2.6.1 Programme Outcomes and Course outcomes For All Programme Offered by the Institution.

Index

1.Civil Engineering Department
(UG)

1.Civil Engineering Department (UG):

Program Educational Objective (PEO)

- **PEO-1-**To prepare students to succeed in employment, profession and/or to purse post graduation and research in civil engineering discipline in particular and allied engineering disciplines in general.

- **PEO-2-**To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to formulate, analyse and solve civil engineering related problems.

- **PEO-3-**To prepare the students to acquire the knowledge in breadth in order to solve mathematical problems related to analysis and design of various systems pertaining to different fields of Civil Engineering in order to utilize their skills to perform location surveying, cost estimates and activities related to Civil Engineering projects, using conventional and modern engineering tools.

- **PEO-4-**To inculcate ethical practices and to establish understanding of professionalism, safety, sustainability, their duties and contribution to the society.

- **PEO-5-**To provide students with academic environment that makes them aware of excellence and to enable them to understand the significance of life –long learning in global perspective.

Program Outcomes (UG)

- **PO-1- Engineering Knowledge**: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- **PO-2- Problem Analysis**: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
- **PO-3- Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental Consideration
- **PO-4- Conduct investigations of complex problems** using research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
- **PO-5- Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an under- standing of the limitations.
- **PO-6- The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
- **PO-7- Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- **PO-8- Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- **PO-9- Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multi disciplinary settings.
- **PO-10- Communication**: Communicate effectively on complex engineering activities with the engineering com- munity and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
- **PO-11- Project Management and Finance**: Demonstrate knowledge and understanding of engineering

and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Program Specific Outcomes (UG)

- **PSO-1**-Carry out structural analysis and design, develop minor project plans.

- **PSO-2**-Examine geotechnical applications which includes the design of shallow and deep foundations, common issues in foundation construction, site characterization and rock slope assessment, tunneling and earth dam designs

- **PSO-3**-Carry out location survey and quantity survey for cost estimation of structures, including interpretation and understanding of civil engineering drawings.

Course Outcomes (CO)

First Year: Semester I:

Course Name: Engineering Mechanics		Course Code: CV2101
CO1	Describe the fundamental concepts of statics and dynamics	
CO2	Apply the basic concepts of applied mechanics for solution of problems on planar force system.	
CO3	Determine the properties of surface like centroid, moment of inertia, etc. for planar surfaces and mass moment of inertia for rigid body.	
CO4	Analyze pin jointed truss frame structure and beam structure analytically and graphically.	
CO5	Evaluate the dynamic variables of kinetics of particles and simple lifting machine	

Course Name: LAB: Engineering Mechanics		Course Code: CV2102
CO1	Describe the fundamental concepts of statics and dynamics	
CO2	Apply the basic concepts of applied mechanics for solution of problems on planar force system.	
CO3	Determine the properties of surface like centroid, moment of inertia, etc. for planar surfaces and mass moment of inertia for rigid body.	
CO4	Analyze pin jointed truss frame structure and beam structure analytically and graphically.	
CO5	Evaluate the dynamic variables of kinetics of particles and simple lifting machine	

First Year: Semester II:

Course Name: Engineering Mechanics		Course Code: CV2101
CO1	An ability to apply the concept of mechanics and can solve problems on planar force system for smooth as well rough surfaces.	
CO2	An ability to analyze pinned jointed truss frame using method of joint.	
CO3	An ability to understand the properties of surface and can find centroid, moment of inertia, product of inertia, etc.	
CO4	An ability to determine the dynamic variables by applying Kinetics of Particle, work energy method and linear impulse momentum methods.	

Course Name: LAB: Engineering Mechanics		Course Code: CV2102
CO1	An ability to apply the concept of mechanics and can solve problems on planar force system for smooth as well rough surfaces.	
CO2	An ability to analyze pinned jointed truss frame using method of joint.	

CO3	An ability to understand the properties of surface and can find centroid, moment of inertia, product of inertia, etc.
CO4	An ability to determine the dynamic variables by applying Kinetics of Particle, work energy method and linear impulse momentum methods.

Course Name: Fluid Mechanics		Course Code: CV2205
CO1	Examine the fundamental principles of fluid mechanics and related applications and estimate Fluid pressure, forces on various surface.	
CO2	Analyze the motion of fluid, various flow pattern produced without reference of force	
CO3	Understand the kinetics of flow and computation of flow using various devices.	

Course Name: LAB: Fluid Mechanics		Course Code: CV2206
CO1	An ability to determine floating conditions of ship model.	
CO2	An ability to verify Bernoulli‴s theorem.	
CO3	An ability to measure velocity, discharge in pipe, tank, channel andto determine hydraulic coefficients of devices.	
CO1	An ability to determine hydraulic jump, roughness, concept of specific energy in open channels.	
CO2	An ability to determine types of flow in pipes and flow around immersed bodies	

Course Name: Geotechnical Engineering		Course Code: CV2203
CO1	An ability to characterize and classify soils.	
CO2	An ability to determine index and engineering properties of soil.	
CO3	An ability to understand surface stresses and their distribution within a soil mass.	
CO4	An ability to understand the principles of compaction and consolidation.	
CO5	An ability to determine shear strength of soil.	

Course Name: LAB: Geotechnical Engineering		Course Code: CV2204
CO1	An ability to determine the Index properties of soil.	
CO2	An ability to determine the Engineering properties of soil.	

Course Name: Strength of Materials		Course Code: CV2201
CO1	An ability to understand basic concepts and mechanical properties of materials.	
CO2	An ability to analyze behavior of material under various types of loading pattern.	
CO3	An ability to draw diagram showing variation of shear force, bending moment and stresses.	
CO4	An ability to check feasibility of different sections subjected to different loading patterns.	

Course Name: LAB: Strength of Materials		Course Code: CV2202
CO1	An ability to understand basic concepts & mechanical properties of material.	
CO2	An Ability to understand behavior of various materials such as Steel, Aluminum, Wood etc. when subjected to various types of loading.	

Course Name: Water Supply Engineering		Course Code: CV2207
CO1	An ability to understand significance of community water supply scheme.	
CO2	An ability to design water conveyance system.	
CO3	An ability to understand importance of water quality and its treatment aspects.	
CO4	An ability to understand different patterns of distribution of water.	
CO5	An ability to understand the significance and concept of solid waste management.	

Course Name: LAB: Water Supply Engineering		Course Code: CV2208
CO1	To understand importance of water quality standards.	
CO2	An ability to perform various physical and chemical tests on water sample.	
CO3	An ability to understand various biological tests performed on water sample and to perform a few biological tests on water.	

<mark>Second Year: Semester IV:</mark>

Course Name: Advanced Mathematical Techniques		Course Code: GE2204
CO1	Utilize numerical techniques to obtain approximate solutions of mathematical	
CO2	Measure the Statistical parameters for random variables	
CO3	Design and determine the solution of linear programming problems	
CO4	Explain the basic concept of fuzzy sets, Relations and fuzzy logic.	

Course Name: Concrete Technology		Course Code: CV2251
CO1	An ability to understand the properties of the constituent materials of concrete.	
CO2	An ability to understand the properties of fresh and hardened concrete and tests to determine these properties	
CO3	An ability to design concrete mixes and apply statistical quality control techniques	
CO4	An ability to understand admixtures and their role in concrete properties	
CO5	An ability to understand the durability of concrete.	
CO6	An ability to understand importance of Non-destructive testing and various equipment used.	

Course Name: Lab: Concrete Technology		Course Code: CV2252
CO1	An ability to conduct different tests on cement.	
CO2	An ability to assess the different properties of coarse and fine aggregate.	
CO3	An ability to conduct different workability tests on fresh concrete and various tests on hardened concrete.	
CO4	An ability to understand working of various Non-destructive testing equipment.	

Course Name: Surveying		Course Code: CV2253
CO1	An ability to understand the basic concepts of surveying and use of conventional surveying equipment.	
CO2	An ability to understand the basic principles, operation, handling & uses of various advanced surveying equipment.	
CO3	An ability to draw the location map, contour map using various surveying equipment.	

Course Name: Lab : Surveying		Course Code: CV2254
CO1	An ability to work in a team to carry out a survey of a small area using appropriate methods.	
CO2	An ability to describe the observation, computation and adjustment of a Traverse to carry out basic survey computation and adjustment.	
CO3	An ability to understand the angle and distance measurement; and differential, profile, cross-section, and topographic leveling procedures and apply them to field conditions.	

Course Name: Structural Analysis		Course Code: CV2255
CO1	An ability to understand basic concepts of structural analysis.	

CO2	An ability to apply various methods of structural analysis to analyze different types of structures.
CO3	An ability to express results of forces generated in structure with diagrams.

Course Name: Lab: Structural Analysis		Course Code: CV2256
CO1	An ability to understand various types of strain gauges and to measure the strain in beam.	
CO2	An ability to find the defections in truss analytically and graphically.	
CO3	An ability to determine the horizontal thrust of different types of arches.	
CO4	An ability to understand the various properties of beam.	
CO5	An ability to understand the behavior of the column, curved member and portal frame.	

Course Name: Transportation Engineering		Course Code: CV2257
CO1	An ability to understand basic concepts of transportation and traffic engineering.	
CO2	An ability to understand concepts of geometric design, construction and maintenance of road pavements.	
CO3	An ability to understand importance of various tests conducted on highway materials.	
CO4	An ability to understand basics of bridge and railway engineering	

Course Name: Lab :Transportation Engineering		Course Code: CV2258
CO1	An ability to conduct various tests on aggregates and soil.	
CO2	An ability to conduct various tests on aggregates, bitumen and bitumen mix.	

Course Name: Fundamentals of Economics		Course Code: GE1312
CO1	Recognize consumer"s behavior and analyze Market price	
CO2	Extrapolate operations in market with production constraints	
CO3	Describe the national income accounting and public finance	
CO4	Analyze international trade and institutions.	

Third Year: Semester V:

Course Name: OE I : Building Services Engineering		Course Code: CV1327
CO1	An ability to understand relevance of services related to lighting, ventilation & acoustics & understand the methodologies, materials & equipment in this regards.	
CO2	An ability to understand special installations in buildings such as electrical, air conditioning, heating & mechanical ventilation & related practices.	
CO3	An ability to understand specifications & usage of mechanical installations like lifts, security systems etc. & special features required as per need.	
CO4	An ability to understand causes of fires in buildings & their preventive and protective strategies	

Course Name: OE I: Construction Techniques		Course Code: CV1329
CO1	An ability to understand the construction techniques to be used in the construction of building	
CO2	An ability to understand the demolition techniques, Importance of rehabilitation, Strengthening etc.	

Course Name: OE I : Environmental Management		Course Code: CV1325
CO1	Identify the scientific and social aspects of environmental issues.	

CO2	Understand the procedure of environmental protection by legislation.
CO3	Understand the role of environmental management system in protecting the resources.

Course Name: Reinforced Concrete Structures	Course Code: CV1331
CO1	An ability to understand the structural properties of steel and concrete and their applications in structural planning.
CO2	An ability to acquire the knowledge about the basic methods of structural design.
CO3	An ability to understand the analysis, design and detailing of RCC structural elements required for building.
CO4	An ability to understand the concept and application of Prestressed concrete

Course Name: Structural Analysis-I	Course Code: CV1307
CO1	An ability to understand the basic concept of structural analysis
CO2	An ability to understand the behavior of structural components subjected to various loadings.
CO3	An ability to understand various methods of analysis of structural elements.

Course Name: LAB: Structural Analysis-I	Course Code: CV1308
CO1	An ability to understand various types of strain gauges and to measure the strain in beam.
CO2	An ability to find the defections in truss analytically and graphically.
CO3	An ability to determine the horizontal thrust of different types of arches.
CO4	An ability to understand the various properties of beam.
CO5	An ability to understand the behavior of the column, curved member and portal frame.

Course Name: Surveying-II	Course Code: CV1301
CO1	An ability to understand the importance of modern technique of surveying.
CO2	An ability to understand and operate the modern Surveying equipment‟s
CO3	An ability to understand basic concepts of GIS, GPS & Remote sensing

Course Name: LAB: Surveying-II	Course Code: CV1302
CO1	An ability to measure distance by using tachometry
CO2	An ability to plot Horizontal curve by using theodolite
CO3	An ability to understand the rectangular coordinate system
CO4	An ability to Understand (introductory level) geographic information systems and Global positioning system (GIS, GPS)

Course Name: Transportation Engineering-I	Course Code: CV1304
CO1	An ability to understand concept of Geometric design of roads and various aspects of traffic engineering.
CO2	An ability to understand various types of bridges and their design aspects.
CO3	An ability to understand various traffic characteristics and analysis and use the data for road design.
CO4	An ability to understand various Highway materials and their suitability under different conditions.

Course Name: LAB: Transportation Engineering-I	Course Code: CV1305
CO1	An ability to conduct various tests on aggregates and study its desirable properties.

CO2	An ability to conduct various tests on bitumen and understand its properties.
CO3	An ability to perform the CBR value.
CO4	An ability to perform Marshall stability of bituminous mixture.
CO5	An ability to conduct traffic volume survey.
CO6	An ability to understand about bridges and various components.

Course Name: Fluid Mechanics – II		Course Code: CV1310
CO1	Students will be able to examine the fundamental principles of fluid mechanics and related applications.	
CO2	Students will be able to analysis of network and Estimate discharge, shear stresses, pressure drop, water losses, water hammer in pipe flow.	
CO3	Students will be able to estimate flow parameter and Design the most economical open channels for conveyance of water	
CO4	Students will be able to estimate and study the specific energy, slope, analize flow profile, profile length, uniform flow, critical flow, gradually & Rapidly varied flow in open channel.	
CO5	Students will be able design and analyze the model to predict the performance of hydraulic structure, partially and fully submerged body.	

Course Name: Lab: Fluid Mechanics – II		Course Code: CV1311
CO1	An ability to determine the forces around the submerged bodies.	
CO2	An ability to carry out the head loss in pipes for design of pipe network.	
CO3	An ability to carry out analysis of water distribution network.	
CO4	An ability to determine velocity and sketch various profiles, back water length, hydraulic jump, roughness, concept of specific energy in open channels.	
CO5	An ability to determine the performance of hydraulic machines.	

Course Name: Lab : Seminar		Course Code: CV1314
CO1	An ability to utilize technical resources.	
CO2	An ability to understand information in detail for report writing.	
CO3	An ability to write and present report of associated work effectively.	

Course Name: PE I : Water Treatment		Course Code: CV1315
CO1	An ability to understand importance of water treatment	
CO2	An ability to analyse available data and design a water treatment unit.	

Course Name: PE I : Prestressed Concrete		Course Code: CV1316
CO1	An ability to understand the basic concepts of prestressed concrete structures.	
CO2	An ability to analyze the prestressed concrete structural elements.	
CO3	An ability to design the prestressed concrete structural elements.	
CO4	An ability to exercise the limit state of serviceability to prestressed concrete members.	

Course Name: PE I : Building Services		Course Code: CV1317
CO1	An ability to understand relivance of services related to lighting, ventilation & acoustics & understand the methodologies, materials &equipments in this regards.	
CO2	An ability to understand special installations in buildings such as electrical, air conditioning, heating & mechanical ventilation & related practices.	
CO3	An ability to understand specifications & usage of mechanical installations like lifts, security systems etc& special features required as per need.	
CO4	An ability to understand facilities necessary for physically handicapped and aged people.	

Course Name: PE I : Pavement Design	Course Code: CV1323
CO1	Students will be able to identify various types of pavement, design parameters and material characteristic for flexible and rigid pavements.
CO2	Students will be able to analyze and design of flexible and rigid pavements for highway and airfields pavement.
CO3	Students will be able to identify and refer various standards and specifications related to highway and airfields pavement.
CO4	Students will be able to rectify various pavement distresses and their repair or maintenance strategies.

Course Name: Steel Structures	Course Code: CV1332
CO1	An ability to understand effect of forces and its impact on structure
CO2	An ability to identify the type of structure and its design methodology
CO3	An ability to utilize the application of Indian Standard code for design purpose.
CO4	An ability to design the simple, built up section and column bases.

Course Name: Geotechnical Engineering - II	Course Code: CV1333
CO1	An ability to understand & apply the fundamentals of earth pressure to earth retaining structure.
CO2	An ability to understand & apply knowledge of stability of slopes and ground improvement techniques
CO3	An ability to comprehend and utilize the geotechnical literature to establish the framework for foundation design.
CO4	An ability to execute a site investigation for determination of soil properties and to develop good technical reporting and data presentation skills.

Course Name: OE II: Elements of Earthquake Engineering	Course Code: CV1341
CO1	An ability to understand the necessity and importance of earthquake engineering
CO2	An ability to understand the provision of IS code used for earthquake resistant design of structure
CO3	An ability to understand provision for earthquake resistant design of structures as per Indian standard
CO4	An ability to study of damages caused due to past earthquake in & outside India and remedial measures

Course Name: OE II: Air Pollution and Solid Waste Management	Course Code: CV1342
CO1	Students will be able to Analyze the type, sources & effect of air pollutants.
CO2	Students will be able to Determine and estimate the parameters affecting air pollution and various methods of measurement.
CO3	Students will be able to Use various air pollution control equipments& pollution caused due to automobile exhaust and basics of noise pollution.
CO4	Students will be able to Interpret the concepts of solid waste management, treatment and disposal methods.

Course Name: OE II : Introduction to Finite Element Method	Course Code: CV1343
CO1	An ability to apply the steps required for FEM solution to variety of physical systems.
CO2	An ability to create models for simple structures.
CO3	An ability to solve engineering problems.
CO4	An ability to extend the knowledge of the application of FEM to solve engineering problems.

Fourth Year: Semester VII:

Course Name: Environmental Engineering-II	Course Code: CV1441
CO1	An ability to understand importance of effective collection and conveyance of sewage.
CO2	An ability to understand methods of construction and maintenance of sewerage system including house drainage system.
CO3	An ability to understand working of sewage treatment plant including difference with industrial wastewater treatment plant.
CO4	An ability to understand importance of air pollution control including methods to control it.

