO12: Analyze the Torsion test. CO13: Analyze the Hardness test. CO14: Analyze the Brinells hardness test. CO15: Analyze the Rockwell hardness test CO15: Analyze the Test on springs CO16: Analyze the Compression test on cube. CO18: Analyze the Impact test. CO19: Analyze the Punch shear test.
25	II/I	PCC-Lab2	Production technology lab	**CO1:**Student will able to study Study of deep drawing and extrusion operations, Basic powder compaction and sintering, TIG/MIG Welding, Resistance Spot Welding, Brazing and soldering, Plastic Molding Process. **CO2:** Student will able to Sand properties testing on Sieve analysis (dry sand), Clay content test, Moisture content test, Strength test (Compression test & Shear test), and Permeability test. **CO3:** Student will able to Mould preparation on Straight pipe, Bent pipe, dumble, Gear blank.

26	II/II	BSC	Complex variables & statistical methods	**CO1:** apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic. **CO2:** find the differentiation and integration of complex functions used in engineering problems. **CO3::**make use of the Cauchy residue theorem to evaluate certain integrals. **CO4:** apply discrete and continuous probability distributions. **CO5:** design the components of a classical hypothesis test. **CO6:** infer the statistical inferential methods based on small and large sampling tests.
27	II/II	PCC-ME	Kinematics of machinery	**CO1:** Contrive a mechanism for a given plane motion with single degree of freedom. **CO2:** Suggest and analyze a mechanism for a given straight line motion and automobile steering motion. **CO3:** Analyze the motion (velocity and acceleration) of a plane mechanism. **CO4:** Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc. **CO5:** Select a power transmission system for a given application and analyze motion of different transmission systems.
28	II/II	PCC-ME	Applied thermodynamics	**CO1:** Expected to learn the working of steam power cycles and also should be able to analyze and evaluate the performance of individual components. **CO2:** Student is able to learn the principles of combustion stochiometry and flue gas analysis. **CO3:** Students will be able to design the components and calculate the losses and efficiency of the boilers, nozzles and impulse turbines. **CO4:** Students will be able to design the components and calculate the losses and efficiency of reactions turbines and condensers. **CO5:** Student is able to learn various types of compressors, principles of working and their performance evaluation.
29	II/II	PCC-	Fluid mechanics &	**CO1:** The basic concepts of fluid properties.

		ME	hydraulic machines	**CO2:** The mechanics of fluids in static and dynamic conditions. **CO3:** Boundary layer theory, flow separation and dimensional analysis. **CO4:** Hydrodynamic forces of jet on vanes in different positions. **CO5:** Working Principles and performance evaluation of hydraulic pump and turbines.
30	II/II	PCC-ME	Metal cutting & machine tools	**CO1:** Learned the fundamental knowledge and principals in material removal process. **CO2:** Acquire the knowledge on operations in conventional, automatic, Capstan and turret lathes. **CO3:** capable of understanding the working principles and operations of shaping, slotting, planning, drilling and boring machines. **CO4:** able to make gear and keyway in milling machines and understand the indexing mechanisms. **CO5:** Understand the different types of unconventional machining methods and principles of finishing Processes.
31	II/II	PCC-ME	Design of machine members – I	**CO1:** Calculate different stresses in the machine components subjected to various static loads, failures and suitability of a material for an engineering application. **CO2:** Calculate dynamic stresses in the machine components subjected to variable loads. **CO3:**Design riveted, welded, bolted joints, keys, cotters and knuckle joints subjected to static loads and their failure modes **CO4:** Design the machine shafts and suggest suitable coupling for a given application. **CO5:** Calculate stresses in different types of springs subjected to static loads and dynamic loads.
32	II/II	MC2201	Essence of Indian traditional knowledge	**CO1:** Understand the concept of Traditional knowledge and its importance. **CO2:** Know the need and importance of protecting traditional knowledge. **CO3:** Know the various enactments related to the protection of traditional knowledge. **CO4:**Understand the concepts of Intellectual property to protect the traditional knowledge. **CO5:** Understand the traditional knowledge.

				CO6: Contrast and compare characteristics importance kinds of traditional knowledge. **CO7:** Analyze physical and social contexts of traditional knowledge. **CO8:** Evaluate social change on traditional knowledge. **CO9:** Know the need of protecting traditional knowledge. **CO10:** Apply significance of TK protection. **CO11:** Analyze the value of TK in global economy. **CO12:** Evaluate role of government. **CO13:** Understand TK and IPR. **CO14:** Apply systems of TK protection. **CO15:** Analyze legal concepts for the protection of TK. **CO16:**Evaluate strategies to increase the protection of TK.
33	II/II	PCC-Lab6	Machine tools lab	**CO1:** The students are required to understand the parts of various machine tools and operate them. They are required to understand the different shapes of products that can be produced on these machine tools. **CO2:** Able to learn machining economics. **CO3:** Able to operate lathe, drilling, milling, etc.
33	II/II	PCC-Lab5	Fluid mechanics & Hydraulic machinery lab	**CO1:** To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps. **CO2:** Able to perform the Pelton Wheel, Kaplan Turbine, Single Stage Centrifugal Pump, Venturimeter, Multi Stage Centrifugal Pump. **CO3:** Determination of loss of head due to sudden contraction in a pipeline.
34	III/I	PCC-ME	dynamics of machinery	**CO1:** To compute the frictional losses and transmission in clutches, brakes and dynamometers. **CO2:** To determine the effect of gyroscopic couple in motor vehicles, ships and aero planes. **CO3:** To analyze the forces in four bar and slider crank mechanisms and design a flywheel. **CO4:** To determine the rotary unbalanced mass in reciprocating equipment. **CO5:** To determine the unbalanced forces and

				couples in reciprocating and radial engines. **CO6:** To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations.
35	III/I	PCC-ME	Design of machine members-II	**CO1:** Select the suitable bearing based on the application of the loads and predict the life of the bearing. **CO2:** Design of IC Engines parts. **CO3:** Design of power transmission elements such as gears, belts, chains, pulleys, ropes, levers and power screws. **CO4:** Design spur & helical gear for different engineering applications.
36	III/I	PCC-ME	Mechanical measurements & metrology	**CO1:** Describe the construction and working principles of measuring instruments for measurement of displacement and speed and select appropriate instrument for a given application. **CO2:** Describe the construction and working principles of measuring instruments for strain, force,Torque, power, acceleration and Vibration and select appropriate instrument for a given application. **CO3:** Explain shaft basis system and hole basis systems for fits and represent tolerances for a given fit as per the shaft basis system and hole basis system and design limit gauges based on the Tolerances for quality check in mass production. **CO4:** Explain methods for linear, angle and flatness measurements and select a suitable method and its relevant instrument for a given application. **CO5:** To measure the threads, gear tooth profiles, surface roughness and flatness using appropriate instruments and analyze the data.
37	III/I	HSIMS	Managerial economics and financial accountancy	**CO1:** The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product. **CO2:** The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. **CO3:** The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions

				and also to have the knowledge of different Business Units. **CO4:** The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis. **CO5:** The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
38	III/I	PCC-ME	IC Engines & Gas Turbines	**CO1:** Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications. **CO2:** Explain working principle and various components of IC engine **CO3:** Explain combustion phenomenon of CI and SI engines and their impact on engine variables. **CO4:** Analyze the performance of an IC engine based on the performance parameters. **CO5:** Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine. **CO6:** Explain the applications and working principle of rockets and jet propulsion.
39	III/I	PCC-Lab	Thermal engineering lab	**CO1:**I.C. Engines valve and port timing diagrams. **CO2:** Testing of Fuels – Viscosity, flash point/fire point, carbon residue, calorific value. **CO3:**I.C. Engine performance test and Exhaust emission measurements (4 -stroke diesel engine) **CO4:**I.C. Engine performance test and Exhaust emission measurements (2-stroke petrol engine) **CO5:** Evaluation of friction power by conducting Morse test on 4-stroke multi cylinder engine. **CO6:** Determination of Friction Power by retardation or motoring test on IC engine. **CO7:**I.C. Engine heat balance at different loads and show the heat distribution curve. **CO8:** Economical speed test of an IC engine. **CO9:** Performance test on variable compression ratio engines. **CO10:** Performance test on reciprocating air compressor unit. **CO11:**Dis-assembly / assembly of different parts of two wheelers. 3 wheelers & 4 wheelers.

				Tractor &Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines. **CO12:** Study of boilers, mountings and accessories.
40	III/I	PCC-Lab	Theory of machines lab	**CO1:** To determine whirling speed of shaft theoretically and experimentally. **CO2:** To determine the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation. **CO3:**To analyze the motion of a motorized gyroscope when the couple is applied along its spin axis **CO4:** To determine the frequency of undamped free vibration of an equivalent spring mass system. **CO5:**To determine the frequency of damped force vibration of a spring mass system **CO6:** To study the static and dynamic balancing using rigid blocks. **CO7:**To find the moment of inertia of a flywheel **CO8:** To plot follower displacement vs cam rotation for various Cam Follower systems. **CO9:** To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism/Four bar mechanism. **CO10:** To find coefficient of friction between belt and pulley. **CO11:** To study simple and compound screw jack and determine the mechanical advantage, velocity ratio and efficiency. **CO12:** To study various types of gears- Spur, Helical, Worm and Bevel Gears.
41	III/I	PCC-Lab	Mechanical measurements & metrology lab	**CO1:**Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc). **CO2:** Students will be able to select proper measuring instrument and know requirement of calibration, errors in measurement etc. They can perform accurate measurements.
42	III/II	PCC-	Operations	**CO1:** Formulate the resource management

		ME	research	problems and identify appropriate methods to solve them. **CO2:** Apply LPP, transportation and assignment models to optimize the industrial resources. **CO3:** Solve decision theory problems through the application of game theory. **CO4:** Apply the replacement and queuing models to increase the efficiency of the system. **CO5:** Model the project management problems through CPM and PERT.
43	III/II	PCC-ME	Heat transfer	**CO1:** Compute rate of heat transfer for 1D, steady state composite systems without heat generation. **CO2:** Analyze the system with heat generation, variable thermal conductivity, fins and 1D transient conduction heat transfer problems. **CO3:** Develop the empirical equations for forced convection problems by using Buckingham's pi theorem. **CO4:** Compute the rate of heat transfer for natural convection systems and design and analysis of heat exchangers. **CO5:** Solve the heat transfer systems with phase change and radiation.
44	III/II	PCC-ME	CAD/CAM	**CO1:** Describe the mathematical basis in the technique of representation of geometric entities including points, lines, and parametric curves, surfaces and solid, and the technique of transformation of geometric entities using transformation matrix. **CO2:**Describe the use of GT and CAPP for the product development. **CO3:** Identify the various elements and their activities in the Computer Integrated Manufacturing Systems.
45	III/II	PEC-ME1	Composite Materials	CO1: Explain various composite materials with their constituents, advantages, limitations and applications. CO2: Enumerate different reinforcements with their application. CO3: Describe various manufacturing methods of polymer and metal matrix composites materials. CO4: Describe various manufacturing methods of metal matrix composites materials and their

				applications.
				CO5: synthesis and characterization procedure nano composites.
46	III/II	PEC-ME1	Refrigeration and air conditioning	**CO1:** Differentiate between different types of refrigeration systems with respect to engineering applications. **CO2:** Thermodynamically analyze refrigeration and air conditioning systems and evaluate performance parameters. **CO3:** Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications. **CO4:** Perform cooling load calculations and select the appropriate process and equipment for the required comfort and industrial air-conditioning.
47	III/II	PEC-ME1	Unconventional Machining Processes	CO1: Understand the characteristics and importance of different types of unconventional machining processes. CO2: Identify the appropriate unconventional machining process for the implementation in a typical industrial scenario based on the applications. CO3: Understand the significance of tools and resources used for machining the components in unconventional machining. CO4: Machine the components through ECM / EDM and other machining processes. CO5: Perform experiments in the advanced unconventional machining processes such as laser beam machining and electron beam machining.
48	III/II	PEC-ME1	Advanced mechanics of solids	**CO1:** Able to identify the failure modes of different structural members and apply various energy methods for statically determinant and in determinant structures. **CO2:** Gets acquainted with solving problems of curved beams and beams with un-symmetrical loading. **CO3:** Able to apply the Soap-film analogy concept for torsional problems with non-circular cross section.
49	III/II	PEC-ME2	Material characterization	**CO1:** choose and appropriate electron microscopy techniques to investigate microstructure of materials at high resolution **CO2:** Determine crystal structure of specimen

				and estimate its crystallite size **CO3:** Use appropriate spectroscopic technique to measure vibration / electronic transitions to estimate parameters like energy band gap, elemental concentration, etc. **CO4:** Apply thermal analysis techniques to determine thermal stability of and thermodynamic transitions of the specimen.
50	III/II	PEC-ME2	Tribology	**CO1:** Students will demonstrate basic understanding of friction, lubrication and wear rocesses. **CO2:** Students will become familiar with mathematical tools used to analyze tribological processes. **CO3:** To enhance students' awareness of tribological issues in the design of machine components, such as rolling element bearings, journal bearings, thrust bearings, seals and braking systems. **CO4:** Students will become familiar with common anti-friction and anti-wear components and the lubricants used therein. **CO5:** Students will be able to describe the detailed operation of selected anti-friction or anti-wear components. **CO6:** Students will be exposed to design a tribological system for optimal performance. **CO7:**Students will be able to develop technical project reports and technical presentations
51	III/II	PEC-ME2	Automobile engineering	**CO1:** Describe the basic lay-out of an automobile and its components and enlist the emission standards of an automobile. **CO2:** Describe different engine cooling, lubrication, ignition, electrical and air conditioning systems and suggest suitable systems for a given application. **CO3:** Explain the principles of transmission, suspension, steering and braking systems. **CO4:** Describe various fuel supply systems in SI and CI engines.
52	III/II	PEC-ME2	Mechatronics	**CO1:** Shall be able to use the various mechatronics systems devices and components in the design of electro mechanical systems. **CO2:** Explain mechatronics design process and outline appropriate sensors and actuators for engineering applications

				CO3: Develop a simulation model for simple physical systems
				CO4: Write simple microcontroller programs.
				CO5: Explain linearization of nonlinear systems and elements of data acquisition.
				CO6: Explain various applications of design of mechatronic systems.
53	III/II	PCC-Lab	Simulation of mechanical systems lab	CO1: Students will be able to learn Mass-Spring-Damper with controller. CO2: Students will be able to learn Double Mass-Spring- Damper. CO3: Students will be able to learn Simple Mechanical System. CO4: Students will be able to learn Mechanical System with Translational Friction. CO5: Students will be able to learn Mechanical System with Translational Hard stop. CO6: Students will be able to learn Mechanical Rotational System with stick-slip motion. CO7: Students will be able to learn Linkage Mechanism. CO8: Students will be able to learn Steering Mechanism.
54	III/II	PCC-Lab	Heat transfer lab	CO1: The student should be able to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries and should be able to compare the performance of extended surfaces and heat exchangers. CO2: Determination of emissivity of a given surface. CO3: Determination of Stefan Boltzmann constant. CO4: Determination of heat transfer rate in drop and film wise condensation. CO5: Determination of critical heat flux. CO6: Determination of Thermal conductivity of liquids and gases. CO7: Investigation of Lambert's cosine law.
55	III/II	PCC-Lab	CAD/CAM lab	CO1: The student will be able to appreciate the utility of the modeling tools in creating 2D and 3D drawings. CO2:Use of these tools for any engineering and real time applications. CO3:Acquire knowledge on utilizing these tools for a better project in their curriculum as

				well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their Employment.
56	IV/I	HSIMS	Industrial management	**CO1:**Design and conduct experiments, analyse, interpret data and synthesize valid conclusions **CO2:** Design a system, component, or process, and synthesize solutions to achieve desired needs. **CO3:** Use the techniques, skills, and modern engineering tools necessary for engineering practice. **CO4:** With appropriate considerations for public health and safety, cultural, societal, and environmental constraints. **CO5:**Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management.
57	IV/I	PCC-ME	Finite element methods	**CO1:**Understand the concepts behind variational methods and weighted residual methods in FEM **CO2:** Identify the application and characteristics of FEA elements such as bars, beams, plane and isoperimetric elements, and 3-D element. **CO3:** Develop element characteristic equation procedure and generate global equations. **CO4:** Able to apply Suitable boundary conditions to global equations, and reduce it to a solvable form. **CO5:** Able to apply the FE procedure to field problems like heat transfer.
58	IV/I	PEC-3	Mechanical vibrations	**CO1:**To Analyze the various 1-D periodic and periodic responses of an vibrating system with and without damping **CO2:**Able to derive equations of motion and solutions for two and multi degree freedom systems by the application of analytical methods **CO3:** Able to understand the numerical methods for quick estimation of 1st natural frequency of multi degree freedom systems. **CO4:** Apply the knowledge of the various physical vibration measuring instruments and their applications in real life vibration data acquisition.
59	IV/I	PEC-3	Renewable energy	**CO1:** To understand the principles and working