Course Name: PE II: Advanced Hydraulics	Course Code: CV1411
CO1	Examine the fundamental principles of fluid mechanics and related applications.
CO2	Estimate and analyze various flow parameters, flow profiles and profile length in open channel.
CO3	Estimate time flow establishment for unsteady flow and the pressure develop in pipe by considering Rigid and Elastic water column theory.
CO4	Analyze the stability of surge tank

Course Name: PE II : Computer Application in Civil Engineering	Course Code: CV1459
CO1	An ability to understand the basic concepts of C Programming language
CO2	An ability to develop computer programs for the solution of Civil Engineering problems.
CO3	An ability to translate numerical methods into simple, reusable program modules
CO4	An ability to develop good technical understanding & application with good presentation skills.

Course Name: LAB: Computer Application in Civil Engineering	Course Code: CV1442
CO1	An ability to understand the basic concepts of C Programming language.
CO2	An ability to develop computer programs for the solution of Civil Engineering problems.
CO3	An ability to translate numerical methods into simple, reusable program modules.
CO4	An ability to develop good technical reporting and data presentation skills.

Course Name: PE II : Natural Resources Management	Course Code: CV1413
CO1	An ability to solve important natural resource management problems.
CO2	An ability to describe planning and responsibilities taken by professional authorities.
CO3	An ability to understand laws, policies & practice implementation for private and public resource owners and users.
CO4	An ability to work on multiple environmental issues for a sustainability.

Course Name: PE II : Traffic Engineering	Course Code: CV1410
CO1	An ability to understand different methods for measurement of spot speed, journey speed & running speed,
CO2	An ability to understand different statistical methods which can be used in various analyses of traffic studies.
CO3	An ability to understand design of rotary intersections, Parking& Accidents

CO4	An ability to understand design of signals at various intersections considering practical problems.

Course Name: Structural Analysis - II		Course Code: CV1402
CO1	An ability to understand the matrix methods of structural analysis and its applications.	
CO2	An ability to understand the flexibility matrix method and apply its application to beam structure.	
CO3	An ability to understand the stiffness matrix method and apply its application to pin jointed frame structure and beam structure.	
CO4	An ability to understand the column analogy method and apply its application to beam and frame structure.	
CO5	An ability to understand the moment distribution method and apply its application to frames with sway.	
CO6	An ability to understand the approximate method of analysis and apply its application to multistoried frame structures	

Course Name: LAB: Structural Analysis - II		Course Code: CV1403
CO1	An ability to understand the effect of forces on structure.	
CO2	An ability to develop and execute the Beam models in the software package without any error	
CO3	An ability to develop and execute the Plane truss models in the software package without any error	
CO4	An ability to develop and execute the Frame models in the software package without any error	
CO5	An ability to compare the result between hand calculation (manual analysis) and output result of the software.	
CO6	An ability to understand the application of software package and limitation of manual analysis	

Course Name: Transportation Engineering-II		Course Code: CV1422
CO1	An ability to update and upgrade knowledge about transportation system in India	
CO2	An ability to design railway tracks, crossings	
CO3	An ability to avail information about development of air transportation in urban areas	
CO4	An ability to understand the construction of tunnel and advances in tunneling	

Course Name: Water Resource Engineering		Course Code: CV1410
CO1	An ability to understand water requirement for various crop pattern.	
CO2	An ability to understand parameters and procedures adopted in reservoir planning.	
CO3	An ability to understand the design of water conveyance system like canal.	
CO4	An ability to understand the analysis and design of various water retaining structures like weirs and dams.	

Fourth Year: Semester VIII:

Course Name: Estimating and Costing	Course Code: CV1442

CO1	An ability to understand the definitions in estimates of structures.
CO2	An ability to develop the specifications and find out the quantities of materials in different items to prepare the estimate.
CO3	An ability to workout the valuation and rent of civil engineering structures.
CO4	An ability to workout the estimate and costing of building, road, hill road and canal.
CO5	An ability to fill the tenders and carry out the construction of civil engineering structures.

Course Name: Comprehensive Viva-Voce	Course Code: CV1424
CO1	An ability to collect information regarding only topic related in civil engineering
CO2	An ability to present the information collected in the expected format
CO3	An ability to express and communicate about the information collected

Course Name: Project Phase-II (GEO)	Course Code: CV1425
CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Understand problem identification, formulation and solution.
CO3	Design engineering solutions to complex problems utilizing a systems approach including ability to work in a team.
CO4	Communicate effectively to discuss and solve engineering problems.

Course Name: Project Phase-II (STR & CT)	Course Code: CV1425
CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Understand problem identification, formulation and solution.
CO3	Design engineering solutions to complex problems utilizing a systems approach including ability to work in a team.
CO4	Communicate effectively to discuss and solve engineering problems.

Course Name: Project Phase-II (TRE)	Course Code: CV1425
CO 1	Demonstrate a sound technical knowledge of their selected project topic.
CO 2	Understand problem identification, formulation and solution.
CO 3	Design engineering solutions to complex problems utilizing a systems approach including ability to work in a team.
CO4	Communicate effectively to discuss and solve engineering problems.

Course Name: Project Phase-II (WRE)	Course Code: CV1425
CO 1	Demonstrate a sound technical knowledge of their selected project topic.
CO 2	Understand problem identification, formulation and solution.
CO 3	Design engineering solutions to complex problems utilizing a systems approach including ability to work in a team.
CO 4	Communicate effectively to discuss and solve engineering problems.

Course Name: Extra / Co-Curricular / Competitive Examination		Course Code: CV1426
CO1	An ability to work initially as well as part of team to achieve set goals	
CO2	An ability to work to serve society and for betterment of society.	
CO3	An ability to communicate with people at large.	

Course Name: PE IV: Waste Water Treatment		Course Code: CV1427
CO1	An ability to understand the necessity of water quality management	
CO2	An ability to understand & design various treatment units for wastewater treatment	
CO3	An ability to understand Advanced waste water treatment	
CO4	An ability to understand treatment for Industrial waste.	

Course Name: PE IV : Earthquake Engineering		Course Code: CV1428
CO1	After completion of course the student will be able to understand the fundamentals and Importance of Earthquake Engineering	
CO2	Apply the basic principles for seismic design and construction of structures in accordance with the provisions of Indian Standard Codes.	
CO3	Understand various special aspects in Multi-story buildings	
CO4	Understand the social aspects of earthquake disaster, its management and damages caused due to past Earthquake in & outside India and remedial measures.	

Course Name: PE IV : Matrix Analysis of Structures		Course Code: CV1429
CO1	An ability to understand the stiffness method for analyzing statically indeterminate structures.	
CO2	An ability to model the behaviour of various structural elements and systems.	
CO3	An ability to understand the effect of various loading and support conditions on structural elements and systems.	
CO4	An ability to implement the computer program to analyse the structures.	

Course Name: PE V: Water Transmission & Distribution Systems		Course Code: CV1432
CO1	Students will be able to examine the fundamental principles of fluid mechanics and related applications.	
CO2	Students will be able to estimate discharges in multy -reservoir system connected by pipes	
CO3	Students will be able to analyze the water distribution network by using various method	
CO4	Students will be able to design optimal diameter of rising main and water distribution network	
CO5	Students will be able to optimize water distribution network	

Course Name: PE V : Advanced Steel Design		Course Code: CV1433
CO1	An ability to understand different types of loading with respect to structural parameters.	
CO2	An ability to identify the type of structure and its design methodology.	
CO3	An ability to utilize the application of Indian Standard code for design purpose.	

Course Name: PE V: Maintenance & Rehabilitation Engineering		Course Code: CV1434
CO1	Students will know about different high quality materials for civil engineering applications.	
CO2	Ability to use materials for better and durable Civil Engineering Structures.	
CO3	Student will know about various smart materials.	

Course Name: PE III - New Engineering Materials		Course Code: CV1446
CO1	An ability to understand different high quality materials for Civil Engineering applications	
CO2	An ability to use engineering materials for better and durable Civil Engineering Structures	
CO3	An ability to utilize bio nondegradable materials for Civil Engineers	
CO4	An ability to understand the use of Composite sections for effective utilization of materials	

Course Name: PE III : Advanced R.C.C.		Course Code: CV1447
CO1	An ability to understand the importance of various structures like multistoried buildings, bridges, water tanks and retaining walls.	
CO 2	An ability to analyze the structures for various types of loading conditions as per Codal provisions	
CO 3	An ability to design various structures such as bridges, tanks, and retaining walls.	

Course Name: PE III : Remote Sensing & GIS		Course Code: CV1448
CO1	Explain the principles of Geoinformatics.	
CO2	Describe the process of data acquisition of satellite images and their characteristics.	
CO3	Illustrate knowledge of remote sensing and GIS in different civil engineering applications.	

Course Name: PE III : Urban Transportation Planning		Course Code: CV1451
CO1	Students understood about traffic forecasting and its effects on environment.	
CO2	Students understood the necessity and importance of Traffic regulations.	
CO3	Students understood the necessity and arrangement of street lighting.	
CO4	Students understood about planning process and traffic problems.	

Course Name: PE IV : Advanced Survey		Course Code: CV1452
CO 1	The students will be able to understand the advantages of electronic surveying over conventional surveying methods.	
CO 2	The student will be able to handle and understand the working principle of Advanced Electronic Devices and total Station.	
CO 3	The student will be able to understand and to apply knowledge of GPS, GIS and Remote Sensing technique / data for required purpose.	

Course Name: PE V – Advanced Foundation Engineering	Course Code: CV1458
CO1	An ability to understand various approaches of determining bearing capacity of shallow foundation.
CO2	An ability to predict and calculate settlement of foundation.
CO3	An ability to design deep and machine foundations

Course Name: PE V – Advanced Foundation Engineering	Course Code: CV1458

2. M.Tech Structural Engineering (PG)

Program Educational Objectives (PEOs) of M. Tech. (Structural Engineering)

- **PEO-1-**To provide fundamental knowledge of Civil engineering in general and Structural Engineering in specific for better understanding of various Structural systems.

- **PEO-2-**To provide understanding of and ability to apply Structural engineering knowledge and approaches to generate effective engineering solutions.

- **PEO-3-**To provide academic environment to work independently and in a team , to initiate research in demanding areas and develop a habit of upgrading knowledge of advancements in technologies for sustainable development in conjunction with contemporary issues.

- **PEO-4-**To inculcate professional and ethical attitude, effective communication skills to become successful professional and understand responsibility towards wellbeing of society.

Program outcomes (POs)of M. Tech. (Structural Engineering)
- **PO-1-**An ability to independently carry out research /investigation and development work to solve practical problems in Structural Engineering

- **PO-2-**An ability to write and present a substantial technical report/documents in the area of structural engineering

- **PO-3-**An ability demonstrate advances in structural engineering.

- **PO-4-**An ability to learn and apply advanced engineering techniques and software tools

- **PO-5-**An ability to acquire professional, ethical and responsible attitude towards development of the profession and society.

- **PO-6-**An ability to adapt lifelong learning to upgrade knowledge and competence continuously.

- **Course Outcomes PG M-Tech (Structural Engineering)**

- **First Year:-First Semester**

Course Code: CV3901	Course Name: - Theory of Elasticity and Elastic Stability
CO1	Demonstrate the knowledge of fundamental methods of elasticity for 2-D and 3D stress analysis
CO2	Analyze bending and torsional problems and apprise various theories to solve 2-D problems
CO3	Apply the basic knowledge of elastic stability to various structural elements
CO4	Explain and solve the problems of beam-column, column and built up column using the concept of elastic stability

Course Code: CV3902	Course Name: - Structural Dynamics
CO1	An ability to apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.
CO2	Ability to identify, formulate and solve engineering problems having motions varying with time. This will be accomplished by having students model, analyze and modify a vibratory structure, in order to achieve specified requirements.
CO3	Understanding professional and ethical responsibilities. This will be accomplished by emphasizing the importance of understanding how structural vibrations may affect safety and reliability of engineering systems.
CO4	An ability to Understand IS codes related to earthquake loading.
Course Code: CV3903	Course Name: - Lab : Structural Dynamics
CO1	An ability to understand the behavior of vibratory system during cyclic loading.
CO2	An ability to understand phenomenon like damping and its relevance in actual structuralapplications.
CO3	An ability to understand the effect of earthquake phenomenon on water media and subsoil.
CO4	An ability to understand provision of various Indian standards for design of structures from seismic safety point of view.

Course Code: CV3904	Course Name: - Matrix Analysis of Structures
CO1	Understand the different types of structures
CO2	Apply the matrix stiffness method to model the behavior of planar trusses, beams, and frames.
CO3	Analyze any multistoried building using Matrix Stiffness methods of structural analysis.
CO4	Recognize special effects on behavior of structures.
CO5	Implement the method developing their own computer program to analyze structures.

Course Code: CV3905	Course Name: - Lab:- Matrix Analysis of Structures
CO1	Apply the stiffness method for structural analysis.
CO2	Analyze continuous beams, plane truss, space truss, plane frame neglecting axial deformation, plane frame considering axial deformation, plane grids.

CO3	Recognize special effects on behavior structures.

Course Code: CV3906	Course Name: - Design of Substructures and Foundations
CO1	Students will be able to identify the type of foundations to be used for various site conditions
CO2	Students will be able to analyze and design different types of foundation structures.
CO3	Students will be able to draw RCC detailing and to prepare working drawing.
CO4	Students will be able to understand the importance of various codes used for different types of foundation structures.

Course Code: CV3907	Course Name: - Earthquake and Wind Effects on Structures
CO1	An ability to apply the knowledge of geological feature, plate tectonics in understanding occurrence of earthquake.
CO2	An ability to understand causes and sources of earthquake damages and possible response of structure and system to earthquake
CO3	An ability to understand characteristics of wind and its static and dynamic effects on structures
CO4	An ability to understand relevant I.S. codes and philosophy in design of earthquake& Wind resistant structure

Course Code: CV3908	Course Name: - Advanced Concrete Structures
CO1	An Ability to know provisions of relevant IS codes / IRC code required for design of advanced concrete structures such as water tank, bridges ,multistoried building
CO2	An ability to design advanced concrete structures such as water tank , bridge and culvert
CO3	An ability to understand the various methods of design of multistoried buildings, retaining wall.
CO4	An ability to draw RCC detailing of structures.

Course Code: CV3909	Course Name: - Lab : RCC Design Studio
CO1	An Ability to know provisions of relevant IS codes / IRC code required for design of advanced concrete structures such as water tank, bridges ,multistoried building
CO2	An ability to design advanced concrete structures such as water tank , bridge and culvert
CO3	An ability to understand the various methods of design of multistoried buildings.
CO4	An ability to draw RCC detailing of structures

First Year: Semester II:

Course Code: CV3915	Course Name: - Finite Element Method
CO1	An ability to derive element matrix equation by different methods by applying basic laws in structural analysis.
CO2	An ability to apply the knowledge of finite element method to solve simple problems.
CO3	An ability to extend the knowledge of finite element method to solve complex problems using various elements.

CO4	An ability to understand solution and modeling techniques used in finite element method

Course Code: CV3916	Course Name: - Lab: Finite Element Method
CO1	An ability to identify the information required to conduct a structural analysis using finite element software
CO2	An ability to interpret the solutions obtained from finite element analyses
CO3	An ability to have basic skills in using commercial finite element software and effective presentation of their analysis results
CO4	An ability to communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained

Course Code: CV3917	Course Name: - Theory of Plates and Shells
CO1	Demonstrate behavior of various plates
CO2	Analyze plates using different methods
CO3	Explain various theories of shells
CO4	Evaluate structural actions of shells using various theories

Course Code: CV3918	Course Name: - Advanced Steel Structures
CO1	An ability to understand the configuration (component of structures, civil\structural engineering drawing etc.) of the structure.
CO2	An ability to understand the effect of natural phenomenon (wind and earthquake), in structural engineering applications
CO3	An ability to analyze and design the advanced steel structures by applying the provision of Indian Standard Code

Course Code: CV3919	Course Name: - Lab: Steel Design Studio
CO1	An ability to apply the basic knowledge of structural steel.
CO2	An ability to develop the model (structure) in commercially available software, analyze and design it by applying appropriate loads
CO3	An ability to present the analysis and design results in schematic way of the desired structure

Course Code: CV3920	Course Name: - PE-I : New Engineering Materials
CO1	An ability to introduce different high quality materials for civil engineering applications
CO2	An ability to use engineering materials for better and durable Civil Engineering Structures

Course Code: CV3921	Course Name: - PE-I : Prestressed Concrete
CO1	Students will be able to apply basic concepts of prestressed concrete in construction industry.
CO2	Students will be able to identify, formulate and solve engineering problems pertaining to prestressed concrete.
CO3	Students will be able to Understand IS codes related to prestressed concrete.
CO4	Students will be able to design special prestressed concrete structures.

Course Code: CV3922	Course Name: - PE-I : Smart Structures and Applications
CO1	An ability to understand passive and active systems.
CO2	An ability to understand the characteristics and behavior of smart materials
CO3	An ability to understand control system and its applications
CO4	An ability to understand techniques of base isolation

Course Code: CV3923	Course Name: - PE-II : RC Tall Buildings
CO1	The students will be able to describe fundamental concept, principle and application of earthquake engineering.
CO2	The students will be able to analyze and design RCC structures with ductile detailing as per Indian standards.
CO3	The students will be able to apply technical design principles and techniques such as P-delta effect, soil structure interaction for a design of high rise structures.
CO4	The students will be able to apply various provisions for earthquake resistance design of structures as per Indian standards.

Course Code: CV3924	Course Name: - PE-II : Composite Structures
CO1	Students will be able to understand basic concepts and characteristics of Composite materials.
CO2	Students will be able to understand elastic behavior of lamina.
CO3	Students will be able to understand various failure theories.
CO4	Students will be able to analyse laminated plates under bending and vibration.

Course Code: CV3925	Course Name: - PE-II : RC Bridge Design
CO1	An ability to identify the types of bridge to be used for various site and loading conditions
CO2	An ability to understand applicability of IRC codes related to bridges
CO3	An ability to analyze and design slab bridges and its components

Course Code: CV3926	Course Name: - PE-III : Plastic Analysis & Design of Steel Structure
CO1	An ability to understand behavior of steel structure elements beyond yield point loading and basic concepts of plastic analysis
CO2	An ability to understand techniques for estimation of collapse loads on steel structures
CO3	To understand the effects of axial and shear forces on plastic moment of resistance
CO4	To understand philosophies of plastic design of steel structural elements

Course Code: CV3927	Course Name: - PE-III : Seismic Analysis and Design of Structures
CO1	An ability to apply basic concepts Earthquake resistant design in construction industry.