			sources	of solar, wind, biomass, geo thermal, ocean energies. **CO2:** To understand the principles and working and green energy systems and appreciate their significance in view of their importance in the current scenario and their potential future applications.
60	IV/I	PEC-3	Production planning & control	**CO1:** Apply the systems concept for the design of production and service systems. **CO2:** Make forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques. **CO3:** Apply the principles and techniques for planning and control of the production and service systems to optimize/make best use of resources. **CO4:** Understand the importance and function of inventory and to be able to apply selected techniques for its control and management under dependent and independent demand circumstances.
61	IV/I	PEC-3	Machine tool design	**CO1:** Understand the basic working principles of different machine tools with kinematic mechanisms. **CO2:** Distinguish the functional and operational requirements of different machine tools. **CO3:** Design speed and feed gear boxes for a particular configuration. **CO4:** Design machine tool structures for strength and rigidity. **CO5:** Understand various controls used in machine tools.
62	IV/I	PEC-4	Industrial automation and robotics	**CO1:** Identify various robot configuration and components. **CO2:** Select appropriate actuators and sensors for a robot based on specific application. **CO3:** Carry out kinematic and dynamic analysis for simple serial kinematic chains. **CO4:** Perform trajectory planning for a manipulator by avoiding obstacles. **CO5:** Use knowledge of robotics for automation in manufacturing applications.
63	IV/I	PEC-4	Micro and nano manufacturing	**CO1:** get awareness of different techniques used in micro and nano manufacturing. **CO2:** get in-depth idea of thin films and nano composites

				CO3:get awareness on Characterization Techniques CO4: find different materials for Micro and Nano mechanical systems and their applications in mechanical engineering. CO5: Explain different MEMS & Nano fabrication Techniques.
64	IV/I	PEC-4	Power plant engineering	CO1: Understand various conventional methods of power generation. CO2: To understand the principle of operation and performance of respective prime movers along with their economics and their impact on environment. CO3: To understand the power plant instrumentation and control.
65	IV/I	PEC-4	Optimization techniques	CO1: Students at the end of the course learn advanced optimization techniques to solve real-life problems. CO2: Students can able to formulate and solve various practical optimization problems in manufacturing and service organizations.
66	IV/I	OEC-1	Micro electro mechanical systems	CO1: After completion of this course, the student shall be able to understand various micro electro mechanical system devices and components.
67	IV/I	OEC-1	Operations management	CO1: Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness. CO2: Analyze plant and process layout. CO3: Develop aggregate capacity plans and MPS in operation environments.
68	IV/I	OEC-1	Nano technology	CO1: Learn the basic concepts of nanotechnology. CO2: Understand the synthesis of nanomaterials and their application. CO3: Apply their learned knowledge to develop Nanomaterial's.
69	IV/I	PCC-ME Lab	Finite element simulation lab	CO1: Determination of deflection and stresses in 2D and 3D trusses and beams. CO2:Determination of deflections component and principal and Von-misses stresses in plane CO3: stress, plane strain and Ax symmetric components. CO4:Determination of stresses in 3D and shell structures (at least one example in each case)

				CO5: Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam. **CO6:** Casting processes - Study of Solidification, temperatures, Residual stresses, metallurgical phases etc. **CO7:** Forging processes - Study of cold working and hot working processes for extrusion, drawing, rolling, etc. **CO8:** Forming Processes – Study of blanking, bending, deep drawing, etc. **CO9:** Steady state heat transfer Analysis of plane and Ax symmetric components. **CO10:** Convective heat transfer – Internal flow (study both velocity and thermal boundary layers) **CO11:** Convective heat transfer – External flow (study both velocity and thermal boundary layers). **CO12:** Radiation heat transfer– Emissivity.
70	IV/II	PEC-5	Additive manufacturing	**CO1:**The student shall be able to identify the use of Rapid Prototyping Techniques in the manufacturing of complex components that are otherwise very difficult to manufacture.
71	IV/II	PEC-5	Gas dynamics and jet propulsion	**CO1:** Illustrate fluid flow systems. **CO2:** Analyze the isotropic flow of an ideal gas and its parameter. **CO3:** Study simple frictional flow with heat transfer problems. **CO4:** Analyze the impact of heat transfer on flow parameters. **CO5:** Performance evaluation of different propulsion systems.
72	IV/II	PEC-5	Product design and development	**CO1:** Apply the principles of generic development process; conduct customer need analysis; and set product specification for new product design and development. **CO2:** Generate, select, screen, and test concepts for new product design and development. **CO3:** Apply the principles of product architecture and industrial design to design and develop new products. **CO4:** Apply the principles of DFMA and Prototyping to design and develop new product.

				CO5: Apply the concepts of economics principles sustainable product development and life cycle assessment.
73	IV/II	PEC-5	Reliability engineering	**CO1:** Explain the basic concepts of Reliability Engineering and its Understand measures. **CO2:** Predict the Reliability at system level using various models. **CO3:** Design the test plan to meet the reliability Requirements. **CO 4:** Predict and estimate the reliability from failure data. **CO5:** Develop and implement a successful Reliability programme.
74	IV/II	PEC-6	Condition monitoring	**CO1:** understand the types of maintenance used and its significance, role of condition based maintenance in industries, familiarize with different condition monitoring techniques and its advantages in industries. **CO2:** implement the basic signal processing techniques. **CO3:** understand the role of vibration monitoring, its methodology and its use in condition monitoring of rotating and reciprocating machines. **CO4:** understand the significance of mechanical fault diagnosis and non-destructive testing techniques in monitoring and maintenance. **CO5:** study condition monitoring of rolling element bearing, gears and tool condition monitoring techniques in machining.
75	IV/II	PEC-6	Computational fluid dynamics	**CO1:** After undergoing the course the student shall be able to apply various numerical tools like finite volume, finite difference etc for solving the different fluid flow heat transfer problems.
76	IV/II	PEC-6	Non - destructive evaluation	**CO1:** Comprehensive, theory based understanding of the techniques and methods of non destructive testing. **CO2:** Apply methods knowledge of non destructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc.
77	IV/II	PEC-6	Control systems	**CO1:** Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal

				flow graphs. **CO2:** Determine time response specifications of second order systems and to determine error constants. **CO3:** Analyze absolute and relative stability of LTI systems using Roth's stability criterion and the root locus method. **CO4:** Analyze the stability of LTI systems using frequency response methods. **CO5:** Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.
78	IV/II	PEC-6	Entrepreneurship development	**CO1:** Gain the competency of preparing business plans **CO2:** Get the awareness on industrial policies **CO3:** Study the impact of launching small business **CO4:** Understand the recourse planning and market selection for start ups.
79	IV/II	OEC-2	Hydrogen & fuel cells	**CO1:** Students gets exposure to different fuel cells in particularly Hydrogen fuel cells.
80	IV/II	OEC-2	Robotics	CO1: Understand the basic components of robots. CO2: Differentiate types of robots and robot grippers. CO3: Model forward and inverse kinematics of robot manipulators. CO4: Analyze forces in links and joints of a robot. CO5: Programme a robot to perform tasks in industrial applications. CO6: Design intelligent robots using sensors.
81	IV/II	OEC-2	Energy management	**CO1:** Explain the fundamentals of energy management and its influence on environment **CO2:** Describe methods of energy production for improved utilization. **CO3:** Apply the principles of thermal engineering and energy management to improve the performance Of thermal systems. Analyze the methods of energy conservation and energy efficiency for buildings, air-conditioning, heat recovery and thermal energy storage systems. **CO4:** Assess energy projects on the basis of economic and financial criteria.

82	IV/II	OEC-2	3D printing technologies	**CO1:** Describe various CAD issues for 3D printing and rapid prototyping and related operations for STL model manipulation. **CO2:** Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting. **CO3:** Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modeling and subdivision surface fitting. **CO4:** Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems. **CO5:** Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts.
83	IV/II	OEC-3	Total quality management	**CO1:** To realize the importance of significance of quality. **CO2:** Manage quality improvement teams. **CO3:** Identify requirements of quality improvement programs.

HOD-MECHANICAL

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OUTCOMES -ACADEMIC YEAR - 2017-2018

S.NO	Year /sem	Course code	Course Name	Course Outcomes (After completion of the course student can able to:)
1	I/I	HS1101	English	CO1: Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information CO2:Ask and answer general questions on familiar topics and introduce oneself/others CO3:Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information CO4:Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs CO5:Form sentences using proper grammatical structures and correct word forms
2	I/I	BS1101	Mathematics - I	CO1:Utilize mean value theorems to real life problems (L3) CO2:Solve the differential equations related to various engineering fields(L3) CO3:Familiarize with functions of several variables which is useful in optimization(L3) CO4:Apply double integration techniques in evaluating areas bounded by region(L3) CO5: Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3-dimensional coordinate systems (L5)

3	I/I	BS1106	Applied Chemistry	CO1: • Outline the properties of polymers and various additives added and different methods of forming plastic materials. • Explain the preparation, properties and applications of some plastic materials. • Interpret the mechanism of conduction in conducting polymers. Discuss natural and synthetic rubbers and their applications CO2: • Explain the theory of construction of battery and fuel cells. • Categorize the reasons for corrosion and study some methods of corrosion control. CO3: • Understand the importance of materials like nano materials and fullerenes and their uses. • Understand liquid crystals and superconductors. Understand the preparation of semiconductors. CO4: Obtain the knowledge of computational chemistry Understand importance molecular machines CO5: • understand the principles of different analytical instruments • explain the different applications of analytical instruments. • design sources of energy by different natural sources.
4	I/I	ES1101	Programming for Problem Solving Using C	CO1:To write algorithms and to draw flowcharts for solving problems CO2: To convert flowcharts/algorithms to C Programs, compile and debug programs CO3: To use different operators, data types and write programs that use two-way/ multi-way selection

				CO4: To select the best loop construct for a given problem To design and implement programs to analyze the different pointer applications CO5: To decompose a problem into functions and to develop modular reusable code To apply File I/O operations
5	I/I	ES1103	Engineering Drawing	The student will learn how to visualize 2D & 3D objects
6	I/I	HS1102	English Lab	CO1: The student will learn Vowels, Consonants, Pronunciation, and Phonetic Transcription. CO2: The student will learn Past tense markers, word stress-di-syllabic words, Poly-Syllabic words CO3: The student will learn Rhythm & Intonation and Contrastive Stress.
7	I/I	BS1107	Applied Chemistry Lab	CO1: The students entering into the professional course have practically very little exposure to lab classes. CO2: The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. CO3: Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.
8	I/I	ES1102	Programming for Problem Solving Using C Lab	CO1: Gains Knowledge on various concepts of a C language. CO2: Able to draw flowcharts and write algorithms. CO3: Able design and development of C problem solving skills. CO4: Able to design and develop modular programming skills.

				CO5: Able to trace and debug a program
9	I/I	MC1101	Environmental Science	CO1: understand multi disciplinary nature of Environmental studies and eco system Co2: understand about Natural resources and associated problems. CO3: understand about Biodiversity and its conservation CO4: understand about Environmental Pollution &Solid Waste Management CO5: Understand about Social Issues and the Environment CO6:understand about Environmental Management
10	I/II	BS1202	Mathematics – II	CO1:develop the use of matrix algebra techniques that is needed by engineers for practical applications(L6) CO2:solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel(L3) CO3:evaluate approximating the roots of polynomial and transcendental equations by different algorithms(L5) CO4:apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals(L3) CO5:apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations(L3)
11	I/II	BS1203	Mathematics – III	CO1:interpret the physical meaning of different operators such as gradient, curl anddivergence (L5) CO2: estimate the work done against a field, circulation and flux using vector calculus(L5) CO3:apply the Laplace transform for solving differential equations(L3) CO4:find or compute the Fourier series of periodic signals(L3)

				CO5: know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms(L3)
				CO6: identify solution methods for partial differential equations that model physical processes (L3)
12	I/II	BS1204	Applied Physics	CO1: • Explain the need of coherent sources and the conditions for sustained interference. • Analyze the differences between interference and diffraction with applications. • Illustrate the resolving power of various optical instruments CO2: • Explain the fundamental concepts of quantum mechanics. • Analyze the physical significance of wavefunction. • Apply Schrödinger's wave equation for energy values of a free particle. CO3: • Explain the various electron theories. • Calculate the Fermi energy. • Analyze the physical significance of wave function. • Interpret the effects of temperature on Fermi Dirac distribution function. • Summaries various types of solids based on band theory. CO4: • Classify the energy bands of semiconductors. • Outline the properties of n-type and p-type semiconductors. • Identify the type of semiconductor using Hall effect.

				CO5:
				- Explain the concept of polarization in dielectric materials. - Summarize various types of polarization of dielectrics. - Interpret Lorentz field and Claussius- Mosotti relation in dielectrics. - Classify the magnetic materials based on susceptibility and their temperature dependence. - Explain the applications of dielectric and magnetic materials. - Apply the concept of magnetism to magnetic devices.
13	I/II	ES1209	Network Analysis	CO1:gain the knowledge on basic network elements CO2:will analyze the RLC circuits behavior in detailed. CO3: analyze the performance of periodic waveforms. CO4: gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h &g). CO5:analyze the filter design concepts in real world applications
14	I/II	ES1211	Basic Electrical Engineering	CO1: Able to explain the operation of DC generator and analyze the characteristics of DC generator. CO2: Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DC motors. CO3: Ability to analyze the performance and speed – torque characteristics of a 3-phase induction motor and understand starting methods of 3-phase induction motor.

				CO4: Able to explain the operation of Synchronous Machines CO5": Capability to understand the operation of various special machines
15	I/II	ES1215	Electronic workshop	Students are able to identify the basic components, identify active elements like BJT, MOSFET, working of multimeters, testing of components, soldering practice, PCB layout design, study of CRO
16	I/II	ES1208	Basic Electrical Engineering Lab	CO1: Determine and predetermine the performance of DC machines and transformers CO2: Control the DC shunt machines CO3: Compute the performance of 1-phasetransformer. CO4: Perform tests on 3-phase induction motor and alternator to determine their performance characteristics.
20	II/I	PC	Electronic Devices and Circuits	CO1: Apply the basic concepts of semiconductor physics. CO2: Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation. CO3: Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons. CO4: Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations CO5: Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions CO6: Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations

21	II/I	PC	Switching Theory and Logic Design	CO1: Classify different number systems and apply to generate various codes. CO2: Use the concept of Boolean algebra in minimization of switching functions CO3: Design different types of combinational logic circuits. CO4: Apply knowledge of flip-flops in designing of Registers and counters CO5: The operation and design methodology for synchronous sequential circuits and algorithmic state machines. CO6: Produce innovative designs by modifying the traditional design techniques
22	II/I	PC	Signals and Systems	CO1: Differentiate the various classifications of signals and systems CO2: Analyze the frequency domain representation of signals using Fourier concepts CO3: Classify the systems based on their properties and determine the response of LTI Systems. CO4: Know the sampling process and various types of sampling techniques. CO5: Apply Laplace and z-transforms to analyze signals and Systems (continuous &discrete).
23	II/I	PC	Random Variables and Stochastic Processes	CO1:Mathematically model the random phenomena and solve simple probabilistic problems CO2:Identify different types of random variables and compute statistical averages of these random variables CO3:Characterize the random processes in the time and frequency domains CO4:Analyze the LTI systems with random inputs

24	II/I	ES	Object Oriented Programming through Java	CO1: Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard CO2:Illustrate the basic principles of the object-oriented programming CO3:Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming
25	II/I	HS	Managerial Economics & Financial Analysis	CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for product. CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. CO4:The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis. CO5:The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision-making
28	II/I	MC	Constitution of India	CO1: • Understand the concept of Indian constitution • Apply the knowledge on directive principle of state policy • Analyze the History, features of Indian constitution • Evaluate Preamble Fundamental Rights and Duties

				CO2: • Understand the structure of Indian government • Differentiate between the state and central government • Explain the role of President and Prime Minister • Know the Structure of supreme court and High court CO3: • Understand the structure of state government • Analyze the role Governor and Chief Minister • Explain the role of state Secretariat • Differentiate between structure and functions of state secretariat CO4: • Understand the local Administration • Compare and contrast district administration role and importance • Analyze the role of Myer and elected representatives of Municipalities Evaluate Zilla panchayat block level organisation CO5: • Know the role of Election Commission apply knowledge • Contrast and compare the role of Chief Election commissioner and Commissiononerate • Analyze role of state election commission • Evaluate various commissions of viz SC/ST/OBC and women
29	II/II	PC	Electronic Circuit Analysis	CO1: Design and analysis ofsmall signal high frequency transistor amplifier using BJT and FET. CO2: Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.