CO2	An ability to identify, formulate and solve engineering problems pertaining to earthquake effects on structures.
CO3	An ability to understand IS codes related to static as well as dynamic analysis of high rise buildings.
CO4	An ability to design special structures subjected to more effective earthquake forces

Course Code: CV3928	Course Name: - PE-III : Design of Industrial Structures
CO1	An expertise to understand planning of industrial structures.
CO2	The capability to analyse large span structures.
CO3	An expertise to understand stability of silos and bunkers under dynamic loads
CO4	The skill to analyse and design foundations for industrial structures

Second Year: Semester III:

Course Code: CV3939	Course Name: - Project Phase-I
CO1	An ability to understand the advances in structural engineering
CO2	An ability to understand the use of modern tools
CO3	An ability to work independently and in a team for effective communication
CO4	An ability to understand the importance of lifelong learning

Second Year: Semester IV:

Course Code: CV3940	Course Name: - Project Phase-II
CO1	An ability to understand the advances in structural engineering
CO2	An ability to solve real world structural engineering problems
CO3	An ability to understand the importance of lifelong learning and the use of modern tools
CO4	An ability to work independently and in a team for effective communication

3 .M. Tech. (Environmental Engineering)

Program Educational Objectives (PEOs) of M. Tech. (Environmental Engineering)

- **PEO-1-**To provide fundamental knowledge of Civil engineering in general and Environmental Engineering in specific for better understanding of various environmental systems.

- **PEO-2-**To provide understanding of and ability to apply environmental engineering knowledge and approaches to generate effective engineering solutions.

- **PEO-3-**To provide academic environment to work independently and in a team , to initiate research in demanding areas and develop a habit of upgrading knowledge of advancements in technologies for sustainable development in conjunction with contemporary issues.

- **PEO-4-**To inculcate professional and ethical attitude, effective communication skills to become successful professional and understand responsibility towards wellbeing of society.

Programme Outcomes of M. Tech Environmental Engineering Programme

- **PO-1-**An ability to carry out experimental investigation as well as use of software tools for conducting independently a research work

- **PO-2-**An ability to design various units and systems for treatments of water and wastewater, supply of water as well as collection of wastewater

- **PO-3-**An ability to write and present a substantial technical report/document as well as demonstrate communication and presentation skill.

- **PO-4-**An ability to understand impact of pollutants on environmental and ways means to control the pollution of environmental including using management tools.

Course Outcomes (CO)

First Year: Semester I:

Course Name: Environmental Chemistry and Microbiology	Course Code: CV3961
CO1	An ability to understand the concepts Environmental chemistry & to learn how the concepts of environmental chemistry can be put to practical applications
CO2	An ability to explain microbial technology in environmental engineering practices

Course Name: Lab Environmental Chemistry and Microbiology	Course Code: CV3962
CO1	An ability to understand importance of water quality standards
CO2	An ability to perform various physical and chemical tests on water sample
CO3	An ability to understand various biological tests performed on water sample and to perform a few biological tests on water

Course Name: Water Supply and Waste Water Collection System	Course Code: CV3963
CO1	An Ability to understand fundamental of design of the pipe in water distribution system and wastewater collection system
CO2	An Ability to understand different methods of analysis of pipe network for water distribution.
CO3	Ability to design of water distribution system and sewerage system

Course Name: Lab Water Supply and Waste Water Collection System	Course Code: CV3964
CO1	An Ability to understand fundamental of design of the pipe in water distribution system and wastewater collection system
CO2	An Ability to understand different methods of analysis of pipe network for water distribution.
CO3	Ability to design of water distribution system and sewerage system

Course Name: Municipal Water Treatment	Course Code: CV3965
CO1	An ability to understand the fundamentals related to water treatment
CO2	An Ability to design different water treatment Units

Course Name: Municipal Solid Waste Management	Course Code: CV3966
CO1	An ability to understand different characteristic of solid waste.
CO2	An ability to understand different methods of collection, transfer and transport of solid waste.

CO3	An ability to understand different Processing and disposal methods for solid waste.
Course Name: Municipal Waste water Treatment	**Course Code: CV3966**
CO1	An ability to understand basics of different wastewater treatment processes
CO2	An ability to understand working of different sewage treatment units
CO3	An ability to design different sewage treatment units.
CO4	An ability to understand different methods of treatment and disposal of bio-solids

First Year: Semester II:

Course Name: Industrial Wastewater Treatment and Reuse	**Course Code: CV 3975**
CO1	An ability to understand importance of industrial wastewater treatment.
CO2	An ability to understand the fundamentals of various treatment processes.
CO3	An ability to understand treatment methodologies for various industrial wastewaters.
CO4	An ability to design various treatment units for Industrial wastewater

Course Name: Environmental Management	**Course Code: CV 3976**
CO1	An ability to grasp the fundamentals and identify the tools used for Environmental Management
CO2	An ability to understand environmental impact assessment (EIA) as an environmental management tool
CO3	An ability to understand the evolution of environmental policies and laws and implications of international policies and laws for India.

Course Name: Air Quality Management	**Course Code: CV 3977**
CO1	An ability to understand air pollution and its control
CO2	An ability to understand various meteorological factors and its influence on air pollution.
CO3	An ability to understand the basic principles, equipment, and methods used to control particulate matter, gaseous emission and automobile emission
CO4	An ability to understand basics of urban air pollution, odour and noise pollution

Course Name: Rural Water Supply and Sanitation	Course Code: CV 3978
CO1	An Ability to understand the knowledge regarding rural water supply and sanitation scheme.
CO2	An Ability to understand different compact units of rural water treatment and supply.
CO3	An Ability to tell simple wastewater treatment for rural water supply
Course Name: PE-I : Hazardous Waste Management	Course Code: CV 3979
CO1	An ability to understand principle of methods given to hazardous waste.
CO2	An ability to understand the common functional elements of waste management system
CO3	An ability to suggest suitable waste processing technologies and disposal methods.

Course Name: PE-I : Water Resources Management	Course Code: CV 3980
CO1	An ability to understand water resources planning
CO2	An ability to understand water policies and application of remote-sensing.
CO3	An ability to understand different methods of conservation and recharging of water resources
CO4	An ability to Understand inter-basin transfer and EIA of water Resource development projects

Course Name: PE-I : Environmental Biotechnology	Course Code: CV 3981
CO1	An Ability to understand the fundamental concept of microbial biochemistry and biotechnology
CO2	An Ability to understand the Relationship between cell signalling and gene transcription.

Course Name: PE-I : Advanced Water Treatment	Course Code: CV 3982
CO1	An ability to understand the fundamental, scientific basis governing the design and performance of the treatment technologies.
CO2	An ability to understand the role of each unit operation
CO3	Process within typical treatment process trains and their interaction

Course Name: PE-II : Energy Conversion and Environment	Course Code: CV 3983
CO1	An Ability to Understand and apply basic concept of waste to energy technology and environmental protection.
CO2	An Ability to understand the concept of environmental appraisal, energy audit and assessment of energy potential of energy sources

| Course Name: PE-II : Applied Structure	Course Code: CV 3984
CO1	1. An Ability to design various pipes and associated structures.
CO2	2. An ability to analysis different loads conditions applicable for different environmental structures
CO3	3. An ability to design water tanks
CO4	An ability to understand importance of durability of water supply structures
Course Name: PE-II : Water Reuse and Recycling	**Course Code: CV 3985**
CO1	An Ability to understand the concept of sustainable water resources management as a foundation for water reclamation and reuse
CO2	An Ability to understand the various technologies and systems available for reclaimed water
CO3	An Ability to understand the Water reuse applications including agricultural uses, landscape irrigation, industrial uses, environmental and recreational uses, groundwater recharge

| Course Name: Seminar	Course Code: CV 3986
CO1	An Ability to understand various aspects of presentation skills
CO2	An ability to carry out literature survey, compilation of literature data
CO3	An ability to understand effective technical paper writing

Second Year: Semester III:

Course Name: Project Phase-1	Course Code: CV 3989
CO1	An ability to understand the advances in Environmental engineering.
CO2	An ability to understand the use of modern tools.
CO3	Anabilitytoworkindependentlyandinateamforeffective communication
CO4	An ability to understand the importance of lifelong learning

Second Year: Semester IV:

Course Name: Project Phase-II	Course Code: CV 3990
CO1	An ability to understand the advances in Environmental engineering.
CO2	An ability to solve real world Environmental engineering problems
CO3	An ability to understand the importance of lifelong learning and the use of modern tools.
CO4	Anabilitytoworkindependentlyandinateamforeffective communication.
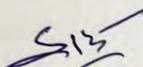
Dr.S.P.Raut
HoD, CE

Head
Department of Civil Engineering
Y. C. College of Engineering
NAGPUR–441 110
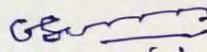
Dr.U.P.Waghe
Principal,YCCE

Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

4.Mechanical Engineering Department

Program Educational Objectives of the program (PEO)

- To prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs. (Preparation)

- Be competent with strong technological background to analyze data, formulate and undertake industrial problems and obtain viable solutions. (Core Competence)

- To prepare students with engineering breadth to innovate, create and design novel systems and to contribute in providing solutions to real-life problems. (Breadth)

- Be Competent for effective communication, in management and in professional skills and ethics. (Professionalism)

- To provide opportunity to the students to expand their horizon beyond mechanical engineering which enable them to understand the significance of life-long learning in global perspective. (Learning Environment)

Program Outcomes (PO)

- **Engineering knowledge**: An ability to apply knowledge of mathematics, science and engineering.
- **Problem Analysis:** Ability to design and conduct experiments, as well as to analyze and interpret data.
- **Design and Development of Solution:** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- **Conduct investigation of Complex problems:** Knowledge of Research methodology, data interpretation to provide valid Conclusion of contemporary issues.
- **Modern Tool Usage**: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- **The Engineer and Society:** Ability to Apply reasoning informed by the contextual knowledge to asses health, safety and cultural issues relevant to the professional engineering practices.
- **Environmental and Sustainability**: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
- **Ethics:** An understanding of professional and ethical responsibility.
- **Individual And team Work:** An ability to function on multidisciplinary teams.
- **Communication:** An ability to communicate effectively.
- **Project management and Finance:** An ability to demonstrate knowledge and understanding of engineering and management principles and application to the project work.
- **Life-long learning.** Recognition of the need for, and an ability to engage in life-long learning.

Program specific Outcomes (PSO)

- An ability to demonstrate knowledge, technical skill and problem solving techniques in mechanical system design & analysis.

- An ability to develop, realize and operate systems in mechanical engineering domain.

Course Outcomes (UG)

Course Name: Engineering Mathematics-I	Course Code: GE-2101
CO-1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures
CO-2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.
CO-3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.
CO-4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name: Engineering Mathematics-II	Course Code: GE-2102
CO-1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
CO-2	Analyse the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals
CO-3	Use Matrix method to solve linear equations , evaluate eigen values - eigen vectors and its applications.
CO-4	Measure the statistical parameters and derive the equations of best fit curves

Course Name: Communication Skill	Course Code: GE-2107
CO-1	Explain the basics of communication process as well as identif y the barriers in communication.
CO-2	Classify and describe the different Speech Sounds of English Language.
CO-3	Apply different strategies and techniques of presentations, interviews and group communication.
CO-4	Drafting reports, memos and emails, considering the professional etiquettes and ethics with appropriate content and context.

Course Name: Social Science	Course Code: GE-2108
CO-1	Explain the basic concepts of Social Sciences.
CO-2	Describe the development of various Civilizations and their Culture.
CO-3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
CO-4	Explain Industrial Organization and Management.

Course Name: Engineering Physics Course Name: Engineering Physics (Lab.)	Course Code: GE-2105 and GE 2106
CO-1	Examine the intensity variation of light due to interference, diffraction and its applications.
CO-2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
CO-3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
CO-4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
CO-5	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name: Engineering Chemistry Course Name : Engineering Chemistry (Lab.)	Course Code: GE2103 and GE 2104
CO-1	Assess qualitative and quantitative aspects of water as a conventional material for industrial and domestic applications.
CO-2	Apply the knowledge of basic electrochemistry to understand battery technology, corrosion process and preventive techniques.
CO-3	Know the basics and assess analytical aspects of industrial materials like fuels and lubricants for efficient utilization.
CO-4	Recognize the significance of cement and advanced engineering materials in technological applications.
CO5	Analyze and generate analytical and instrumental techniques.

Course Name: **Engineering Mechanics** **Engineering Mechanics** **(Lab.)**	Course Code: CV-2101 - CV2102
CO-1	An ability to apply the concept of applied mechanics and can solve problems on planar force system for friction as well as frictionless surfaces.
CO-2	An ability to analyze pin jointed truss frame structure and beam structure analytically and graphic
CO-3	An ability to understand centroid, moment of inertia, product of inertia and mass moment of inertia and can find properties of surfaces.
CO-4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.

Course Name: Basic Electronics	**Course Code: EE 2101**
CO-1	Characterize Number systems, semiconductors, diodes, transistors and operational amplifiers.
CO-2	Design simple analog circuits
CO-3	Design simple combinational and sequential logic circuits
CO-4	Identify functions of digital multimeter, Bridges and transducers in the measurement of physical variables

Course Name: Introduction to Computer Programming **Introduction to Computer Programming** **(Lab.)**	**Course Code: IT2101** **Course Code: IT-2102**
CO-1	Understand computer system, basics of algorithm & f lowchart, and demonstrate straight line program using basic „C" programming language constructs.
CO-2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
CO-3	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.
CO-4	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.

Course Name: Electrical Engineering Elect. Eng. Lab	Course Code: EL 2101 EL-2102 (Lab)
CO-1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.
CO-2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
CO-3	Explain construction, working, testing, and applications of various electrical machines.
CO-4	Analyse performance of various electrical machines.
CO-1	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name: Engineering Graphics Engineering Graphics Lab.	Course Code: ME2101 ME-2102
CO-1	Transform orthographic projections into isometric projections and vice versa.
CO-2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
CO-3	Built the development of lateral surfaces of various solids and their cut section.
CO-4	Predict the intersections and intersections of various solid objects.
CO-1	Justify the use of software tools used for Two dimensional drawings.

Course Name: Workshop Practice	Course Code: ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications
CO2	Understand the fitting tools, measuring instruments, machineries and its applications
CO3	Understand the smithy tools furnaces and hand and power forging equipment‟s
CO4	Understand Gas and Electric welding processes, utility, tools and its applications

Course Name: Engineering Mathematics III	Course Code:GE2201
CO1	Estimate the Calculus of Numerical Function.
CO2	Determine transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations.
CO3	Discuss the nature of periodic function and express it in terms of series.
CO4	Use appropriate method/s to solve partial differential equations

Course Name: Material Science and Metallurgy	Course Code:ME2201
CO1	Student will be able to distinguish microstructure and analyse the effect of Crystalline nature of metals
CO2	Student will be able to construct Iron-Iron carbide equilibrium diagram and analyse microstructure, general properties and heat treatment practices of commercial steels and Cast Iron.
CO3	Student will be able to analyse and implement suitable heat treatment processes
CO4	Student will be able to perceive the basics of powder Metallurgy for powder metallurgical components

Course Name: Material Science and Metallurgy LAB	Course Code:ME2202
CO1	Students will be able to create specimen for metallographic examination
CO2	Students will be able to analyze the microstructure and investigate various properties of ferrous and non-ferrous Materials
CO3	Students will be able to test different Engineering Materials

Course Name: Fluid Mechanics Fluid Mechanics LAB	Course Code: ME-1205 ME 1206
CO-1	The student will be able to evaluate various fluid properties and analyze hydrostatic forces acting on submerged flat bodies
CO-2	The students will be able to classify and analyze the various flow pattern, and will be able to evaluate velocity and acceleration using fluid kinematics.
CO-3	The students will be able to analyze and solve ideal flow and real flow problems by applying bernoulli's equations and momentum equations. The students will also be able to describe and analyze the fluid flow over bodies.
CO-4	The students will be able to analayze the flow, through pipes. The students will be able to evaluate head losses, discharge, power lost etc for the flow through pipes with and without fittings

Course Name: Machining process Machining process Lab	Course Code:ME2203 ME2204
CO-1	Distinguish among various cutting tool materials and tool geometries.

CO-2	Examine the different processes and machine tools for cylindrical surface machining.
CO-3	Differentiate various machining processes and conditions for flat surface machining using SPCT.
CO-4	Justify machining processes for flat surfaces marching using MPCT.

Course Name:Mechanics of Materials Mechanics of Materials LAB	Course Code: ME2205 ME2206
CO-1	Describe the basic concepts of stress, strain and their variations under different types of loading
CO-2	Apply the basic concepts involved in mechanics of materials,
CO-3	bending moment, shear force, stresses in beams to solve complex problems
CO-4	Analyze strain, impact loading and crippling load
CO-5	Evaluate the torsional shear stress in shaft and solve the problem on Slope and deflection in beams under different loading and support conditions.

Course Name:KINEMATICS OF MACHINERY	Course Code:ME2207
CO1	Students should be able to understand the mechanical system, mechanism its components, relative motion between them.
CO2	Students should be able to determine the velocity & Acceleration of a kinematic link of a given mechanism and various forces coming on links in static condition.
CO3	Students should be able to identify the motion as per the application & draw the profile of a camfollowers mechanism.
CO4	Students should be able to understand the kinematics of gears and gear train. They should be able to select an appropriate gear system.

<mark>Second Year: Semester IV:</mark>

Course Name: - Advanced Mathematical Techniques	Course Code:ME2204
CO1	Utilize numerical techniques to obtain approximate solutions of mathematical equations
CO2	Measure the Statistical parameters for random variables
CO3	Explain the basic concept of fuzzy sets, Relations and fuzzy logic
CO4	Design and determine the solution of linear programming problems

Course Name: Engineering Thermodynamics	Course Code:ME2212
CO1	Apply the laws of thermodynamics for the analysis of thermodynamic systems to evaluate energy interactionin various processes s.
CO2	Evaluate the performance of cyclic devices, change in the entropy and availability in various processes applying the laws of thermodynamics.

CO3	Examine various thermodynamic parameters in the processes with phase change using steam tables, charts and relations applying the laws of thermodynamics.
CO4	Apply the laws of thermodynamics for the analysis of thermodynamic cycles.

Course Name: Design of machine elements	**Course Code:** ME 2251
CO1	Student will be able to apply the knowledge of design principal in machine components.
CO2	Student will be able to Design and analyze various joints i.e., Welded joints, Bolted joints and Riveted joints.
CO3	Student will be able to Learn the design principals of power screw, springs, clutches and brakes.
CO4	Student will be able to Apply principal of design of pressure vessel and power transmission shafts.

Course Name: Machine Drawing	**Course Code:** ME 2253
CO1	Apply standards practices and conventions in machine drawing
CO2	Draw a Orthographic and Isometric drawing
CO3	Preparing and visualizing detailed drawing of various machine components
CO4	Create a 2D and 3D using CAD software with due manufacturing consideration.

Course Name: Manufacturing process II **Manufacturing process II LAB**	**Course Code: ME2254** **2255**
CO-1	The student will be able to illustrate the basics of moulding practices and various casting process .
CO-2	The student will be able to illustrate CUPOLA and other furnaces.
CO-3	The student will be able to Elaborate and classify different welding processes.
CO-4	The student will be able to discuss various SMW processes

Course Name: Mechanical Measurement and Metrology **Mechanical Measurement and Metrology LAB**	**Course Code:** ME2256 **ME2257**
CO-1	The student will be able to Demonstrate the basic knowledge of measuring Instruments and evaluate various characteristics.
CO-2	The student will be able to Select proper measuring instruments and use it for measuring various parameters
CO-3	The student will be able to design limit gauges & tolerance charts.
CO-4	The student will be able to Evaluate statistical process control and acceptance sampling procedures to improve quality of process.

Course Name: Fundamental of Management	Course Code:GE2311
CO1	Explain the Legal provision and Functions of Management.
CO2	Analyze the role of Human Resource and Financial Management in the organization.
CO3	Analyze the project life cycles.
CO4	Identify tools and techniques for the marketing of goods and services

course Name: heat transfer heat transfer lab	Course Code:ME2301 ME2302
CO-1	Analyze and solve the problems of unidirectional steady state heat conduction systems.
CO-2	Investigate and apply the empirical correlations in convection and phase change processes to estimate the heat transfer coefficient.
CO-3	Design & analyze the heat exchangers with LMTD & ϵ-NTU methods
CO-4	Examine and evaluate the net thermal radiation exchange between surfaces and estimate radiation view factors using tables, graphs and the view factor relationships

Course Name: Operation Research Techniques	Course Code: ME2315
CO1	Apply basic operations research techniques to formulate given situation as LLP and solving by graphical & simplex method.
CO2	To Solve transportation and Assignment Models and analyse the concept of dynamic programming to Solve problems of discreet and continuous variables.
CO3	Analyze projects for minimum total cost and smooth level of resources.
CO4	Evaluation of different replacement policies and its application in operation research and analyse of the application of simulation, inventory control model and waiting line mode.

Course Name: Applied Thermodynamics	Course Code: ME- 2307
CO1	Students shall be able to describe and analyze the basic principles of compressible fluid flow and apply those principles to its applications.
CO2	Students should illustrate and analyze Steam nozzle, steam turbine and condenser used in thermal power plants.
CO3	Students should able to illustrate and evaluate gas turbine cycle, its classification, and its application in power plant.
CO4	Students should able to evaluate gas turbine cycle, and its application to jet propulsion.

Course Name: OE-1: Automobile Engineering	Course Code: ME-1317

CO1	Student will be able to analyze various systems of Engine, its function including fuel supply, cooling and lubrication system in vehicle.
CO2	Student will be able to describevarious power transmission systems from clutch to wheel in vehicle.
CO3	Student will be able to evaluate and describecontrol systems like steering and brakes in vehicle.
CO4	Student will be able to illustrate and describe the necessary electrical and luxurious systems and safety system in vehicle.

Course Name:DYNAMICS OF MACHINERY	Course Code:ME1323
CO1	Students should be able to understand the mechanical system, mechanism its components, relative between them.
CO2	Students should be able to determine the relative velocity & Acceleration of a kinematic link of a given mechanism and various forces coming on links in static condition.
CO3	Students should be able to identify the motion as per the application & draw the profile of a camfollowers mechanism.
CO4	Students should be able to understand various types of Gears used in Machine terminologies and concepts of velocity ratios in gear trains.

Course Name: DYNAMICS OF MACHINERY LAB	Course Code: ME1324
CO1	Students will be able to: Differentiate static anddynamic forces on different machines and mechanisms.
CO2	Analyze the unbalanced in rotating & reciprocating machines and corrections required to balance the same.
CO3	identify the vibrations in different machines.
CO4	Evaluate and justify vibrations.

<mark>Third Year: Semester VI:</mark>

Course Name: OE-II: Power Generation Engineering	Course Code:ME1333
CO1	Student will be able to describe basics of power generations systems.
CO2	Student will be able to analyze various conventional & non-conventional power plants.
CO3	Student will be able to analyze and examine combined operations of different power plants.
CO4	Student will be able to evaluate and describeHydroelectric power plant nuclear power plant

Course Name: Energy Conversion	Course Code:ME1310
CO1	The student will be able to describe and analyze the working of compressors.
CO2	The student will be able to describe and analyze the working of I.C.Engines
CO3	The student will be able to describe and analyze the working of Refrigeration systems

CO4	The student will be able to define evaluate Psychromatic properties and; describe and analyze the air conditioning processes

Course Name: COMPUTER AIDED DESIGN		Course Code:ME1312
CO1	Distinguish the various CAD CAM tools and also evaluate criteria for CAD CAM systems	
CO2	Design 2D and 3D Transformation matrices	
CO3	Calculate and analyse the parametric equations for wire frame. surface and solid modeling entities	
CO4	Design the applications of modeling and evaluate data exchange formats	

Course Name:COMPUTER AIDED DESIGN LAB		Course Code:ME1312
CO1	Execute transformation through C++ prgramming language	
CO2	Apply appraches of sketcher modeling for developing CAD Model	
CO3	Apply appraches of part modeling for developing CAD Model	

Course Name: TOTAL QUALITY MANAGEMENT		Course Code:ME1331
CO1	Develop an understanding on quality management philosophies and frameworks.	
CO2	Develop in-depth knowledge on various tools and techniques of quality management.	
CO3	To Evaluate the applications of quality tools and techniques in both manufacturing and service industry	
CO4	Ability to use quality management methods analyzing and solving problems of organization.	

<mark>Fourth Year: Semester VII:</mark>

Course Name: Production Management		Course Code: ME1447
CO1	Ability to estimate and evaluate manage production system using work study.	
CO2	Ability to design and evaluate plant layouts	
CO3	Ability to predict and evaluate future demand using forecasting.	
CO4	Ability to estimate production costing and apply by judging production planning and control.	

Course Name: (PE-1) REFRIGERATION AND CRYOGENICS		Course Code:ME1469
CO1	The student will be able to describe, analyze and evaluate Vapour Compression Refrigeration System.	
CO2	The student will be able to describe and analyze other refrigeration system such as Vapour Absorption Refrigeration System, Electrolux refrigeration system, steam jet refrigeration systems, thermoelectric refrigeration and vortex tube refrigeration	

CO3	The student will be able to describe, analyze and evaluate Air Cycle Refrigeration Systems.
CO4	The student will be able to describe and analyzeCryogen ic Systems.

Course Name: (PE-2) Renewable Energy System	Course Code:ME1410
CO1	Students will be able to apply the use of solar energy for the benefit of the society.
CO2	Students will be able to understand the better awareness of potential of Biogas and gasifiers also its use for the society.
CO3	Students will be able to understand the better awareness of potential of wind energy. Geothermal energy .
CO4	Students will be able to understand the better awareness of potential of ocean wave energy and tidal energy, MHD generation

Course Name: (PE-3)I.C.Engines	Course Code: ME-1419
CO1	Student should able to analyze basic working cycles, construction and and systems of I.C. Engines.
CO2	Student should able to analyze fuels, combustion process, pollution and its control of engines.
CO3	Student should able conduct a trial for Engine performance evaluation.

Course Name: Advanced Manufacturing Techniques	Course Code: ME 1456
CO1	Distinguish the various nontraditional manufacturing process based on energy sources.
CO2	Evaluate various advanced manufacturing process for new materials and the requirements of complex features on the basis of various parameters.
CO3	Justify the various advanced welding and bonding techniques as per the applications.
CO4	Evaluate the application of various advanced manufacturing techniques in industries

Course Name: Management Information Systems	Course Code: ME1443
CO1	Differentiate the nature, scope and the role of MIS in an organization.
CO2	Examining the system for processing the information.
CO3	Compose the DSS to solve the managerial problems.
CO4	Justify the application using MIS tools.

Course Name: Management Information Systems LAB	Course Code: ME1444
CO1	Differentiate the nature, scope and the role of MIS in an organization.
CO2	Examining the system for processing the information.
CO3	Apply the MIS tools for various application

Course Name: ENGINEERING OF PLASTICS	Course Code:ME1404
CO1	Students will be able to select the suitable plastic material for given application.
CO2	Students will be able to select suitable plastic processing technique.
CO3	Students will be able to select suitable machining and joining process for plastic components.
CO4	Student will be able to implement suitable processes for manufacturing various composite products.

Course Name: DESIGN OF MECHANICAL DRIVES	Course Code:ME1448
CO1	Describe the design process, material selection & calculations of stresses in flat belt, V belt, chain drive and rope drive, and finding its failure criteria.
CO2	Design the various gear drive such as spur, helical, worm & worm wheel and bevel gears, and finding its failure criteria.
CO3	Summarize the knowledge on shafts, coupling and flywheel and finding its failure criteria.
CO4	Evaluate the radial and thrust load for journal bearings, antifriction bearings and finding its failure criteria.

Course Name:PE-I:Tool Design	Course Code: ME1401
CO1	Student will be able to explain the fundamentals of Tool Design
CO2	Design various cutting tools, dies, Jigs & Fixtures and Forging dies
CO3	Evaluate the failure modes of tools and cost estimation
CO4	Compose planning for manufacturing of tools for various parts

Course Name: EL I: Material Handling System	Course Code: ME 1402
CO1	Explain the various typs of Material handling systems.
CO2	Design the various rope and chain assisted material handling systems
CO3	Explin various attachments, drives and safety components of material handling system
CO4	Analyze and select various material handling systems for different material handling situations

Course Name: EL III: Machine Tool Design	Course Code:ME1476
CO1	Explain the drives and mechanisms of machine tools
CO2	Design Gear boxes of machine tools
CO3	Design machine tool structures, guide ways and power screws, spindles and supports of machine tools.
CO4	Test the machine tools and examine the control system of machine tools.
Course Name: EL III: Machine Tool Design LAB	Course Code:ME1477
CO1	describe the drives and mechanisms of machine tools
CO2	design Gear boxes of machine tools

CO3	design machine tool structures, guide ways and power screws, spindles and supports of machine tools
CO4	describe testing and control system of machine tools

Course Name:FEM	Course Code:ME1406
CO1	Evaluate the fundamentals of Finite Elements Method.
CO2	Analyze the mechanical engineering problems.
CO3	Evaluate the stresses, strains and deformation in simple machine elements and design solutions for simple problems.
CO4	Build the solutions using the commercial softwares for simple machine elements.

Course Name: FEM LAB	Course Code:ME1406
CO1	Study, analyse and develop the fundamentals of Finite Elements Method for mechanical engineering problems
CO2	Evaluate the stresses, strains and deformation in simple machine elements and design solutions for simple problems.
CO3	Build the solutions using the commercial software"s for simple machine elements.

Course Name: VIBRATION VIBRATION LAB	Course Code:ME1415 ME1416
ME1415 ME1416 CO1	Analyze the various types of vibrations
ME1415 ME1416 CO2	Evaluate vibrations and carry out its analysis
ME1415 ME1416CO3	Predict/judge vibration parameters and evaluate through different approaches for multidegree freedom system
ME1415 ME1416CO4	Form and work on transformation of matrices for vibration for evaluating frequencies

Course Name:CIM	Course Code:ME1417
CO1	The Students will have ability to design and evaluate experimentation on CNC machines.
CO2	Desiging of GT cell layouts for transforming into flexible manufacturing system.
CO3	The students will be able to compose and transform robot programs various industrial applications.
CO4	The students will have ability to justify CAPP and CAQC to design computer integrated manufacturing

Course Name: project phase I	Course Code: ME1433
CO1	Concept and Objective of Project
CO2	Preliminary Approach & Literature Survey
CO3	Innovativeness,Technical Skills
CO4	Presentation & Reasoning Skills

Course Name: Automation in Production	Course Code:ME1435
CO1	The students will have ability to design and evaluate product layout using line balancing
CO2	The students will be able to compose and evaluate CNC Programs.
CO3	The students will be able to examine use of robot and automated material to design automated systems
CO4	The students will be able to design GT cells to build FMS.

Course Name: EL V:PRODUCT DESIGN AND DEVELOPMENT	Course Code: ME 1455
CO1	Student will be able to Evaluate the product life cycle
CO2	Student will be able to Analyze and select the materials and manufacturing processes for designed product
CO3	Student will be able to Evaluate the product for different design criteria like robust design, benchmarking, DFX,etc and estimate the product costing
CO4	Student will be able to Explain the various prototyping methods and its economics

Course Name: (PE-4) Industrial Fluid Power	Course Code: ME-1437
CO1	To investigate the hydraulic fluids and apply the fluid power laws and principals for analysis of simple fluid power system.
CO2	To identify, analyze, and justify selection of suitable components of fluid power system for specific applications based on its function, performance and working characteristics.
CO3	To design and examine the fluid power system and to compose and interpret its circuit diagrams using standard symbols.
CO4	To examine the fluid piping and fittings, safety measures, maintenance, and trouble shooting for fluid power systems.

Course Name: (PE-4) Vehicle Engineering	Course Code: ME-1441
CO1	Student will be able to analyze various systems of Engine, its function including fuel supply, cooling and lubrication system in vehicle.
CO2	Student will be able to describe various power transmission systems from clutch to wheel in vehicle.
CO3	Student will be able to evaluate and describe control systems like steering and brakes in vehicle.
CO4	Student will be able to illustrate and describe the necessary electrical and luxurious systems and safety system in vehicle.

Course Name: Advance Welding Techniques	Course Code: ME1460

CO1	Student can be able to Justify the concept of advance welding processes applicable to industry.
CO2	Student can be able to examine the parameters needed for welding to increase the durability of product.
CO3	Student can be able to differentiate the concept of soldering and brazing and cutting process through welding.
CO4	Student can be able to evaluate welding defect through welding testing method.

Course Name: OPTIMISATION TECHNIQUES	**Course Code:** ME1475
CO1	Apply basic operations research techniques to formulate given situation as LLP and solving by graphical & simplex method.
CO2	To Solve transportation and Assignment Models and analyse the concept of dynamic programming to Solve problems of discreet and continuous variables.
CO3	Analyze projects for minimum total cost and smooth level of resources.
CO4	Evaluation of different replacement policies and its application in operation research and analyse of the application of simulation, inventory control model and waiting line mode.

Course Name: EL IV: CNC & Robotics CNC & Robotics LAB	**Course Code:** ME 1439 ME1440
CO1	Explain the structure of NC,CNC and DNC
CO2	Design the tooling of CNC and compose the program for CNC
CO3	Explain the structure and kinematics of Robot
CO4	Explain the various grippers and sensors, Design the applications and Compose the programe for Robot

Course Name: EL V: Value Engineering	**Course Code:** ME 1453
CO1	Explain the various types of Values and functions
CO2	Evaluate the product life cycle.
CO3	Analyze the project selection and estimate life cycle costs.
CO4	Evaluate and improve value of product/system by designing and critically analyzing the VE job plans and othe VE/VA techniques.

Course Name:(PE-5) Power Plant Engineering	**Course Code:**ME1457
CO1	Student will be able to understand the various Thermal power plant characters.
CO2	Student will be able to understand arrangement of power generation systems and components used in Hydraulic power plants.
CO3	Student will be able to undertake power load analysis & Economic analysis of power generations systems.
CO4	Student will be able to understand the Nuclear, Combine cycles and nonconventional power plants.

Course Name: PE-V : Air Conditioning	Course Code:ME1480
CO1	Student will be able to evaluate various psychometric properties
CO2	student will be able to evaluate and analyse Psychometric process
CO3	The student will be able to describe human comfort parameter and evaluate various air conditioning load as per the human comfort and
	Industrial requirement .
CO4	The students will be able to describe various Air conditioning accessories, components, air distribution

Course Name: Design of experiments by taguchi method	Course Code: ME1452
CO1	Calculate and represent Frequency Distribution, Histograms and Probability distribution
CO2	Design the experiments
CO3	Distinguish and analyze the different optimization techniques.
CO4	Analyze the variance in observation data.

5. M.Tech Robotics and Automation

Program Educational Objectives (PEOs) of M. Tech.

- To impart in depth knowledge to students in the current technologies in CAD, CAM and CAE and toequip them for research and professional development

- To develop analytical problem solving capabilities to develop practicable solutions to engineeringproblems

- To create technical ability in students by imparting hands on experience on software and advancedmanufacturing machines

Program outcomes (POs)of M. Tech.

- An ability to analyze mechanical components/systems for critical analysis and improvement indesign.

- An ability to apply knowledge and skills to develop solutions in the field of CAD/CAM.

- An ability to handle sophisticated machines & instruments for carrying out analysis & research.

- An ability to develop and execute programs for advanced manufacturing systems.

- An ability to function in a multidisciplinary team for design and development of sophisticatedmechanical system.

- An ability to develop proficiency in communication of technical and research work.

Course Outcomes (CO)

(PG):First Year:

Semester I:

Course Name: ME 1901	Course Code: ME 1901
CO1	Demonstrate the knowledge of applied elasticity to solve simple problem.
CO2	Select the appropriate experimental technique, apply it and interpret the results.

Course Name: Computer Integrated manufacturing	Course Code: ME 1902
CO1	Demonstrate the he knowledge of working and integration of CIM components
CO2	Apply the fundamentals of group technology and flexible manufacturing system for CIM.
CO3	Analyze and Select appropriate automated material handling and storage system.
CO4	Plan and develop the processes for manufacturing using advanced

Course Name: Computer Graphics and Solid Modeling	Course Code:ME 1903
CO1	Demonstrate the knowledge of working for the CAD system.
CO2	Ability to apply approaches of geometric modelling for developing CAD model.
CO3	Demonstrate knowledge of various data exchange standards for

Course Name :Lab: Computer Graphics and Solid Modeling	Course Code:ME•1904
CO1	Demonstrate the knowledge and working of CAD system.
CO2	Will have ability to apply approaches of geometric modeling for developing CAD model.