				CO3: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept. CO4:Know the classification of the power and tuned amplifiers and their analysiswith performance comparison.
30	II/II	PC	Linear Control Systems	CO1: This course introduces the concepts of feedback and its advantages to various control systems CO2: The performance metrics to design the control system in time-domain and frequency domain are introduced. CO3: Control systems for various applications can be designed using time-domain and frequency domain analysis. CO4: In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced
31	II/II	PC	Electromagnetic Waves and Transmission Lines	CO1: Determine E and H using various laws and applications of electric & magnetic fields CO2: Apply the Maxwell equations to analyze the time varying behavior of EM waves CO3: Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media CO4: Calculate Brewster angle, critical angle and total internal reflection CO5: Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart
32	II/II	PC	Analog Communications	CO1: Differentiate various Analog modulation and demodulation schemes and their spectral characteristics

				CO2: Analyze noise characteristics of various analog modulation methods CO3: Analyze various functional blocks of radio transmitters and receivers CO4: Design simple analog systems for various modulation techniques
33	II/II	ES	Computer Architecture and Organization	CO1:Students can understand the architecture of modern computer CO2: They can analyze the Performance of a computer using performance equation CO3: Understanding of different instruction types. CO4: Students can calculate the effective address of an operand by addressing modes CO5: They can understand how computer stores positive and negative numbers. CO6: Understand the concepts of I/O Organization and Memory systems.
34	II/II	HS	Management and Organizational Behavior	CO1: After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure. CO2: Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments. CO3: The learner is able to think in strategically through contemporary management practices. CO4: The learner can develop positive attitude through personality development and can equip with motivational theories. CO5: The student can attain the group performance and grievance handling in managing the organizational culture.
37	III/I	PC	Linear Integrated Circuits and Applications	CO1: Design circuits using operational amplifiers for various applications. CO2: Analyze and design amplifiers and active filters using Op-amp.

				CO3: Diagnose and trouble-shoot linear electronic circuits.
				CO4: Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
				CO5: Understand thoroughly the operational amplifiers with linear integrated circuits
38	III/I	PC	Microprocessor and Microcontrollers	CO1: Understand the architecture of microprocessor/ microcontroller and their operation CO2: Demonstrate programming skills in assembly language for processors and Controllers. CO3: Analyze various interfacing techniques and apply them for the design of processor/Controller based systems
39	III/I	PC	Digital Communications	CO1: Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system. CO2: Analyze various source coding techniques. CO3: Compute and analyze Block codes, cyclic codes and convolution codes. CO4: Design a coded communication system
40	III/I	PC	Electronic Measurements & Instrumentation	CO1: Select the instrument to be used based on the requirements. CO2: Understand and analyze different signal generators and analyzers. CO3: Understand the design of oscilloscopes for different applications. CO4: Design different transducers for measurement of different parameters
41	III/I	PE	Professional Elective – Digital system design	CO1: Understand the architecture of

			using HDL	FPGAs, tools used in modeling of digital design. CO2: Analyze and design basic digital circuits with combinatorial and sequential logic circuits using Verilog HDL. CO3: Model complex digital systems at several levels of abstractions. CO4: Design real time applications such as vending machine and washing machines etc
46	III/I	MC	Essence of Indian Traditional Knowledge	CO1:Understand the concept of Traditional knowledge and its importance CO2: Know the need and importance of protecting traditional knowledge CO3:Know the various enactments related to the protection of traditional knowledge CO4: Understand the concepts of Intellectual property to protect the traditional knowledge
47	III/II	PC	Wired and Wireless Transmission Devices	CO1: Identify basic antenna parameters Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro strip antennas CO3: Quantify the fields radiated by various types of antennas CO4: Design and analyze antenna arrays CO5: Analyze antenna measurements to assess antenna's performance CO6: Identify the characteristics of radio wave propagation
48	III/II	PC	VLSI Design	CO1: Demonstrate a clear understanding of CMOS fabrication flow and technology scaling ,Apply the design Rules and draw layout of a given logic circuit. Design MOSFET based logic circuit. CO2: Design basic building blocks in Analog IC design. Analyze the behavior of amplifier circuits with various loads. CO3:Design various CMOS logic circuits

				for design of Combinational logic circuits. Design amplifier circuits using MOS transistors. CO4: Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS. Analyze the behavior of static and dynamic logic circuits. CO5: FPGA Design , Introduction To Advanced Technologies Like Metal Gate Technology, FinFet
49	III/II	PC	Digital Signal Processing	CO1: Formulate engineering problems in terms of DSP operations CO2: Analyze digital signals and systems CO3: Analyze discrete time signals in frequency domain CO4: Design digital filters and implement with different structures CO5: Understand the key architectural
50	III/II	PE	Cellular Mobile communication	CO1: Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems. CO2: Understand the frequency management, channel assignment strategies and antennas in cellular systems. CO3: Understand the concepts of handoff and architectures of various cellular systems
51	III/II	OE	MEMS and it's applications	CO1: Understand the basic overview of MEMS and Microsystems with broad category of MEMS & Micro system applications. CO2: Understanding the working principles of Microsystems CO3: Understand the Scaling Laws in Miniaturization and Materials for MEMS and Microsystems CO4: Understand the Micro system Fabrication Process and Analyze the different Micro manufacturing process and Applications.

				CO5: Study and Analyze the different types of RF switches, Various Switching Mechanism and their applications..
52	III/II	PC	Internet of Things	CO1: Understand internet of Things and its hardware and software components. CO2: Interface I/O devices, sensors &communication modules. CO3: Remotely monitor data and control devices. CO4: Design real time IoT based applications
55	III/II	MC	Intellectual Property Rights (IPR) & Patents	CO1:IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents CO2: Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements CO3:advanced Technical and Scientific disciplines CO4: Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments
56	IV/I	PC	Microwave and Optical Communication Engineering	CO1: Design different modes in waveguide structures CO2:Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction CO3: Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices. CO4: Measure various microwave parameters using a Microwave test bench
57	IV/I	PC	Data Communications & Computer networks	CO1: Know the Categories and functions of various Data communication Networks CO2: Design and analyze various error detection techniques. CO3:Demonstrate the mechanism of

				routing the data in network layer CO4: Know the significance of various Flow control and Congestion control Mechanisms CO5: Know the Functioning of various Application layer Protocols
58	IV/I	PC	Digital Image and Video Processing	CO1: Defining the digital image, representation of digital image, importance of image resolution, applications in image processing. Know the advantages of representation of digital images in transform domain, application of various image transforms. CO2: Know how an image can be enhanced by using histogram techniques, filtering techniques etc Understand image degradation, image restoration techniques using spatial filters and frequency domain CO3: Know the detection of point, line and edges in images, edge linking through local processing, global processing. Understand the redundancy in images, various image compression techniques. CO4: Know the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing. CO5: Know the general methodologies for 2D motion estimation, various coding used in video processing.
59	IV/I	PE	ANALOG IC DESIGN	CO1: Model and simulate different MOS Devices using small signal Model C□□□□Design and analyze any Analog Circuits in real time applications. CO3: Apply the concepts Analog Circuit Design to develop various Applications in Real Time. CO4: Analyze and compare different Open-Loop Comparators and Oscillators.
60	IV/I	PE	EMBEDDED	

			SYSTEMS	CO1: Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
				CO2: The hardware components required for an embedded system and the design approach of an embedded hardware.
				CO3: The various embedded firmware design approaches on embedded environment.
				CO4: Understand how to integrate hardware and firmware of an embedded system using real time operating system.
64	IV/II	PE	WIRELESS COMMUNICATION	CO1:Know about the Wireless systems and Standards (1G/2G/3Gsystems). CO2: Concept and analysis of CDMA-based wireless networks. CO3: Understand the concepts of Multiple-Input Multiple-Output (MIMO). CO4: Understand the modern wireless systems using OFDM. CO5: Analysis of Satellite-Based Wireless systems
65	IV/II	OE	CYBER SECURITY & CRYPTOGRAPHY	CO1: Explain the computer forensics fundamentals. CO2:Describe the types of computer forensics technology CO3Analyze various computer forensics systems. CO4: Illustrate the methods for data recovery, evidence collection and data seizure.

HOD-ECE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE OUTCOMES -ACADEMIC YEAR -2017-2018

S.NO	Year /sem	Course code	Course Name	Course Outcomes (After completion of the course student can able to:)
1	I/I	HS1101	English	**CO1:** understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information **CO2:** ask and answer general questions on familiar topics and introduce oneself/others **CO3:** employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information **CO4:** recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs **CO5:** form sentences using proper grammatical structures and correct word forms
2	I/I	BS1101	Mathematics -I	**CO1**: Utilize mean value theorems to real life problems (L3) **CO2**: Solve the differential equations related to various engineering fields (L3) **CO3**: Familiarize with functions of several variables which is useful in optimization (L3) **CO4**: Apply double integration techniques in evaluating areas bounded by region (L3) **CO5**: Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)
3	I/I	BS1106	Applied Chemistry	**CO1**: Outline the properties of polymers and various additives added and different methods of forming plastic materials. **CO2**: Interpret the mechanism of conduction in conducting polymers, natural and synthetic rubbers and their applications **CO3**: the theory of construction of battery and fuel cells, categorize the reasons for corrosion and study some methods of corrosion control. **CO4**: Understand the importance of materials like nanomaterials and fullerenes and their uses, liquid crystals and superconductors, semiconductors. **CO5**: knowledge of computational chemistry, molecular machines, principles and applications of analytical instruments.
4	I/I	ES1112	Fundamentals Of Computer	**CO1**: Illustrate the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.