Course Name: CNC Technologies	Course Code:ME•1905

CO1	Demonstrate the knowledge of CNC machines.
CO2	Design and implement CNC program for making simple mechanical components using CNC machines.
CO3	Demonstrate the knowledge of integration of CNC machines with CIM systems

Course Name:: CNC Technologies (Lab)	Course Code: ME•1906
CO1	Demonstrate the knowledge of CNC machines.
CO2	Design and implement CNC programme for making simple mechanical components using CNC machines.

Course Name: Project Engineering (PE-I)	Course Code: ME•1907
CO1	Apply planning and execution techniques for projects. (II). (III.
CO2	Demonstrate knowledge of industrial and plant design.
CO3	Function in multidisciplinary team for design, development planning and execution of project

Course Name: Tool Design	Course Code: ME1908
CO1	Learn various cutting tools and tooling required for manufacturing.
CO2	Design these tools and tooling"s.
CO3	Design and draw the tooling CAD/CAM.

Course Name: Tool Design (Professional Elective •I)	Course Code: ME•1908
CO1	Learn various cutting tools and tooling"s required for manufacturing.
CO2	Design these tools and tooling"s.
CO3	Design and draw these tooling using CAD/CAM.
CO4	Apply the knowledge of tool design while working on shop floors.

Course Name: Object Oriented Programming (Professional Elective •I)	Course Code: ME•1909
CO1	Demonstrate the knowledge of data structures.
CO2	Update data structures and data files.
CO3	Select and apply appropriate technique to solve engineering problem.

Course Name: Reliability Engineering (Professional Elective I)	Course Code: ME1910
CO1	Analyze the failure of component/systems to identify the underlying failure model.
CO2	Calculate the system reliability from component reliability.
CO3	Test the components/systems to find reliability and suggest improvements.
CO4	Demonstrate the application of availability, maintainability

Course Name: Robotics	Course Code: ME•1911
CO1	Demonstrate the knowledge of Robots and their applications.
CO2	Design of Robot for Simple Applications.
CO3	Program the Robot for Industrial Application.
CO4	Integrate Robot with CNC machines in CIM

Course Name: Modeling & Simulation	Course Code: ME•1912
CO1	The students will be able to analyze the dynamic system for its time Response and stability.
CO2	The students will be able to simulate various discrete and process Control systems.

Course Name: Finite Element Method	Course Code: ME•1913
CO1	(I).Analyze the dynamic system for its time response and stability.
CO2	The students will be able to simulate various discrete and process control systems.

Course Name: Lab: Finite Element Method	Course Code: ME1914
CO1	Apply knowledge of theory of elasticity for solving simple problems
CO2	Assemble global stiffness matrix carry out FEA and interpret the results for common mechanical, Thermal analysis problems.

Course Name: Artificial Intelligence	Course Code: ME1915
CO1	Apply representation techniques and problem solving strategies to different AI applications.
CO2	Demonstrate knowledge of processes involved in expert system and in building system
CO3	Able to write logical inference algorithm.

Course Name: Seminar	Course Code: ME1916
CO1	Identify the topic for detailed study.
CO2	Conduct literature survey on the topic identified and identify research Papers for detailed study.
CO3	Demonstrate the knowledge gained from study of research papers by preparingaseminarreportandgivingapresentationbeforeseminarreviewcommittee.

Course Name: Product Data Management	Course Code: ME1917
CO1	Demonstrate the knowledge of database structure.
CO2	Design the database model with constraints.
CO3	Apply expert system for industry.

Course Name: PE-III Mechatronics	Course Code: ME1918
CO1	Demonstrate the knowledge of Mechatronics systems and components.
CO2	Analyze and select proper sensors and actuators for Mechatronics system
CO3	Demonstrate the knowledge of digital controllers and their interfacing with input and output devices.
CO4	Apply soft computing techniques for advancement of Mechatronics systems

Course Name: PE-II Machine Tool Design	Course Code: ME1919
CO1	Demonstrate the fundamentals of machine tool design.
CO2	Design speed and feed gearbox.
CO3	Design overall structure of machine tool along with guide ways, Power screws and spindles.

Course Name: PE-II Plant design	Course Code: ME1920
CO1	Design pressure vessels and mountings for process industries
CO2	Design storage tanks and heat exchangers for process industries
CO3	Design valves and piping systems for process industries
CO4	Analyze the piping systems to identify problems.

Third Semester:

Course Name:	Course Code: ME1921
CO1	Implement product development.
CO2	Select proper material for product.
CO3	Select proper manufacturing process

Course Name: Project Phase-I	Course Code: ME1922
CO1	Identify the problem area for project work
CO2	Carry out literature survey and collect all there relevant literature.
CO3	Define the problem
CO4	Prepare a plan of and schedule of work to solve the above problem.
CO5	Prepare a detailed report and present before the committee

Course Name: Computational Fluids Dynamics	Course Code: ME1923
CO1	Formulate the mathematical models by CFD equations for various applications in the field of fluid dynamics and heat transfer.
CO2	Students will be able to apply the various CFD equations and basics of discretization to analyze various applications in fluid dynamics and heat transfer
CO3	Students will be able to select proper numerical methods and solve

Course Name: Design Optimization Technique	Course Code: ME1924
CO1	Select and apply suitable optimization technique.
CO2	Interpret the results for decision making to optimize the system.
CO3	Optimally design various mechanical components.

Course Name: PE-III Rapid Prototyping	Course Code: ME1925
CO1	Demonstrate the use of R.P. for product development.
CO2	Demonstrate the knowledge of R.P. process.
CO3	Demonstrate the knowledge of construction, working and applications Of R.P. machines.
CO4	Demonstrate the knowledge of rapid tooling and rapid manufacturing

Course Name: Design for Manufacturing and Assembly	Course Code: ME1926
CO1	To learns general rules of manufacturability, criteria's for material selection for various processes.
CO2	To learn methods of casting, joining, different welding techniques, Different forging processes.
CO3	To apply the knowledge of design of manufacturing and assembly in industries and on the field.

Dr.J.P.Giri

HoD,ME

Dr. Jayant P. Giri
Associate Professor
Deptt. of Mechanical Engg.
Y.C.C.E., Nagpur

Dr.U.P.Waghe

Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

6.Department Of Electrical Engineering:

Programme Educational Objectives (PEO)

- **PEO-1-**Graduate will be able to demonstrate technical competency and leadership to become successful professionals

- **PEO-2-**Our graduates will have solid technical foundation for solving engineering problems associated with multidisciplinary field in general and electrical engineering in particular

- **PEO-3-**Our graduates will be able to innovate, create and design novel systems to contribute for sustainable development to real life problems

- **PEO-4-**Our graduates will have successful professional carriers in industry, government and academic as electrical Engineer

- **PEO-5-**Our graduate will continue to learn and advance their careers through participation in professional organizations, attainment of professional certification and seeking higher education

PROGRAMME OUTCOMES (POs)

PO-1- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO-2-**Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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

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

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

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

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

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

- **PO-10-**Communication: Communicate effectively on complex engineering activities with the

engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receiveclear instructions.

- **PO-11-**Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one''s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Program Specific Objectives (PSO):
- **PSO-1-**Interpret, identify, analyse and evaluate problems in power system operation, control and design.

- **PSO-2-**Demonstrate knowledge to develop, control and assess electrical and electronic systems.

Course Outcomes (CO) (UG)

Course Name: Engineering Mathematics I (T)	Course Code: GE2101
CO1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures
CO2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.
CO3	Evaluate the integrals of single, multiple variables and use it to find the dimensions of various geometrical figures.
CO4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name: Engineering Mathematics II (T)	Course Code: GE2102
CO1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
CO2	Analyse the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals
CO3	Use Matrix method to solve linear equations , evaluate eigen values - eigen vectors and its applications.
CO4	Measure the statistical parameters and derive the equations of best fit curves

Course Name: Communication Skill (T)	Course Code: GE2107
CO1	Explain the basics of communication process as well as identify thebarriers in communication.

CO2	Classify and describe the different Speech Sounds of EnglishLanguage.
CO3	Applydifferent strategies and techniques of presentations, interviewsand group communication.
CO4	Drafting reports, memos and emails, considering the professionaletiquettes and ethics with appropriate content and context.

Course Name: Social Science (T)	**Course Code: GE2108**
CO1	Explain the basic concepts of Social Sciences.
CO2	Describe the development of various Civilizations and their Culture.
CO3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
CO4	Explain Industrial Organization and Management.

Course Name: Engineering Physics (T/P)	**Course Code: GE2105/ GE 2106**
CO1	Examine the intensity variation of light due to interference, diffraction and its applications.
CO2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
CO3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
CO4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
CO1	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name: Engineering Chemistry (T/P)	**Course Code: GE2103/ GE 2104**
CO1	Assess qualitative and quantitative aspects of water as a conventional material for industrial and domestic applications.
CO2	Apply the knowledge of basic electrochemistry to understand battery technology, corrosion process and preventive techniques.
CO3	Know the basics and assess analytical aspects of industrial materials like fuels and lubricants for efficient utilization.

CO4	Recognize the significance of cement and advanced engineering materials in technological applications.
CO5	Analyze and generate analytical and instrumental techniques.

Course Name: Engineering Mechanics (T/P)	Course Code: CV2101/CV2102
CO1	An ability to apply the concept of applied mechanics and can solve problems on planar force system for friction as well as frictionless surfaces.
CO2	An ability to analyze pin jointed truss frame structure and beam structure analytically and graphic
CO3	An ability to understand centroid, moment of inertia, product of inertia and mass moment of inertia and can find properties of surfaces.
CO4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.

Course Name: Basic Electronics (T)	Course Code: EE 2101
CO1	Characterize Number systems, semiconductors, diodes, transistors and operational amplifiers.
CO2	Design simple analog circuits
CO3	Design simple combinational and sequential logic circuits
CO4	Identify functions of digital multimeter, Bridges and transducers in the measurement of physical variables

Course Name: Introduction to Computer Programming (T/P)	Course Code: IT2101/IT2102
CO1	Understand computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C" programming language constructs.
CO2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
CO3	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.
CO4	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.

Course Name: Electrical Engineering (T/P)	Course Code: EL 2101/EL2102
CO1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.
CO2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
CO3	Explain construction, working, testing, and applications of various electrical machines.
CO4	Analyse performance of various electrical machines.
CO5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name: Engineering Graphics (T/P) Engineering Graphics Lab.	Course Code: ME2101/ME2102
CO1	Transform orthographic projections into isometric projections and vice versa.
CO2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
CO3	Built the development of lateral surfaces of various solids and their cut section.
CO4	Predict the intersections and intersections of various solid objects.
CO5	Justify the use of software tools used for Two dimensional drawings.

Course Name: Workshop Practice (P)	Course Code: ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications
CO2	Understand the fitting tools, measuring instruments, machineries and its applications
CO3	Understand the smithy tools furnaces and hand and power forging equipment"s
CO4	Understand Gas and Electric welding processes, utility, tools and its applications

Course Name: Engineering Mathematics III (T)	Course Code: GE2201
CO1	Estimate the Calculus of Numerical Function.
CO2	Determine the transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations.
CO3	Discuss the nature of periodic function and express it in terms of series.
CO4	Use appropriate method/s to solve partial differential equations.

Course Name: Analog Electronics (T)	Course Code: EL2201
CO1	To identify the basic structure, characteristics and various operating modes of BJT
CO2	To Explain and Describe the various small signal parameters and its applications.
CO3	To demonstrate the knowledge to develop various power amplifier and oscillator circuit.
CO4	To analyse and evaluate the basic concept of Op-Amp circuit and its various applications.

Course Name: Electronics Engineering Workshop (P)	Course Code: EL2202
CO1	Explain the basics of electronic hardware system and to identify the active and passive electronic components.
CO2	Build hands-on training with familiarization, identification, testing, assembling, and dismantling of various components.
CO3	Test the electronic components like resistors, capacitors, transistors, UJT, JFET, different IC"s, etc. using analog and digital meters.
CO4	Design various systems and develop PCB fabrication skills making use of the various tools and instruments available in the Electronics Engineering Workshop.

Course Name: Electrical Machines (T/P)	Course Code: EL2203/EL2204
CO1	Explain and apply the basic fundamentals of Electromagnetism.
CO2	Develop phasor diagrams, classify 3 phase transformers, analyse and evaluate performance indices theoretically and experimentally and examine the need of parallel operation of transformers.
CO3	Explain and examine principle, construction, types, operation, speed control, characteristic and applications of DC machines and evaluate performance parameters of d.c. machines theoretically and experimentally.
CO4	Explain and examine principle, construction, operation, starting, speed control, applications and evaluate the performance indices of induction motors theoretically and experimentally.

Course Name: Network Analysis (T)	Course Code: EL2205
CO1	Define basic concepts related to the course of network analysis.

CO2	Select best possible method of circuit analysis for a given situation.
CO3	Apply a variety of circuit analysis methods including theorems and Laplace transform.
CO4	Design circuits for a given voltage, power, as well as for critical frequencies and two port parameters.

Course Name: Computer Programming (P)	Course Code: EL2206
CO1	
CO2	
CO3	
CO4	

Course Name: Electrical Measurement & Instrumentation (T/P)	Course Code: EL2207/EL2208
CO1	Explain the working of Electrical instruments and compute the value of Resistances, inductance and capacitance by using bridges.
CO2	Evaluate electrical power and energy in single phase and three phase circuits.
CO3	Explain and illustrate the concept of instrumentation system with different Transducers and Sensors.
CO4	Explain the construction, working principle and applications of Transducers.
CO5	Evaluate Power calculations and applications of Transducers.

Second Year: Semester IV:

Course Name: Advance Mathematical Techniques (T)	Course Code: GE2204
CO1	Utilize numerical techniques to obtain approximate solutions of mathematical equations
CO2	Design and determine the solution of linear programming problems.
CO3	Measure the Statistical parameters for random variables.
CO4	Explain the basic concept of fuzzy sets, Relations and fuzzy logic.

Course Name: Electrical Machines in Power System (T/P)	Course Code: EL2251/EL2252
CO1	Explain constructional features, develop phasor diagram and winding layout, examine steady state performance of synchronous machines theoretically and experimentally.
CO2	Illustrate the need and method of parallel operation of alternators, analyse and evaluate the behaviour of synchronous machine connected to infinite bus and understand the process of Synchronisation in laboratory.
CO3	Interpret behaviour & determine time constant and equivalent circuit parameters under transient conditions of synchronous machines and evaluate various transient parameters experimentally.

Course Name: Electrical Energy Generation System (T)	Course Code: EL2253
CO1	Classify types of renewable energy sources and relate different factors associated with a generating station.
CO2	Explain various parameters related to selection and application of Solar and Wind Energy.
CO3	Make use of design parameters and develop a model for various Power generating Systems.
CO4	Apply the knowledge to understand the applications of various renewable energy sources.

Course Name: Renewable Energy System (P)	Course Code: EL2254
CO1	Summarize, classify types of renewable energy sources, outline as per Global and Indian context.
CO2	Utilize ,analyze solar energy for various applications.
CO3	Classify, analyze wind energy conversion systems and estimate its parameters.

Course Name: Electric & Magnetic Fields (T)	Course Code: EL2255
CO1	Remember, Understand and analyse the properties of electrostatic field.
CO2	Apply electrostatics on different mediums and analyse the boundary characteristics.
CO3	Remember and Understand and apply the properties of electromagnetic field.
CO4	Understand the electromagnetic waves and analyse them over different medium.

Course Name: Electrical Engineering Workshop (P)	Course Code: EL2256
CO1	Describe the basic concept of various electrical components.
CO2	D emonstrate, formulate and solve the basic maintenance and troubleshooting of household equipment, energy saving etc.
CO3	Outline the fundamentals of major electrical devices and actual operation of devices like induction motor.

Course Name: Microprocessor (T/P)	Course Code: EL2257/EL2258
CO1	List, select and explain types of memory devices and architecture of 8085 microprocessor.
CO2	Recall, experiment with and make use of assembly language instructions of 8085.
CO3	Demonstrate and test microprocessors and its interfacing devices.
CO4	Illustrate and make use of DMA controller and timer.
CO5	Experiment with the real time implementation of programs along with interfacing demonstration.

Course Name: Signals and Systems (T)	Course Code: EL2259
CO1	Determine and Classify signals and systems in continuous and discrete time domain.
CO2	Solve and determine signals in time and frequency domain using Fourier series and Fourier transform.
CO3	Apply sampling and show the character tics of system in time and frequency domain
CO4	Solve and Determine Laplace and Z-transform for analysis of signals and system.

<mark>Third Year: Semester V:</mark>

Course Name: Fundamentals of Economics (T)	Course Code: GE2312
CO1	Recognize consumer"s behaviour and analyse Market price
CO2	Extrapolate operations in market with production constraints
CO3	Describe the national income accounting and public finance.
CO4	Analyse international trade and institutions.

Course Name: Power Electronics (T/P)	Course Code: EL2301/EL2302
CO1	Demonstrate the learnings of various power semiconductor devices with their protection and apply them for various applications.
CO2	Analyse different Power Electronics Converter circuits and choose them for suitable applications.
CO3	Demonstrate the knowledge of chopper circuits, analyse and utilise them for different applications.
CO4	Analyse inverter circuits with different modulation techniques and identify their applications.

Course Name: Fundamentals of Power System (T)	Course Code: EL2303
CO1	Define and explain basic components of power system and representation of its elements in terms of per unit.
CO2	Analyze and evaluate the transmission line parameters which limits the transmission capacity of a line.
CO3	Classify, evaluate and determine the performance of distribution and transmission system.

CO4	Choose, Compare and select the type of insulators and underground cables and improve the performance of system.
Course Name: Electrical Drives (T/P)	**Course Code: EL2304/EL2305**
CO1	CO1: Classify and compare characteristics of AC and DC motors to interpret application of motors in electrical drives.
CO2	CO2: Apply Selection criteria for electrical drives by adapting electrical and mechanical characteristics of motor.
CO3	CO3: Categorize and compare contactors and relays for application of control circuit.
CO4	CO4: Explain the applications of PLCs in electrical drives and compare and assess control of electrical drive.
CO5	CO5: Estimate and adapt different motors for traction work.