			Science	**CO2**: Recognize the Computer networks, types of networks and topologies. **C03**: Summarize the concepts of Operating Systems and Databases. **C04**: Recite the Advanced Computer Technologies like Distributed Computing & Wireless Networks.
5	I/I	ES1103	Engineering Drawing	**CO1**: The student will learn how to visualize 2D & 3D objects.
6	I/I	HS1102	English Lab	**CO1**:Learners learn how to pronounce words using the rules they have been taught. **CO2**: Students learn the importance of speaking English using rhythm and intonation. **CO3**: Students learn to overcome stage fear and make presentations with ease. **CO4**: Students learn to use right words and phrases in keeping the demands of occasion. **CO5**: Students learn to face different types of interviews with confidence. **CO6**: Students learn to participate in group discussions. **CO7**: Students learn to distinguish informal speech from formal speech through role plays. **CO8**: Students learn to use the telephone etiquettes
7	I/I	BS1107	Applied Chemistry Lab	**CO1**: The students entering into the professional course have practically very little exposure to lab classes. **CO2**: The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. **CO3**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments.
8	I/I	ES1105	IT Workshop	**CO1**: Assemble and disassemble components of a PC **CO2**: Construct a fully functional virtual machine, Summarize various Linux operating system commands, **CO3**: Secure a computer from cyber threats, Learn and practice programming skill in Github, Hackerrank, Code chef, Hacker Earth etc. **CO4**: Recognize characters & extract text from scanned images, Create audio files and podcasts **CO5**: Create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyze responses
9	I/I	MC1101	Environmental Science	**CO1**: Overall understanding of the natural resources. **CO2**: Basic understanding of the ecosystem and its diversity. **CO3**: Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. **CO4**: An understanding of the environmental impact of developmental activities. **CO5**: Awareness on the social issues, environmental legislation

				and global treaties.
10	I/II	BS1202	Mathematics - II	**CO1**: develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) **CO2**: solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3) **CO3**: evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5) **CO4**: apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3). **CO5**: apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)
11	I/II	BS1203	MATHEMATICS - III	**CO1**: Interpret the physical meaning of different operators such as gradient, curl and divergence (L5) **CO2**: Estimate the work done against a field, circulation and flux using vector calculus (L5) **CO3**: Apply the Laplace transform for solving differential equations (L3) **CO3**: Find or compute the Fourier series of periodic signals (L3) **CO4**: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3) **CO5**: Identify solution methods for partial differential equations that model physical processes (L3)
12	I/II	BS1204	APPLIED PHYSICS	**CO1**: The need of coherent sources and the conditions for sustained interference. **CO2**: analyze the physical significance of wave function, energy values of a free particle, electron theories, calculate the Fermi energy, physical significance of wave function . **CO3**: interpret the effects of temperature on Fermi Dirac distribution function, types of solids based on band theory, properties of n-type and p-type semiconductors, using Hall effect. **CO4**: summarize various types of polarization of dielectrics, classification of the magnetic materials based on susceptibility and their temperature dependence. **CO5**: the applications of dielectric and magnetic materials , Apply the concept of magnetism to magnetic devices.
13	I/II	ES1201	PROGRAMMING FOR PROBLEM SOLVING USING C	**CO1**: write algorithms and to draw flowcharts for solving problems, convert flowcharts/algorithms to C Programs, compile and debug programs **CO2**: use different operators, data types and write programs that use two-way/ multi-way selection, to select the best loop construct for a given problem **CO3**: design and implement programs to analyze the different pointer applications. **CO4**: decompose a problem into functions and to develop modular reusable code.

				CO5: Apply File I/O operations.
14	I/II	ES1213	DIGITAL LOGIC DESIGN	**CO1**: An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. **CO2**: An ability to understand the different switching algebra theorems and apply them for logic functions. **CO3**: An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions. **CO4**: Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays. **CO5**: Students will be able to design various sequential circuits starting from flip-flop to registers and counters.
15	I/II	ES1205	APPLIED PHYSIC LAB	**CO1**: Develop skills to impart practical knowledge in real time solution. **CO2**: Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations. **CO3**: Design new instruments with practical knowledge. **CO4**: Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems. **CO5**: Understand measurement technology, usage of new instruments and real time applications in engineering studies.
16	I/II	HS1203	COMMUNICA TION SKILLS LAB	**CO1**: Better pronunciation and accent **CO2**: Ability to use functional English **CO3**: Competency in analytical skills and problem solving skills
17	I/II	ES1202	PROGRAMMI NG FOR PROBLEM SOLVING USING C LAB	**CO1**: Gains Knowledge on various concepts of a C language. **CO2**: Able to draw flowcharts and write algorithms. **CO3**: Able design and development of C problem solving skills. **CO4**: Able to design and develop modular programming skills. **CO5**: Able to trace and debug a program
	I/II	PR1201	ENGINEERIN G EXPLORATIO N PROJECT	**CO1**: Use scientific reasoning to gather, evaluate, and interpret ideas **CO2**: Analyze and design solutions to solve the ideas **CO3**: Use one or more creative tools to complete the projects
	I/II	MC1204	CONSTITUTI ON OF INDIA	**CO1**: Understand historical background of the constitution making and its importance for building a democratic India. **CO2**: Understand the functioning of three wings of the government ie., executive, legislative and judiciary. **CO3**: Understand the value of the fundamental rights and duties for becoming good citizen of India, analyze the decentralization of power between central, state and local self-government. **CO4**: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy, features and principles of Indian Constitution, about Union Government, State government and

				its administration. **CO5**: Get acquainted with Local administration and Pachayat Raj, be aware of basic concepts and developments of Human Rights, gain knowledge on roles and functioning of Election Commission
18	II/I	CS2101	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	**CO1**: Demonstrate skills in solving mathematical problems **CO2**: Comprehend mathematical principles and logic **CO3**: Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software **CO4**: Manipulate and analyze data numerically and/or graphically using appropriate Software **CO5**: Communicate effectively mathematical ideas/results verbally or in writing.
19	II/I	CS2102	SOFTWARE ENGINEERING	**CO1**: Ability to transform an Object-Oriented Design into high quality, executable code **CO2**: Skills to design, implement, and execute test cases at the Unit and Integration level **CO3**: Compare conventional and agile software methods
20	II/I	ES2101	PYTHON PROGRAMMING	**CO1**: Develop essential programming skills in computer programming concepts like data types, containers **CO2**: Apply the basics of programming in the Python language **CO3**: Solve coding tasks related conditional execution, loops **CO4**: Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming
21	II/I	CS2103	DATA STRUCTURES	**CO1**: Summarize the properties, interfaces, and behaviors of basic abstract data types **CO2**: Discuss the computational efficiency of the principal algorithms for sorting & searching **CO3**: Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs **CO4**: Demonstrate different methods for traversing trees
22	II/I	CS2104	OBJECT ORIENTED PROGRAMMING THROUGH C++	**CO1**: Classify object oriented programming and procedural programming **CO2**: Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling **CO3**: Build C++ classes using appropriate encapsulation and design principles **CO4**: Apply object oriented or non-object oriented techniques to solve bigger computing problems
23	II/I	CS2105	COMPUTER ORGANIZATION	**CO1**: Develop a detailed understanding of computer systems **CO2**: Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations. **CO3**: Develop a detailed understanding of architecture and functionality of central processing unit. **CO4**: Exemplify in a better way the I/O and memory organization **CO5**: Illustrate concepts of parallel processing, pipelining and inter processor communication

24	II/I	ES2102	PYTHON PROGRAMMING LAB	**CO1**: Write, Test and Debug Python Programs **CO2**: Use Conditionals and Loops for Python Programs **CO3**: Use functions and represent Compound data using Lists, Tuples and Dictionaries **CO4**: Use various applications using python
25	II/I	CS2106	DATA STRUCTURES THROUGH C++ LAB	**CO1**: Apply the various OOPs concepts with the help of programs. **CO2**: Use basic data structures such as arrays and linked list. **CO3**: Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths. **CO4**: Use various searching and sorting algorithms.
26	II/I	MC2101	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	**CO1**: Understand the concept of Traditional knowledge and its importance **CO2**: Know the need and importance of protecting traditional knowledge **CO3**: Know the various enactments related to the protection of traditional knowledge **CO4**: Understand the concepts of Intellectual property to protect the traditional knowledge
27	II/I	MC2102	EMPLOYABILITY SKILLS –I	**CO1**: Establish effective communication with employers, supervisors, and co-workers **CO2**: Identify to explore their values and career choices through individual skill assessments **CO3**: Adapts positive attitude and appropriate body language **CO4**: Interpret the core competencies to succeed in professional and personal life
28	II/II	BS2201	PROBABILITY AND STATISTICS	**CO1**: Classify the concepts of data science and its importance (L4) or (L2) **CO2**: Interpret the association of characteristics and through correlation and regression tools (L4) **CO3**: Make use of the concepts of probability and their applications (L3) **CO4**: Apply discrete and continuous probability distributions (L3) **CO5**: Design the components of a classical hypothesis test (L6) **CO6**: Infer the statistical inferential methods based on small and large sampling tests (L4)
29	II/II	CS2201	JAVA PROGRAMMING	**CO1**: Able to realize the concept of Object Oriented Programming & Java Programming Constructs **CO2**: Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords **CO3**: Apply the concept of exception handling and Input/ Output operations **CO4**: Able to design the applications of Java & Java applet **CO5**: Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

30	II/II	CS2202	OPERATING SYSTEMS	**CO1**: Describe various generations of Operating System and functions of Operating System **CO2**: Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance **CO3**: Solve Inter Process Communication problems using Mathematical Equations by various methods **CO4**: Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques **CO5**: Outline File Systems in Operating System like UNIX/Linux and Windows
31	II/II	CS2203	DATABASE MANAGEME NT SYSTEMS	**CO1**: Describe a relational database and object-oriented database **CO2**: Create, maintain and manipulate a relational database using SQL **CO3**: Describe ER model and normalization for database design **CO4**: Examine issues in data storage and query processing and can formulate appropriate solutions **CO5**: Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
32	II/II	CS2204	FORMAL LANGUAGES AND AUTOMATA THEORY	**CO1**: Classify machines by their power to recognize languages. ⬚ Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy **CO2**: Employ finite state machines to solve problems in computing **CO3**: Illustrate deterministic and non-deterministic machines **CO4**: Quote the hierarchy of problems arising in the computer science
33	II/II	CS2205	JAVA PROGRAMMI NG LAB	**CO1**: Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings **CO2**: Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism **CO3**: Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism **CO4**: Construct Threads, Event Handling, implement packages, developing applets
33	II/II	CS2206	UNIX OPERATING SYSTEM LAB	**CO1**: To use Unix utilities and perform basic shell control of the utilities **CO2**: To use the Unix file system and file access control **CO3**: To use of an operating system to develop software **CO4**: Students will be able to use Linux environment efficiently **CO5**: Solve problems using bash for shell scripting
34	II/II	CS2207	DATABASE MANAGEME	**CO1**: Utilize SQL to execute queries for creating database and performing data manipulation operations

			NT SYSTEMS LAB	**CO2**: Examine integrity constraints to build efficient databases **CO3**: Apply Queries using Advanced Concepts of SQL **CO4**: Build PL/SQL programs including stored procedures, functions, cursors and triggers
35	II/II	MC2201	PROFESSIONAL ETHICS & HUMAN VALUES	**CO1**: Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field **CO2**: Identify the multiple ethical interests at stake in a real-world situation or practice **CO3**: Articulate what makes a particular course of action ethically defensible **CO4**: Assess their own ethical values and the social context of problems **CO5**: Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects **CO6**: Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work **CO7**: Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.
36	II/II	PR2201	SOCIALLY RELEVANT PROJECT	**CO1**: Use scientific reasoning to gather, evaluate, and interpret ideas **CO2**: Analyze and design solutions to solve the ideas **CO3**: Use one or more creative tools to complete the projects
37	III/I	CS3101	DATA WAREHOUSING AND DATA MINING	**CO1**: Design a Data warehouse system and perform business analysis with OLAP tools **CO2**: Apply suitable pre-processing and visualization techniques for data analysis **CO3**: Apply frequent pattern and association rule mining techniques for data analysis **CO4**: Apply appropriate classification techniques for data analysis **CO5**: Apply appropriate clustering techniques for data analysis
38	III/I	CS3102	COMPUTER NETWORKS	**CO1**: Illustrate the OSI and TCP/IP reference model **CO2**: Analyze MAC layer protocols and LAN technologies **CO3**: Design applications using internet protocols **CO4**: Implement routing and congestion control algorithms **CO5**: Develop application layer protocols
39	III/I	CS3103	COMPILER DESIGN	**CO1**: Design, develop, and implement a compiler for any language **CO2**: Use LEX and YACC tools for developing a scanner and a parser **CO3**: Design and implement LL and LR parsers **CO4**: Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity

				CO5: Apply algorithms to generate machine code
40	III/I	CS3104	ARTIFICIAL INTELLIGENCE	CO1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem CO2: Apply the language/framework of different AI methods for a given problem CO3: Implement basic AI algorithms- standard search algorithms or dynamic programming CO4: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports
41	III/I	PE3101	Software Testing Methodologies	CO1: Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods CO2: Design and conduct a software test process for a software project CO3: Analyze the needs of software test automation ⬚ Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects CO4: Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems CO5: Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications
42	III/I	CS3105	COMPUTER NETWORKS LAB	CO1: Apply the basics of Physical layer in real time applications CO2: Apply data link layer concepts, design issues, and protocols CO3: Apply Network layer routing protocols and IP addressing CO4: Implement the functions of Application layer and Presentation layer paradigms and Protocols
43	III/I	CS3106	AI TOOLS & TECHNIQUES LAB	CO1: Identify problems that are amenable to solution by AI methods CO2: Identify appropriate AI methods to solve a given problem CO3: Use language/framework of different AI methods for solving problems CO4: Implement basic AI algorithms CO5: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports
44	III/I	CS3107	DATA MINING LAB	CO1: Extend the functionality of R by using add-on packages CO2: Examine data from files and other sources and perform various data manipulation tasks on them CO3: Code statistical functions in R CO4: Use R Graphics and Tables to visualize results of various statistical operations on data

				CO5: Apply the knowledge of R gained to data Analytics for real life applications
45	III/I	MC3101	EMPLOYABILITY SKILLS -II	CO1: Recite the corporate etiquette. CO2: Make presentations effectively with appropriate body language CO3: Be composed with positive attitude CO4: Apply their core competencies to succeed in professional and personal life
46	III/II	CS3201	WEB TECHNOLOGIES	CO1: Illustrate the basic concepts of HTML and CSS & apply those concepts to design static web pages CO2: Identify and understand various concepts related to dynamic web pages and validate them using JavaScript CO3: Outline the concepts of Extensible markup language & AJAX CO4: Develop web Applications using Scripting Languages & Frameworks CO5: Create and deploy secure, usable database driven web applications using PHP and RUBY
47	III/II	CS3202	DISTRIBUTED SYSTEMS	CO1: Elucidate the foundations and issues of distributed systems CO2: Illustrate the various synchronization issues and global state for distributed systems CO3: Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems CO4: Describe the agreement protocols and fault tolerance mechanisms in distributed systems CO5: Describe the features of peer-to-peer and distributed shared memory systems
48	III/II	CS3202	DESIGN AND ANALYSIS OF ALGORITHMS	CO1: Describe asymptotic notation used for denoting performance of algorithms CO2: Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms CO3: List and describe various algorithmic approaches CO4: Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches CO5: Apply graph search algorithms to real world problems CO6: Demonstrate an understanding of NP- Completeness theory and lower bound theory
49	III/II	PE3201	PROFESSIONAL ELECTIVE –II (NPTEL/SWAYAM)	NPTEL/SWAYAM program.
50	III/II	OE3201	Artificial Neural Networks	CO1: Survey of attractive applications of Artificial Neural Networks. CO2: practically approach for using Artificial Neural Networks in

			(OPEN ELECTIVE –I ECE)	various technical, organizational and economic applications
51	III/II	HS3201	MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY	**CO1**: The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product. **CO2**: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. **CO3**: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. **CO4**: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis. **CO5**: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
52	III/II	CS3204	WEB TECHNOLOGIES LAB	**CO1**: Analyze and apply the role of languages like HTML, CSS, XML **CO2**: Review JavaScript, PHP and protocols in the workings of the web and web applications **CO3**: Apply Web Application Terminologies, Internet Tools, E – Commerce and other web services **CO4**: Develop and Analyze dynamic Web Applications using PHP & MySql **CO5**: Install & Use Frameworks
53	III/II	PR3201	Industrial Training / Skill Development Programmes / Research Project in higher learning institutes	**CO1**: To enable students to learn the basic concepts of Project & Production Management. **CO2**: To be capable of self-education and clearly understand the value of achieving Perfection in the respective Project work. **CO3**: Effectively communicate through verbal/oral communication and improve the listening skills **CO4**: Write precise briefs or reports and technical documents **CO5**: Actively participate in group discussion / meetings / interviews and prepare & deliver presentations. **CO6**: identify and discuss the issues and concepts salient to the research process
54	IV/I	CS4101	CRYPTOGRAPHY AND NETWORK SECURITY	**CO1**: Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory **CO2**: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication **CO3**: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes. **CO4**: Apply different digital signature algorithms to achieve authentication and create secure applications