Course Name: OEI: Renewable Energy Generation System (T)	**Course Code: EL2311**
CO1	Summarize, classify and compare types of renewable energy sources, outline as per Global and Indian context.
CO2	Utilize solar energy for various applications, estimate solar radiation geometry and classify types of wind turbine generator.
CO3	Demonstrate, Classify and utilize geothermal and biomass energy.
CO4	Compare, classify and apply energy from ocean, tide, wave and hydro for power generation, explain storage methods for renewable energy sources.

Course Name: OEI: Electrical Machines and their Applications (T)	**Course Code: EL2312**
CO1	Explain speed-torque characteristics, need for starters, starting and braking of AC and DC motors.
CO2	Apply criterion for selection of drives.
CO3	Illustrate and develop the principle, operation and construction of transformers.
CO4	Classify and identify special machines used in industry.

Course Name: OEI: Testing and Maintenance of Electrical Machines (T)	**Course Code: EL2313**
CO1	Classify, the causes of hazards, accidents, shock and the remedial action taken against the electrical shock.
CO2	Demonstrate, apply and evaluate different types of tests and the various maintenance techniques to be employed on various electrical machines and it installation.
CO3	Demonstrate, apply and estimate the factors affecting the life of insulation, its testing and maintenance.
CO4	Explain, develop and determine the various tests to be conducted on distribution transformer, I.S. Standards.

Course Name: OEII: Electrical Energy Auditand Safety (T)	**Course Code: EL2321**

CO1	Classify, the consumption pattern, conservation of electrical energy and Electricity Act 2001.
CO2	Demonstrate, apply and evaluate different forms of energy to optimize the use for maximizing the efficiency of system.
CO3	Demonstrate, apply and estimate the use energy and its impact on the Environment.
CO4	Explain, develop and determine the hazards, risk associated with unsafe action and the safety.

Course Name: OEII: Utilization of Electrical Energy (T)	Course Code: EL2322
CO1	Demonstrate and utilize electrical energy for various purposes including heating and traction system. Students will also be able to classify illumination, its types and purpose.
CO2	Demonstrate and apply electric energy to different types of welding
CO3	Explain how refrigeration system and air condition system works.
CO4	Analyse, determine and estimate proper economic generation.

Course Name: OEII: Power System Engineering (T)	Course Code: EL2323
CO1	Articulate types of load and power system concepts required to engineering problems.
CO2	Develop the ability to implement the appropriate safety equipment for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology.
CO3	Formulate A.C and D.C distribution networks for necessary variable calculation.
CO4	Ability to design and analyze switchgear protection system with respect to various electrical parameters which is required in substation.

<mark>**Third Year: Semester VI:**</mark>

Course Name: Fundamentals of Management (T)	Course Code: GE2311
CO1	Explain the Legal provision and Functions of Management.
CO2	Analyze the role of Human Resource and Financial Management in the organization.
CO3	Analyze the project life cycles.
CO4	Identify tools and techniques for the marketing of goods and services.

Course Name: Control System (T/P)	Course Code: EL2351/EL2352
CO1	Classify, select types of control systems, interpret transfer function of the system and compare and evaluate electrical and mechanical systems.
CO2	Illustrate the time response, develop and evaluate the controller.

CO3	Demonstrate, apply and evaluate stability using transfer function and state variable approach.
CO4	Demonstrate, construct and select design parameters using root locus and frequency domain methods.
CO5	Experiment, demonstrate and simulate time domain and frequency domain methods using control system components.

Course Name: Power System Analysis (T)	Course Code: EL2353
CO1	Classify, analyze and evaluate different types of faults in power system.
CO2	Explain, apply and evaluate different types of system stability
CO3	Illustrate, examine and estimate economic operation of power system
CO4	Classify and interpret types of neutral grounding and compensation circuits

Course Name: Simulation of Power Electronics & Power System (P)	Course Code: EL2354
CO1	To provide a detailed understanding of the basic concepts involved in the simulation and analysis of single phase & three phase circuit.
CO2	Develop SIMULATION circuit in MATLAB to assess the performance of short, medium and long transmission lines.

Course Name: Substation Design (P)	Course Code: EL2355
CO1	Illustrate and Explain, single line diagram of substation with rating of different equipment‟s, types of relays required and their settings.
CO2	Construct plan of equipment‟s and panels mounted in a substation.
CO3	Design earthing system of a substation.

Course Name: PEI: Advanced Power Electronics (T)	Course Code: EL2361
CO1	Identify and recall various power semiconductor devices and their effects produced in electrical system
CO2	Explain and compare various power electronic converters and inverters used for various applications
CO3	Apply knowledge of modulation techniques to various converters
CO4	Demonstrate knowledge related to effects of harmonics, their measurement and elimination from the system

Course Name: PEI: Electrical Distribution in Power System (T)	Course Code: EL2362
CO1	Define, explain and illustrate various components in distribution System network.
CO2	Experiment with distribution network for voltage drop, reactive power compensation, power loss, fault analysis for better supply toconsumers.

CO3	Classify and inspect the substation and plan metering for consumers.
CO4	Compare and develop distribution systems for distribution automation and SCADA.

Course Name: PEI: Illumination Engineering (MOOC) (T)	Course Code: EL2363
CO1	Identify the criteria for the selection of lamps and lighting systems for an indoor or outdoor space
CO2	Explain the different parameters in designing an illumination system for a particular application.
CO3	Apply different illumination systems for different applications.
CO4	Design proper illumination model for a specific application.

Course Name: PEI: Electric Vehicles (T)	Course Code: EL2364
CO1	Understand the history, vehicle mechanics, laws of motion, dynamics and propulsion power of electric vehicles.
CO2	Analyse energy storage methodologies used in electric vehicles.
CO3	Analyse the topologies of power electronics and drive-train used in electric vehicles.
CO4	Understand the types, design, size, capacity of hybrid electric vehicle.

Course Name: PEI: Electric Power Utilization (T)	Course Code: EL2365
CO1	Classify, Types of electric heating technique, electric welding technique, their Field of application, relative advantage and limitation.
CO2	Illustrate the Basic concept of illumination, various types of lamps along their characteristics and application. They will be able to design illumination system for various criterion.
CO3	Illustrate basic refrigeration cycle, Vapour compression and Vapour absorption refrigeration system. Various types of air conditioning system and its use as per requirement.
CO4	Classify, difference between fans and blowers, various energy saving methods to be used, they can classify pumps, compressors and DG sets, application of compressor as per requirement of compressed air, selection and installation factors of DG system. Energy saving methods for DG sets.

Course Name: OEIII: Renewable Energy Generation System (T)	Course Code: EL2371
CO1	Summarize, classify and compare types of renewable energy sources, outline as per Global and Indian context.
CO2	Utilize solar energy for various applications, estimate solar radiation geometry and classify types of wind turbine generator.
CO3	Demonstrate, Classify and utilize geothermal and biomass energy.

CO4	Compare, classify and apply energy from ocean, tide, wave and hydro for power generation, explain storage methods for renewable energy sources.

Course Name: OEIII: Electrical Machines and their Applications (T)	Course Code: EL2372
CO1	Explain speed-torque characteristics, need for starters, starting and braking of AC and DC motors.
CO2	Apply criterion for selection of drives.
CO3	Illustrate and develop the principle, operation and construction of transformers.
CO4	Classify and identify special machines used in industry.

Course Name: OEIII: Testing and Maintenance of Electrical Machines (T)	Course Code: EL2373
CO1	Classify, the causes of hazards, accidents, shock and the remedial action taken against the electrical shock.
CO2	Demonstrate, apply and evaluate different types of tests and the various maintenance techniques to be employed on various electrical machines and it installation.
CO3	Demonstrate, apply and estimate the factors affecting the life of insulation, its testing and maintenance.
CO4	Explain, develop and determine the various tests to be conducted on distribution transformer, I.S. Standards.

Course Name: OEIV: Electrical Energy Audit and Safety (T)	Course Code: EL2381
CO1	Classify, the consumption pattern, conservation of electrical energyand Electricity Act 2001.
CO2	Demonstrate, apply and evaluate different forms of energy to optimize the use for maximizing the efficiency of system.
CO3	Demonstrate, apply and estimate the use energy and its impact onthe Environment.
CO4	Explain, develop and determine the hazards, risk associated with unsafe action and the safety.

Course Name: OEIV: Utilization of Electrical Energy (T)	Course Code: EL2382
CO1	Demonstrate and utilize electrical energy for various purposes including heating and traction system. Students will also be able to classify illumination, its types and purpose.
CO2	Demonstrate and apply electric energy to different types of welding
CO3	Explain how refrigeration system and air condition system works.
CO4	Analyse, determine and estimate proper economic generation.

Course Name: OEIV: Power System Engineering (T)	Articulate types of load and power system concepts required to engineering problems.	Course Code: EL2383
CO1		
CO2	Develop the ability to implement the appropriate safety equipment for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology.	
CO3	Formulate A.C and D.C distribution networks for necessary variable calculation.	
CO4	Ability to design and analyze switchgear protection system with respect to various electrical parameters which is required in substation.	

Fourth Year: Semester VII:

Course Name: High Voltage Engineering (T/P)		Course Code: EL1401/EL1402
CO1	Understand Breakdown of various dielectrics and calculate their breakdown voltage.	
CO2	Analyze causes of overvoltages due to lightning and switching overvoltages due to protective devices used for the same.	
CO3	Implement propagation of travelling waves along with insulation coordination.	
CO4	Evaluate generation and measurement of high voltage and current.	
CO5	Demonstrate various experimental result of high voltage engineering lab & classify Non-destructive and high voltage testing of electrical apparatus.	

Course Name: Computer Applications in Electrical Engineering (T/P)		Course Code: EL1403/EL1404
CO1	Explain and define the basics of Graph theory, find and Illustrate the different types of Matrices.	
CO2	Apply different method, Build & Develop the Bus Impedance Matrix.	
CO3	Classify, Compare, Make use of different methods and analyze Load Flow studies .	
CO4	Analyze and inspect the system for different types of faults.	
CO5	Analyze and make use of different methods for transient stability studies.	

Course Name: PE II: FACTS Devices (T)		Course Code: EL1410
CO1	Define FACTS Concept, various FACTS Controllers, its classification and explain its applications in Transmission system.	
CO2	Explain, show, implement and design different shunt and series compensators and its control schemes	
CO3	Demonstrate, examine and apply voltage and phase angle regulators in power system	

CO4	Extend, apply and analyze the FACTS concept using combine series-shunt and series-series controllers to evaluate the improved transmission system performance

Course Name: PE II: Artificial Intelligence based Systems (T)	Course Code: EL1427
CO1	Recall, explain, solve and analyse the principles of fuzzy logic and control.
CO2	Explain and discuss adaptive fuzzy control.
CO3	Explain, analyse and solve problems in basic neural networks and associative memories
CO4	Explain, analyse and solve problems on recurrent networks andneural control.

Course Name: PE II: Advanced Control System (T)	Course Code: EL1431
CO1	Explain concept of lag and lead compensator design in time and frequency domain, theory of PI, PD and PID control in time domain and frequency domain.
CO2	Illustrate and apply state variable approach with solution of state models and concepts of controllability, observability and state variable feedback.
CO3	Classify and analyse non-Linear Control System, types of non-linearities, its characteristics. Students will also be able to demonstrate and apply different methods of evaluating non-linear control like describing function method and phase plane method for stability analysis.
CO4	Explain sample data control system, Stability analysis with Z-transforms and solution of discrete time systems.

Course Name: Electrical Distribution Power System (T)	Course Code: EL1432
CO1	Define, explain and illustrate various components in distribution System network.
CO2	Experiment with distribution network for voltage drop, reactive power compensation, power loss, fault analysis for better supply to consumers.
CO3	Classify and inspect the substation and plan metering for consumers.
CO4	Compare and develop distribution systems for distribution automation and SCADA.

Course Name: Simulations in Power System (P)	Course Code: EL1405
CO1	To provide a detailed understanding of the basic concepts involved in the simulation and analysis of single phase & three phase circuit.
CO2	Develop SIMULATION circuit in MATLAB to assess the performance of short, medium and long transmission lines.

Course Name: Industrial Training / CRT (T)	Course Code: EL1406
CO1	Analytical skill improvement of logical reasoning for professional responsibilities.
CO2	Develop communication, overall personality.

Course Name: Project Phase I (T)	Course Code: EL1407
CO1	Identify the research area of project work in Electrical Engineering.
CO2	Summarize the literature review in the area identified, propose the objectives of project work.
CO3	Organize requisite components with specifications for the project software/hardware prototype and apply suitable software/hardware tool in project work
CO4	Compile, discuss and conclude the results in project report and give presentation by effective communication

Fourth Year: Semester VIII:

Course Name: Switchgear and Protection (T/P)	Course Code: EL1416/EL1417
CO1	Explain and define the various basic principles of protection system
CO2	Compare & apply overcurrent protection Principle
CO3	Develop , Compare & Solve the problems of distance protection.
CO4	Explain , Justify and Compare the types of circuit breaker
CO5	Explain, Determine and decide the Equipment Protection

Course Name: Substation Design (P)	Course Code: EL1418
CO1	Illustrate and Explain, single line diagram of substation with rating of different equipment"s, types of relays required and their settings.
CO2	Construct plan of equipment"s and panels mounted in a substation.
CO3	Design earthing system of a substation.

Course Name: Renewable Energy Sources (T/P)	Course Code: EL1433/EL1434
CO1	Summarize, classify types of renewable energy sources, outline as per Global and Indian context.
CO2	Estimate solar radiation geometry, and categorize types of solar energy collectors.
CO3	Utilize solar energy for various applications, function of dc-dc converters and Grid converters.
CO4	Classify, analyze wind energy conversion systems and estimate its parameters.
CO5	Demonstrate various experimental result of renewable energy sources lab & Compare, formulate and estimate energy from ocean, tide, wave and hydro for power generation.

Course Name: PE III: Advanced Electrical Drives (T)	Course Code: EL1411
CO1	Analyse and determine the converter parameters of bridge and chopper controlled DC drives.
CO2	Analyse the various schemes for Induction motor control and estimate the parameters of converters for Induction motor drives.
CO3	Explain synchronous motor, stepper motor and switched reluctance motor drives.
CO4	explain and compare the various drives used in electrical traction and explain solar and battery powered drives.

Course Name: PE III: Power System Operation and Control (T)	Course Code: EL1422
CO1	Explain, analyse reserve requirement & load forecasting methods.
CO2	Analyse optimal scheduling of generating units, determine with the help of flowcharts.
CO3	Expounds and develop optimal unit commitment problem & its solution methods.
CO4	Explain & discuss various methods of voltage control, reactive power compensation equipment used for transmission line & Load Frequency Control.

Course Name: PE III : Fundamentals of Power Quality (T)	Course Code: EL1435
CO1	Illustrate power quality disturbances and typical problems associated with it.
CO2	Analyse and evaluate the voltage sag.
CO3	Appraise the fundamentals of harmonics and develop solutions through filters to minimise the harmonic distortion.
CO4	Plan of mitigating the power quality events through custom power and network configuring devices with applying suitable control strategies

Course Name: PE IV: EHVAC-HVDC Transmission (T)	Course Code: EL1424
CO1	Design and analyse Power handling capacity of EHVAC Transmission systems.
CO2	Explain and analyse Corona, the concept of Electrostatic and electromagnetics, Electrical safety.
CO3	Demonstrate , Classify HVDC Transmission system , Analyse themethods of HVDC Control.
CO4	Design of Harmonic filters and reactive power configuration, HVDC Circuit breaker and Types and applications.

Course Name: PE IV: Electrical Power Utilization (T)	Course Code: EL1425
CO1	Classify, Types of electric heating technique, electric welding technique, their Field of application, relative advantage and limitation.

CO2	Illustrate the Basic concept of illumination, various types of lamps along their characteristics and application. They will be able to design illumination system for various criterion.
CO3	Illustrate basic refrigeration cycle, Vapour compression and Vapour absorption refrigeration system. Various types of air conditioning system and its use as per requirement.
CO4	Classify, difference between fans and blowers, various energy saving methods to be used, they can classify pumps, compressors and DG sets, application of compressor as per requirement of compressed air, selection and installation factors of DG system. Energy saving methods for DG sets.

Course Name: PE IV: Fundamentals of Smart Grid (T)	Course Code: EL1436
CO1	To compare existing & smart grid and illustrate the various aspects of the smart grid.
CO2	To explain the various functions in the smart grid and identify components for functioning of smart grid.
CO3	To assess the performance of smart grid based on congestion, security and contingency studies for optimal solutions.
CO4	To evaluate sustainable energy options for smart grid.

Course Name: PE IV: Electric Vehicles (T)	Course Code: EL1437
CO1	Understand the history, vehicle mechanics, laws of motion, dynamics and propulsion power of electric vehicles.
CO2	Analyse energy storage methodologies used in electric vehicles.
CO3	Analyse the topologies of power electronics and drive-train used in electric vehicles.
CO4	Understand the types, design, size, capacity of hybrid electric vehicle.

Course Name: Project Phase II (P)	Course Code: EL1420
CO1	Develop and inspect the prototype of the project work
CO2	Analyze and conclude the results on proposed work on project
CO3	Compile project work to prepare a thesis report and present a research paper on project

7. M.Tech- IPS

Programme Educational Objectives OF PG Programme (PEO IPS)

- **PEO-1-**To prepare students to succeed in employment, profession and/or pursue doctoral research in electrical engineering discipline.

- **PEO-2-**To provide students with scholarly knowledge so as to formulate, analyze and design novel systems for solving power system problems.

- **PEO-3-**To inculcate in students professional and ethical attitude, effective communication skills and teamwork to become successful professional in global perspective.

- **PEO-4-**To provide students with academic environment that make them aware of excellence and to enable them to understand the significance of life-long learning in global perspective.

Programme Outcomes (PO) (PG)

PO-1-To apply appropriate modern engineering and software tools to power system.

PO-2-To think critically to indentify, conceive, analyse and solve complex engineering problems in power and energy sector.

PO-3-To communicate effectively and acquire professional, ethical and responsible attitude towards sustainable development of the society.

PO-4-To accept and adapt to the technological changes for lifelong learning with enthusiasm and commitment to improve knowledge and competence continuously.

PO-5-To demonstrate capacity for self management, project & finance management and decision making to achieve common goals.

Course Outcomes (PG)

First Year: Semester I:

Course Name: Advanced Power Electronics (T/P)	Course Code: EL3901/EL3902
CO1	Apply knowledge of the power semiconductor devices, to select them for a range of applications.
CO2	Demonstrate and analyze techniques to design and assess the performance of thyristor-based converters, as well as, switch-mode DC/DC power electronic converters, resonant and DC/AC inverters.

| CO3 | Assess power quality specially, power factor and harmonic issues of various power electronic converters/inverters. |
| CO4 | Analyze different modulation techniques for bridge as well as multilevel inverters.5.Design,simulate, and test various converter/inverter circuits in the laboratory.(Lab component) |

Course Name: Analog & Digital Protection (T/P)	Course Code: EL3903/EL3904
CO1	Explain & design protection scheme for Relay Coordination
CO2	Develop, Compare & Solve the problems of over current and distance protection
CO3	Explain and define the basics terms of Digital Protection
CO4	Compare and solve the different methods and techniques of digital protection
CO5	Explain and justify the recent advances in digital protection

Course Name: Digital Control System (T)	Course Code: EL3905
CO1	Recall and explain the basics of discrete time signals.
CO2	Apply and solve Z transforms method for discrete systems and analyse the stability of digital control system.
CO3	Understand the preliminary concept of state variable analysis of discrete time control systems, pole placement and design through state feedback.
CO4	Select the PID parameters through tuning and make use of optimal control for design.

Course Name: HVDC Power Transmission (T)	Course Code: EL3906
CO1	Recall the principles, advantages and applications of a HVDC link.
CO2	Explain the operation of converters in a classical HVDC link and modern VSCHVDC technology.
CO3	Model valve and converter for simulation.
CO4	List various methods of control and protection, various faults, stability aspects relevant to HVDC system.

Course Name: Power System Modelling (T)	Course Code: EL3907
CO1	Understand the general construction and relationship between the various fluxes of various electrical machines and its impact on induced emf during the small and transient disturbances.
CO2	Analyze the electrical machines in stationary and rotary frame of reference in per unit for stability analysis.
CO3	Evaluate the electrical machine parameters for various power system components under static and dynamic load conditions.
CO4	Create mathematical models for stationary and rotating machines under steady state and transient conditions.

Course Name: PE I: Electrical Drives and Controls (T/P)	Course Code: EL3908/EL3909
CO1	Explain the working of DC motor, Induction motor, synchronous motor, brushless DC motor and Switched reluctance motors
CO2	Analyse operation of DC motor, Induction motor, synchronous motor, brushless DC motor and Switched reluctance motors.
CO3	Choose suitable converters for DC motor, Induction motor, synchronous motor, brushless DC motor and Switched reluctance motors.
CO4	Solve numericals on DC motor, Induction motor, synchronous motor.

Course Name: PE I: Renewable Energy System (T/P)	Course Code: EL3910/EL3911
CO1	Apply knowledge of renewable energy sources to various solar, wind and other systems
CO2	Demonstrate and analyze techniques to design and assess the performance of solar PV panels and solar based energy converters
CO3	Assess the output of renewable energy systems under different environmental conditions
CO4	Analyze the performance of different renewable energy sources like solar, wind, geothermal and hybrid sources

First Year: Semester II:

Course Name: Power System Planning (T)	Course Code: EL3915
CO1	Illustrate various regulations by state and central government for energy generation and supply and apply them for planning integrated power system.
CO2	Develop and examine the role of investors in a power plant portfolio for sustainable development
CO3	Interpret the load forecasting and recommend the generation, transmission, and distribution capacities for integrated power system considering economical, reliable and optimal usage for sustainable development.
CO4	Predict the behavior of integrated power system for secure and reliable operation.

Course Name: Application of Power Electronics to Power System (T)	Course Code: EL3916
CO1	Demonstrate the knowledge of AC transmission constraints and decide the power electronics-based solutions.
CO2	Design and assess the performance of shunt and series thyristor-based controllers.
CO3	Interpret and compare the performance of various converter –based controllers
CO4	Analyze different control techniques for shunt/series/shunt-series and series-series controllers.

Course Name: Power Quality (T)	Course Code: EL3917
CO1	Define, discuss and analyse the various power quality problem, their causes and effects in distribution system
CO2	Identify, discuss and analyse the different non-linear loads.
CO3	Define, explain, apply various measurements and transforms to analyse the power quality problems.
CO4	Describe, analyse and calculate the powers, harmonics indices and sequence components.
CO5	Explain, apply the various indices and develop load balancing algorithms.
CO6	Discuss, analyse, apply the various custom power devices, their reference generation algorithms and their applications.

Course Name: PE II: Advanced Digital Signal Processing (T)	Course Code: EL3918
CO1	
CO2	**SUBJECT NOT OFFERED**
CO3	
CO4	

Course Name: PE II: EHV Power Transmission (T)	Course Code: EL3919
CO1	List various aspects of EHVAC Transmission.
CO2	Develop knowledge to calculate various parameters related to EHV Transmission line.
CO3	Explain voltage gradient concept pertaining to conductors of the EHV Transmission line.
CO4	Discuss various effects of EHVAC Transmission related to human life.

Course Name: PE II: Restructuring of Power System (T)	Course Code: EL3920

CO1	Discuss deregulation of electricity market.
CO2	Classify, illustrate different processes and operations in deregulation.
CO3	Explain, apply solution techniques for optimal power flow.
CO4	Discuss automation in energy management and communication technologies in power system.

Course Name: PE III: Power System Stability and Control (T)	Course Code: EL3921
CO1	
CO2	**BYB**
CO3	
CO4	

Course Name: PE III: Power System Operation (T)	Course Code: EL3923
CO1	
CO2	**SUBJECT NOT OFFERED**
CO3	
CO4	

Course Name: PE III: Transients in Power Systems (T)	Course Code: EL3924
CO1	
CO2	**SUBJECT NOT OFFERED**
CO3	
CO4	

Course Name: PE IV: Distribtuted Automation (T)	Course Code: EL3925
CO1	
CO2	**SUBJECT NOT OFFERED**
CO3	
CO4	

Course Name: PE IV: Power Electronics for Renewable Energy Systems (T)	Course Code: EL3926
CO1	Describe the impact and significances of different renewable energy sources.
CO2	Explain solar thermal and solar photovoltaic applications

CO3	Describe and analyse the various solar photovoltaic inverters topologies and configurations, and characteristics.
CO4	Discuss and categorize wind energy conversion systems based on the generators, controls and operation.
CO5	Examine and apply various power converters for Wind energy systems and its controls.
CO6	Define and explain the need of hybrid systems, discuss its various configurations and various power quality issues in grid integrations.

Course Name: PE IV: Control System Design(T)	Course Code: EL3927
CO1	Recall and explain the basics of conventional design method in time and frequency domain.
CO2	Apply and solve problems for design of discrete systems and analyse the stability of digital control system.
CO3	Understand the preliminary concept of discrete time state variable analysis pole placement and design through state feedback.
CO4	Explain the concepts of optimal control formulation of optimal control.

Course Name: Power System Simulation (P)	Course Code: EL3928
CO1	Solve and design the power system problems.
CO2	Explain, compare various pulse width modulations and apply to different converter topologies
CO3	Use and evaluate the load balancing for compensation.
CO4	Design and analyse the renewable energy sources.
CO5	Design the various controls and its application in power system.
CO6	Apply and infer the performance of compensators in power system.

| Course Name: Power System Design (P)	Course Code: EL3929
CO1	Identify and explain the various aspects AC and DC power transmission systems.
CO2	Design and assess the performance of AC transmission system
CO3	Develop optimized and robust HVDC transmission systems and evaluate the significance of the various parameters.

Second Year: Semester III:

Course Name: Project Phase –I	Course Code: EL3939
CO1	Identify research topic
CO2	Carryout literature survey
CO3	Analyze and solve the research problem
CO4	Learn and use the suitable software tool
	To communicate effectively with proper presentation methods

Second Year: Semester IV:

Course Name: Project Phase -II		Course Code: EL3940
CO1	Analyze the system and achieve desired results using software/hardware tools	
CO2	Write and present the research paper based on project work	
CO3	Acquire in-depth knowledge of the subject for the benefit of the society	
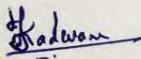
Dr.S.G. Kadwane
HoD, EL
Head of Department
Electrical Engg.
Y.C.C.E., Nagpur
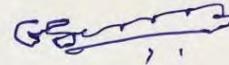
Dr.U.P.Waghe
Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

8.Electronics Engineering Department.

Program Educational Objectives (PEO):

PEO-1-Graduates will be successful in pursuing higher studies in engineering and management or will pursue career path in teaching, research or entrepreneurship.

PEO-2-Graduates will formulate, analyze and solve engineering problems critically with profound scientific and engineering knowledge and research capabilities so as to comprehend, design, create novel systems and solve collaborative multidisciplinary problems in Electronics Engineering.

PEO-3-Graduates will be engineering professionals with ethical attitude, effective communication skills and an ability to relate engineering to global issues in social context.

PEO-IV-Graduates will be able to develop attitude in lifelong learning towards career advancement and respond to changing social needs in a conducive academic milieu.

Programme Outcomes (PO) (UG)

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

PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex Engineering problems reaching substantiate conclusions using first principle of mathematics, natural sciences and Engineering sciences.

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

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

PO5: Modern tool usage: Create, select and apply appropriate techniques, resources and modern Engineering and IT tools including prediction and modelling to complex Engineering activities with anunderstanding of the limitations.

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

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

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

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

PO10: Communication: Communicate effectively on complex Engineering activities with the Engineering community and with society at large such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

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

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

PSO1: An ability to analyze & design electronic applications using Electronics Design Automation (EDA) tools & related softwares.

PSO2: An ability to develop and test electronics systems in the areas related to analog and digital electronics, signal processing, embedded systems and VLSI Design.

Course Name:Engineering Mathematics-I		Course Code:GE-2101
GE-2101 CO-1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures	
GE-2101 CO-2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.	
GE-2101 CO-3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.	
GE-2101 CO-4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.	

Course Name:Engineering Mathematics-II		Course Code:GE-2102
GE-2102 CO-1	Use appropriate Methods to solve first order and higher orderdifferential equations and apply it to find solutions of engineering Problems	
GE-2102 CO-2	Analyse the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals	
GE-2102 CO-3	Use Matrix method to solve linear equations , evaluate eigen values - eigen vectors and its applications.	
GE-2102 CO-4	Measure the statistical parameters and derive the equations of best fit curves	

Course Name:Communication Skill		Course Code:GE-2107
GE-2107 CO-1	Explain the basics of communication process as well as identify the barriers in communication.	
GE-2107 CO-2	Classify and describe the different Speech Sounds of English Language.	
GE-2107 CO-3	Apply different strategies and techniques of presentations, interviews and group communication.	
GE-2107 CO-4	Drafting reports, memos and emails, considering the professional etiquettes and ethics with appropriate content and context.	

Course Name:Social Science		Course Code:GE-2108
GE-2108 CO-1	Explain the basic concepts of Social Sciences.	
GE-2108 CO-2	Describe the development of various Civilizations and their Culture.	
GE-2108 CO-3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.	
GE-2108 CO-4	Explain Industrial Organization and Management.	

Course Name:Engineering Physics Course Name: Engineering Physics (Lab.)	Course Code:GE-2105 andGE 2106
GE 2105 & GE2106 CO1	Examine the intensity variation of light due to interference, diffraction and its applications.
GE 2105 . CO2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
GE 2105 & GE2106 CO3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
GE 2105 & GE2106 CO4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
GE 2105 & GE2106 CO1	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name:Engineering Mechanics Engineering Mechanics (Lab.)	Course Code:CV-2101 -CV2102
CV-2101- CO 1	An ability to apply the concept of applied mechanics and can solveproblems on planar force system for friction as well as frictionless surfaces.
CV-2101- CO 2	An ability to analyze pin jointed truss frame structure and beamstructure analytically and graphic
CV-2101- CO 3	An ability to understand centroid, moment of inertia, product of inertia and mass moment of inertia and can find properties of surfaces.
CV-210- 1CO 4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.

Course Name:Introduction to Computer Programming Introduction to Computer Programming (Lab.)	Course Code:IT2101 Course Code: IT-2102
IT2101, IT2102 CO1	Understand computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C" programming language constructs.
IT2101 IT2102 CO2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
IT2101 IT2102 CO3	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.
IT2101 IT2102 CO4	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.

Course Name:Electrical	Course Code:EL 2101
Engineering Elect. Eng. Lab	EL-2102 (Lab.)
EL 2101 & EL 2102- CO-1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.
EL 2101 & EL 2102- CO-2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
EL 2101 & EL 2102- CO-3	Explain construction, working, testing, and applications of various electrical machines.
EL 2101 & EL 2102- CO-4	Analyse performance of various electrical machines.
EL 2101 & EL 2102- CO-5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name:Engineering Graphics Engineering Graphics Lab.	Course Code:ME2101ME- 2102
ME2101 ME-2102 CO1	Transform orthographic projections into isometric projections and vice versa.
ME2101 ME-2102 CO2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
ME2101 ME-2102 CO3	Built the development of lateral surfaces of various solids and their cut section.
ME2101 ME-2102 CO4	Predict the intersections and intersections of various solid objects.
ME2101 ME-210 2CO5	Justify the use of software tools used for Two dimensional drawings.

Course Name:Workshop Practice	Course Code:ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications
CO2	Understand the fitting tools, measuring instruments, machineries and its applications
CO3	Understand the smithy tools furnaces and hand and power forging equipment‟s
CO4	Understand Gas and Electric welding processes, utility, tools and its applications

Course Name:Engineering Mathematics-I	Course Code:GE-2101
GE-2101 CO-1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures
GE-2101 CO-2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.
GE-2101 CO-3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.
GE-2101 CO-4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name:Engineering Mathematics-II	Course Code:GE-2102
GE-2102 CO-1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
GE-2102 CO-2	Analyse the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals
GE-2102 CO-3	Use Matrix method to solve linear equations , evaluate eigen values - eigen vectors and its applications.
GE-2102 CO-4	Measure the statistical parameters and derive the equations of best fit curves

Course Name:Communication Skill	Course Code:GE-2107
GE-2107 CO-1	Explain the basics of communication process as well as identify the barriers in communication.
GE-2107 CO-2	Classify and describe the different Speech Sounds of English Language.
GE-2107 CO-3	Apply different strategies and techniques of presentations, interviews and group communication.
GE-2107 CO-4	Drafting reports, memos and emails, considering the professional etiquettes and ethics with appropriate content and context.

Course Name:Social Science	Course Code:GE-2108
GE-2108 CO-1	Explain the basic concepts of Social Sciences.
GE-2108 CO-2	Describe the development of various Civilizations and their Culture.
GE-2108 CO-3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
GE-2108 CO-4	Explain Industrial Organization and Management.

Course Name:Engineering Physics Course Name: Engineering Physics (Lab.)	Course Code:GE-2105 andGE 2106
GE 2105 & GE2106 CO1	Examine the intensity variation of light due to interference, diffraction and its applications.
GE 2105 . CO2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
GE 2105 & GE2106 CO3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
GE 2105 & GE2106 CO4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
GE 2105 & GE2106 CO1	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name:Engineering Mechanics Engineering Mechanics (Lab.)	Course Code:CV-2101 -CV2102
CV-2101- CO 1	An ability to apply the concept of applied mechanics and can solveproblems on planar force system for friction as well as frictionless surfaces.
CV-2101- CO 2	An ability to analyze pin jointed truss frame structure and beamstructure analytically and graphic
CV-2101- CO 3	An ability to understand centroid, moment of inertia, product of inertia and mass moment of inertia and can find properties of surfaces.
CV-210- 1CO 4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.

Course Name:Introduction to Computer Programming Introduction to Computer Programming (Lab.)	Course Code:IT2101 Course Code: IT-2102
IT2101, IT2102 CO1	Understand computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C" programming language constructs.
IT2101 IT2102 CO2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
IT2101 IT2102 CO3	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.
IT2101 IT2102 CO4	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.

Course Name:Electrical Engineering Elect. Eng. Lab	Course Code:EL 2101EL-2102 (Lab.)
EL 2101 & EL 2102- CO-1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.
EL 2101 & EL 2102- CO-2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
EL 2101 & EL 2102- CO-3	Explain construction, working, testing, and applications of various electrical machines.
EL 2101 & EL 2102- CO-4	Analyse performance of various electrical machines.
EL 2101 & EL 2102- CO-5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name:Engineering Graphics Engineering Graphics Lab.	Course Code:ME2101ME-2102
ME2101 ME-2102 CO1	Transform orthographic projections into isometric projections and vice versa.
ME2101 ME-2102 CO2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
ME2101 ME-2102 CO3	Built the development of lateral surfaces of various solids and their cut section.
ME2101 ME-2102 CO4	Predict the intersections and intersections of various solid objects.
ME2101 ME-210 2CO5	Justify the use of software tools used for Two dimensional drawings.

Course Name:Workshop Practice	Course Code:ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications
CO2	Understand the fitting tools, measuring instruments, machineries and its applications
CO3	Understand the smithy tools furnaces and hand and power forging equipment‟s

CO4	Understand Gas and Electric welding processes, utility, tools and its applications

Course Name: Electronic Devices (T/P)		Course Code:EE2201/EE2202
CO1	Students will be able to understand the concepts of Energy Bands, Charge Carriers and various semiconductor devices like diodes and BJT	
CO2	Students will be able to be familiarized with semiconductor device fabrication processes.	
CO3	Students will be able to understand various configurations and their characteristics for BJT and MOSFET amplifiers	
CO4	Students will be able to understand the concepts of Stabilization and operating points of BJT and MOSFET amplifiers	

Course Name: Signals & Systems		Course Code:EE2203
CO1	Students will be able to classify continuous time signals and systems, transformation of independent variable.	
CO2	Students will be able to analyze Fourier series, Fourier transform representation of continuous-time periodic and aperiodic signals.	
CO3	Students will be able to determine and evaluate Laplace Transform of continuous time signals.	
CO4	Students will be able to analyze time & frequency characterization of Signals and Systems & Sampling Theorem	

Course Name: Lab : Computing using Python		Course Code: EE2204
CO1	Students will be able to understand syntax and semantics of language	
CO2	Students will be able to understand and apply the basics of the programming language	
CO3	Students will be able to understand and apply special language features	
CO4	Students will be able to develop any application	

Course Name:Digital Logic Design (T/P)		Course Code:EE2205/EE2206
CO1	Students will be able to simplify combination logic circuits using Boolean algebra and exhibit the methods to solve logical functions using K-map and Quine-Mc-Clauskey methods.	
CO2	Students will be able to understand and apply the concept of combinational logic circuits in various digital systems.	
CO3	Students will be able to understand and demonstrate the various codes and illustrate concept of logic family with their characteristics.	
CO4	Students will be able to understand the working of Flip-flops and its useto design Synchronous counters and Design and demonstrate finite state machines.	