				CO5: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP
				CO6: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications
55	IV/I	CS4102	UML & DESIGN PATTERNS	**CO1**: Illustrate software design with UML diagrams **CO2**: Design software applications using OO concepts **CO3**: Identify various scenarios based on software requirements **CO4**: Apply UML based software design into pattern based design using design patterns **CO5**: Illustrate the various testing methodologies for OO software
56	IV/I	CS4103	MACHINE LEARNING	**CO1**: Identify machine learning techniques suitable for a given problem **CO2**: Solve the problems using various machine learning techniques **CO3**: Apply Dimensionality reduction techniques **CO4**: Design application using machine learning techniques
57	IV/I	OE4101	Block chain Technology (Open Elective –II ECE)	**CO1**: Describe the basic concepts and technology used for block chain. **CO2**: Describe the primitives of the distributed computing and cryptography related to block chain. **CO3**: Illustrate the concepts of Bit coin and their usage. **CO4**: Implement Ethereal block chain contract. **CO5**: Apply security features in block chain technologies. **CO6**: Use smart contract in real world applications.
58	IV/I	PE4101	MOBILE COMPUTING	**CO1**: Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI **CO2**: Discuss fundamental challenges in mobile communications and potential Techniques in GSM **CO3**: Demonstrate Mobile IP in Network layer **CO4**: Elaborate TCP/IP Protocols and database issues **CO5**: Illustrate different data delivery methods and synchronization protocols **CO6**: Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts
59	IV/I	PE4101	DATA SCIENCE	**CO1**: Describe what Data Science is and the skill sets needed to be a data scientist **CO2**: Illustrate in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling, Fit a model to data **CO3**: Use R to carry out basic statistical modeling and analysis **CO4**: Apply basic tools (plots, graphs, summary statistics) to carry out EDA **CO5**: Describe the Data Science Process and how its components interact **CO6**: Use APIs and other tools to scrap the Web and collect data

				CO7: Apply EDA and the Data Science process in a case study
60	IV/I	PE4101	NoSQL DATABASES	**CO1**: Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.) **CO2**: Apply NoSQL data modeling from application specific queries **CO3**: Use Atomic Aggregates and renormalization as data modeling techniques to optimize query processing
61	IV/I	PE4101	INTERNET OF THINGS	**CO1**: Describe the usage of the term 'the internet of things' in different contexts **CO2**: Discover the various network protocols used in IoTand familiar with the key wireless technologies used in IoT systems, such as Wi-Fi, 6LoWPAN, Bluetooth and ZigBee **CO3**: Define the role of big data, cloud computing and data analytics in a typical IoT system Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software **CO4**: Build and test a complete working IoT system
62	IV/I	PE4101	SOFTWARE PROJECT MANAGEME NT	**CO1**: Apply the process to be followed in the software development life-cycle models. **CO2**: Apply the concepts of project management & planning. **CO3**: Implement the project plans through managing people, communications and change **CO4**: Conduct activities necessary to successfully complete and close the Software projects **CO5**: Implement communication, modeling, and construction & deployment practices in software development.
63	IV/I	PE4102	WEB SERVICES	**CO1**: Recite the advantages of using XML technology family **CO2**: Analyze the problems associated with tightly coupled distributed software architecture **CO3**: Learn the Web services building block **CO4**: Implement e-business solutions using XML based web services
64	IV/I	PE4102	CLOUD COMPUTING	**CO1**: Interpret the key dimensions of the challenge of Cloud Computing **CO2**: Examine the economics, financial, and technological implications for selecting cloud computing for own organization **CO3**: Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications **CO4**: Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas **CO5**: Illustrate Virtualization for Data-Center Automation
65	IV/I	PE4102	MEAN STACK TECHNOLOGI ES	**CO1**: Enumerate the Basic Concepts of Web & Markup Languages **CO2**: Develop web Applications using Scripting Languages & Frameworks

				CO3: Make use of Express JS and Node JS frameworks **CO4**: Illustrate the uses of web services concepts like restful, react js **CO5**: Apply Deployment Techniques & Working with cloud platform
66	IV/I	PE4102	AD-HOC AND SENSOR NETWORKS	**CO1**: Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks **CO2**: Determine the principles and characteristics of wireless sensor networks **CO3**: Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks **CO4**: Illustrate the various sensor network Platforms, tools and applications **CO5**: Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs
67	IV/I	PE4102	CYBER SECURITY & FORENSICS	**CO1**: Enumerate the computer forensics fundamentals **CO2**: Describe the types of computer forensics technology **CO3**: Analyze various computer forensics systems **CO4**: Illustrate the methods for data recovery, evidence collection and data seizure **CO5**: Identify the Role of CERT-In Security
68	IV/I	CS4104	UML LAB	**CO1**: Know the syntax of different UML diagrams **CO2**: Create use case documents that capture requirements for a software system **CO3**: Create class diagrams that model both the domain model and design model of a software system **CO4**: Create interaction diagrams that model the dynamic aspects of a software system **CO5**: Write code that builds a software system **CO6**: Develop simple applications
69	IV/I	PR4101	PROJECT-I	**CO1**: Understand the basic concepts & broad principles of real time software projects. **CO2**: Understand concepts of Project and Production Management **CO3**: Get capable of self education and clearly understand the value of achieving perfection in project implementation & completion. **CO4**: Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach.
70	IV/I	MC4101	IPR & PATENTS	**CO1**: Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP. **CO2**: Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology

				development.
				CO3: Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technology development.
				CO4: Be familiar with the processes of Intellectual Property Management (IPM) and various approaches for IPM and conducting IP and IPM auditing and explain how IP can be managed as a strategic resource and suggest IPM strategy.
				CO5: Be able to anticipate and subject to critical analysis arguments relating to the development and reform of intellectual property right institutions and their likely impact on creativity and innovation.
				CO6: Be able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing;
71	IV/II	HS4201	MANAGEMENT AND ORGANIZATIONAL BEHAVIOR	**CO1**: acquire the knowledge on management functions, global leadership and organizational structure **CO2**: Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments **CO3**: The learner is able to think in strategically through contemporary management practices **CO4**: The learner can develop positive attitude through personality development and can equip with motivational theories **CO5**: The student can attain the group performance and grievance handling in managing the organizational culture
72	IV/II	OE4201	Smart Cities Open Elective – III(CIVIL)	
73	IV/II	PE4201	DEEP LEARNING	**CO1**: Demonstrate the mathematical foundation of neural network **CO2**: Describe the machine learning basics **CO3**: Differentiate architecture of deep neural network **CO4**: Build a convolution neural network **CO5**: Build and train RNN and LSTMs
74	IV/II	PE4201	QUANTUM COMPUTING	**CO1**: Analyze the behavior of basic quantum algorithms **CO2**: Implement simple quantum algorithms and information channels in the quantum circuit model **CO3**: Simulate a simple quantum error-correcting code **CO4**: Prove basic facts about quantum information channels
75	IV/II	PE4201	DevOps	**CO1**: Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility

				CO2: Describe DevOps & DevSecOps methodologies and their key concepts
				CO3: Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
				CO4: Set up complete private infrastructure using version control systems and CI/CD tools
76	IV/II	PE4201	BLOCKCHAIN TECHNOLOGIES	CO1: Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding. CO2: Identify the risks involved in building Block chain applications. CO3: Review of legal implications using smart contracts. CO4: Choose the present landscape of Block chain implementations and Understand Crypto currency markets CO5: Examine how to profit from trading crypto currencies.
77	IV/II	PE4201	BIG DATA ANALYTICS	CO1: Illustrate big data challenges in different domains including social media, transportation, finance and medicine CO2: Use various techniques for mining data stream CO3: Design and develop Hardtop CO4: Identify the characteristics of datasets and compare the trivial data and big data for various applications CO5: Explore the various search methods and visualization techniques
78	IV/II	PR4201	PROJECT -II	CO1: Understand the basic concepts & broad principles of real time software projects. CO2: Understand concepts of Project and Production Management CO3: Get capable of self education and clearly understand the value of achieving perfection in project implementation & completion. CO4: Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach CO5: Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues.

HOD-CSE