Course Name:Network Analysis (T/P)		Course Code:EE2207/EE2208
CO1	Students should be able to apply and analyze nodal and mesh analysis on circuits	
CO2	Students should be able to apply network theorems, initial and final conditions to analyze circuits	

CO3	Students should be able to understand, apply and analyze circuits in transform domain
CO4	Students should be able to apply the concept of two – port networks to find different two-port parameters.

Course Name: Electronic Circuits (T/P)	Course Code:EE2251/2252
CO1	Students will be able to know the low frequency parameters and analysis of BJT, MOSFET and its configuration.
CO2	Students will be able to know the high frequency parameters and analysis of BJT, MOSFET and its configuration.
CO3	Students will be able to analyze amplifiers with and without feedback.
CO4	Students will be able to analyze Power amplifier and Oscillators.

Course Name: Microcontroller & its Applications(T/P)	Course Code: EE2253/2254
CO1	Students will be able to understand & Learn concept of Architecture of 8051 μc
CO2	Students will be able to apply the concept of programming language to interface I/O Devices
CO3	Students will be able to establish the serial communication between the I/O Devices.
CO4	Students will be able to design Data Acquisition System related to Industries

Course Name: Analog Communication (T/P)	Course Code:EE2255/EE2256
CO1	Students will be able to demonstrate and analyze various amplitude, angle modulation techniques.
CO2	Students will be able to understand various types of receivers & noise in communication system and investigate noise parameters.
CO3	Students will be able to understand pulse modulation & multiplexing techniques.
CO4	Students will be able to apply the concept of Radiation & Propagation of waves to design communication system

Course Name: Electromagnetic Fields	Course Code:EE2257
CO1	Students will be able to define and recognize different co-ordinate systems, apply different techniques of vector calculus to understandconcepts of electromagnetic field theory.
CO2	Students will be able to determine the electromagnetic force exerted on charged particles, current elements, working principle of various electric and magnetic fields.
CO3	Students will be able to explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields in different media using the fundamental laws.
CO4	Students will be able to deduce and justify the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves.

Course Name: Lab : Electronics Workshop	Course Code: EE2258
CO1	Students will be able to identify different Electronics Components.
CO2	Students will be able to do mini project to enhance their practical Knowledge.
CO3	Students will be able to artwork, printing, Etching & drilling of PCB
CO4	Students will be able to work in a teamwork

<mark>Third Year: Semester V:</mark>

Course Name: Fundamentals of Management	Course Code:GE2311
CO1	Students will be able to explain the Legal provision and Functions of Management.
CO2	Students will be able to analyze the role of Human Resource and Financial Management in the organization.
CO3	Students will be able to analyze the project life cycles.
CO4	Students will be able to identify tools and techniques for the marketing of goods and services.

Course Name: DigitalSignal Processing (T/P)	Course Code:EE2351/EE2302
CO1	Apply DFT and Z transform for the analysis of signals and systems
CO2	Construct and optimize structures for the realization of discrete Time system
CO3	Design of Analog and Digital Filters for given specifications
CO4	Understand fundamentals and architecture of DSP processor.

Course Name: Analog Integrated Circuits and its Application (T/P)	Course Code:EE2302/EE2304
CO1	Student will acquire knowledge of the fundamentals, the different Parameters and internal structure of the operational amplifier.
CO2	Student will analyze and design the linear applications of the operational amplifier.
CO3	Students will analyze and design active Butterworth filters using operational amplifier.
CO4	Student will analyze and design the non-linear applications of the operational amplifier.

Course Name: PE I : Computer Communication Network(T/P)	Course Code:EE2311/EE2312
CO1	Students will be able to Describe various protocols, models in Computer Networks
CO2	Students will be able to Compare Connectors, Network hardware,Media Types (cables, Wireless)
CO3	Students will be able to Design, implement and analyze simple computer networks.
CO4	Students will be able to Apply the different strategies and Operations of TCP/UDP, FTP, HTTP protocols

Course Name: PE I : Embedded System(T/P)	Course Code:EE2313/EE2314
CO1	Students will be able to understand & Learn concept of Architecture & organization of ARM.
CO2	Students will be able to understand & Learn concept of RTOS Architecture.
CO3	Students will be able to apply the concept of programming language to interface I/O Devices.
CO4	Students will be able to establish the communication between the different Devices.

Course Name: PE I : Algorithm & Data Structure (T/P)	Course Code:EE2315/EE2316
CO1	Students will be able to study the trade-off method Demonstrate and analyze various techniques.
CO2	Students will be able to demonstrate various operation on data Structure
CO3	Students will be able to understand various types Data Structure
CO4	Students will be able to implement various types algorithm and analyze performance of system.

Course Name: PE I : Applied Machine Learning (T/P)	Course Code:EE2317/EE2318
CO1	Students will be able to develop an appreciation for what is involved in learning from data, machine learning techniques that are suitable for the different applications
CO2	Students will be able to design an appropriate learning model from set of samples to meet the desired needs
CO3	Students will be able to compare different machine learning techniquesand demonstrate the comprehension of the trade-offs involved in design choices
CO4	Students will be able to integrate machine learning algorithms with ensembling methods and explain modern technologies like deep and shallow learning

Course Name: OE I : Fuzzy Logic & Neural Network	Course Code:EE2331
CO1	Students will be able to apply the concepts of mathematics and fuzzy logic to define, and analyze uncertainty.
CO2	Students will be able to find solution for real time control problems using concepts of fuzziness.
CO3	Students will be able to compare the Artificial neurons to biological neurons and solve classification using ANN.
CO4	Students will be able to design and solve pattern recognition and classification problems using different learning methods

Course Name:OE I : Basics of Analog and Digital Communication Systems	Course Code:EE2332
CO1	Students will be able to understand different modulation and demodulation schemes for analog communication with the concept of noise.
CO2	Students will be able to understand different pulse analog and digital modulation techniques.
CO3	Students will be able to understand different digital modulation schemes.

CO4	Students will be able to understand the different coding techniques for communication systems.

Course Name:OE I : Biomedical Instrumentation		Course Code:EE2333
CO1	Students will be able to describe the basic concepts of biomedical instrumentation and principle of transducer used in biomedical instrumentation.	
CO2	Students will be able to explain cardiovascular, blood pressure measurement and analyze ECG, plethysmograph and spirogram .	
CO3	Students will be able to identify various techniques used in generationand measurement of x-rays, EMG and use of pacemakers, defibrillators in health care.	
CO4	Students will be able to recognize concept of Telemedicine, itsapplications and use of internet resource for hospital management system.	

Course Name: OE II : Data Acquisition & Signal Conditioning		Course Code:EE2341
CO1	Students will be able to describe the basic model of data acquisition system and the various methods and attributes of signal conditioning	
CO2	Students will be able to Identify the various types of data acquisition hardware and the serial data communication standards.	
CO3	Students will be able to distinguish different standards for connection of different programmable instruments like GPIB and SCPI	
CO4	Students will be able to define use of Ethernet, Medium Access control and USB	

Course Name: OE II : Fundamentals of Microprocessor		Course Code:EE2342
CO1	Students will be able to understand the architecture of 8085 and 8051.	
CO2	Students will demonstrate the ability to identify, Formulate and design program for an assigned task.	
CO3	Students will be able to interface Peripheral devices.	
CO4	Students will apply the knowledge of microprocessor and microcontroller in their respective field	

Course Name: OE II : Consumer Electronics		Course Code:EE2343
CO1	Students will be able to understand the knowledge of the safety aspects in the field of Electrical and Electronics products.	
CO2	Students will be able to analyze the basics of Audio and Video Systems.	
CO3	Students will be able to know about recent trends in Processors and computer peripherals, mobile and wireless technologies.	
CO4	Students will be able to understand the basics of refrigeration cycle and cooling system	

Course Name: Fundamentals of Economics	Course Code:GE2312
CO1	Relate their buyer behavior to particular product and the pricing in the market.
CO2	Examine and classify various market structure and factors of production and its role in production process.
CO3	Analyse the national income accounting and the various issues related to banking, taxation, and inflation.
CO4	Elaborate about international economics, foreign trade and itsagreement, export, foreign exchange and the various international financial institutions.

Course Name: Control System Engineering	Course Code:EE2351
CO1	Students will be able to understand the use of block diagram and signal flow graph as a modeling tool and the role of feedback in control systems.
CO2	Students will be able to understand the response characteristics of basic first- and second-order dynamic systems. Be able to use Routh's criterion for absolute and relative stability analysis.
CO3	Students will be able to construct and recognize the properties of root-locus and its role in the analysis of control systems.
CO4	Students will be able to obtain frequency response indices. Be able to draw frequency response plots such as polar plot, Bode plot etc.

Course Name: Transmission Lines and Wave Guides	Course Code:EE2352
CO1	Students will be able to explain fundamental parameters of transmission line and its constraints in high frequency transmission of information.
CO2	Students will be able to make use of Transmission line to develop impedance matching networks and any communication system.
CO3	Students will be able to relate the propagation characteristics of electromagnetic waves in various wave guide structures.
CO4	Students will be able to analyze transmission line using Smith Chart and Design Impedance Matching network.

Course Name: Digital Communication (T/P)	Course Code:EE2353
CO1	Students will be able to learn pulse modulation & discuss the process of sampling, quantization & coding that is fundamental to the digital transmission of analog signals.
CO2	Students will be able to understand fundamental concepts & limits in information theory in the context of digital communication theory/
CO3	Students will be able to analyze mathematical model of digital communication systems.
CO4	Students will be able to apply error control coding techniques at the receiver.

Course Name: PE- II Internet of Things (T/P)	Course Code:EE2361/EE2362
CO1	Students will be able to understanding of IoT value chain structure (device, data cloud), application areas and technologies involved

100

CO2	Students will be able to understand IoT sensors andtechnological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
CO3	Students will be able to market forecast for IoT devices with a focus on sensors
CO4	Students will be able to explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

Course Name: PE- II Digital CMOS Circuits (T/P)	Course Code:EE2363/EE2364
CO1	Students will be able to describe and interpret the basic concepts of MOS transistors
CO2	Students will be able to construct the ability to design a system, component or process as per needs and specifications.
CO3	Students will be able to analyze inverter design, characteristics and applications and Evaluate circuits using different CMOS
CO4	Students will be able to design arithmetic circuit blocks

Course Name: PE- II Digital Image Processing (T/P)	Course Code:EE2365/EE2366
CO1	Students will be able understand the basic concepts of digital image processing and f digital image geometry.
CO2	Students will be able implement the image enhancement and restoration techniques in spatial and frequency domain.
CO3	Students will be able apply and implement image segmentation techniques using edge detection and merging.
CO4	Students will be able apply different Image processing algorithms.

Course Name:PE IV : Object Oriented Programming (T/P)	Course Code:EE2367/EE2368
CO1	Students will be to understand the concept of concepts of Object Oriented Programming.
CO2	Students will be to analyze the using the concept of Inheritance, Polymorphism, Overloading
CO3	Students will be to choose the appropriate data structure and algorithm design method for a specified application.
CO4	Students will be to develop and use linear and non linear data structures and advanced features.

Course Name: OE III : Fuzzy Logic & Neural Network	Course Code:EE2381
CO1	Students will be able to apply the concepts of mathematics and fuzzy logic to define, and analyze uncertainty.
CO2	Students will be able to find solution for real time control problems using concepts of fuzziness.
CO3	Students will be able to compare the Artificial neurons to biological neurons and solve classification using ANN.
CO4	Students will be able to design and solve pattern recognition and classification problems using different learning methods

Course Name:OE III : Basics of Analog and Digital Communication Systems	Course Code:EE2382
CO1	Students will be able to understand different modulation and

	demodulation schemes for analog communication with the concept of noise.
CO2	Students will be able to understand different pulse analog and digital modulation techniques.
CO3	Students will be able to understand different digital modulation schemes.
CO4	Students will be able to understand the different coding techniques for communication systems.

Course Name:OE III : Biomedical Instrumentation		Course Code:EE2383
CO1	Students will be able to describe the basic concepts of biomedical instrumentation and principle of transducer used in biomedical instrumentation.	
CO2	Students will be able to explain cardiovascular, blood pressure measurement and analyze ECG, plethysmograph and spirogram .	
CO3	Students will be able to identify various techniques used in generationand measurement of x-rays, EMG and use of pacemakers, defibrillators in health care.	
CO4	Students will be able to recognize concept of Telemedicine, itsapplications and use of internet resource for hospital management system.	

Course Name: OE IV : Data Acquisition & Signal Conditioning		Course Code:EE2391
CO1	Students will be able to describe the basic model of data acquisition system and the various methods and attributes of signal conditioning	
CO2	Students will be able to Identify the various types of data acquisition hardware and the serial data communication standards.	
CO3	Students will be able to distinguish different standards for connection of different programmable instruments like GPIB and SCPI	
CO4	Students will be able to define use of Ethernet, Medium Access control and USB	

Course Name: OE IV : Fundamentals of Microprocessor		Course Code:EE2392
CO1	Students will be able to understand the architecture of 8085 and 8051.	
CO2	Students will demonstrate the ability to identify, Formulate and design program for an assigned task.	
CO3	Students will be able to interface Peripheral devices.	
CO4	Students will apply the knowledge of microprocessor and microcontroller in their respective field	

Course Name: OE IV : Consumer Electronics		Course Code:EE2393
CO1	Students will be able to understand the knowledge of the safety aspects in the field of Electrical and Electronics products.	
CO2	Students will be able to analyze the basics of Audio and Video Systems.	
CO3	Students will be able to know about recent trends in Processors and computer peripherals, mobile and wireless technologies.	
CO4	Students will be able to understand the basics of refrigeration cycle and cooling system	

Course Name: Digital System Design (T/P)		Course Code:EE2401/EE2402
CO1	Students will be able to understand hardware description language and able to design and simulate digital systems using different abstraction levels	
CO2	Students will be able to design and analyse combinational and sequential logic circuits.	
CO3	Students will be able to understand and apply timing issues in multiple contexts and design the circuit.	
CO4	Students will be able to understand programmable devices and able to design digital systems using modern design tools	

Course Name:PE III : Switching Theory & Finite Automata		Course Code:EE2411
CO1	Students will be able to design and analyze multilevel logic Network and Threshold logic for nanotechnologies.	
CO2	Students will be able to analyze testing of combinational circuits, Fault Models	
CO3	Students will be able to design and analyze the synchronous and asynchronous sequential circuits.	
CO4	Students will be able to identify and test the sequential machines with experiments.	

Course Name:PE III : Power Electronics		Course Code:EE2412
CO1	Students will be able to understand basic semiconductor physics and properties of power devices for circuit analysis using linear and non -linear operations.	
CO2	Students will be able to design and Analyze power invertor circuits and learnto select suitable power electronic devices by assessing the requirements of application fields.	
CO3	Students will be able to formulate analyze and design the converters for various load types.	
CO4	Students will be able to identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus.	

Course Name:PE III : Wireless Sensor Network		Course Code:EE2413
CO1	Students will be able to study basic wireless sensor technology and different types of sensor protocol	
CO2	Students will be able to understand different routing challenges and design issue in wireless sensor	
CO3	Students will to able to understand wireless sensor network management and traffic management issues	
CO4	Students will to able to study basic wireless sensor technology and different types of sensor protocol	

Course Name:PE III : VLSI Signal Processing		Course Code:EE2414
CO1	Students will be able to design architectures for DSP algorithms.	
CO2	Students will be able to apply the optimisation concept in terms of area, speed and power on DSP systems.	
CO3	Students will be able to optimize DSP arithmetic	

CO4	Students will be able to design of algorithm structure for DSP algorithms based on algorithm transformation.

Course Name:PE IV : Wireless Communication (T/P)	Course Code:EE2421/EE2422
CO1	Students will be able to describe generations of wireless standard and understand cellular concepts to evaluate the signal reception performance in a cellular network and traffic analysis with given quality of service constraints.
CO2	Students will be able to determine the type and appropriate model of wireless fading channel based on the system parameters and the property of the wireless medium.
CO3	Students will be able to describe Equalization & Diversity techniques, compare various wireless systems standards.
CO4	Students will be able to understand the importance of wireless networking and its applications.

Course Name:PE IV : RF and Microwave (T/P)	Course Code:EE2423/EE2424
CO1	Students will be able to apply concepts of Fields and Networks to studyworking principles of specific microwave active/passive devices, transmission lines/microwave devices.
CO2	Students will be able to analyze microwave networks and components using S-parameters.
CO3	Students will be able to design of microwave filters by various methods, Microwave solid state devices.
CO4	Students will be able to apply concepts of instrumentation and measurementsto study microwave measurement of power, frequency and VSWR , impedance for the analysis and design of circuits

Course Name:PE IV : Analog VLSI Design (T/P)	Course Code:EE2425/EE2426
CO1	Students will be able to understand small signal model of MOS transistor and design using SPICE modeling
CO2	Students will be able to analyze single stage and differential amplifier with frequency response.
CO3	Students will be able to analyze and Design basic analog circuits such as current mirrors, active load, biasing circuits.
CO4	Students will be able to illustrate performance parameter of operational amplifier.

Course Name:PE IV : Operating Systems (T/P)	Course Code:EE2429/EE2430
CO1	Students will be able to understand the concepts of operating systems and processes
CO2	Students will be able to learn processes, threads and memory management and storage structures
CO3	Students will be able to evaluate the algorithms and solutions for operating system management
CO4	Students will be able to analyze the security issues in operating systems

Course Name:PE V : Industrial Automation	Course Code:EE2431
CO1	Students will be able to describe working of various blocks of basic industrial

	automation system
CO2	Students will be able to connect the peripherals with the PLC iii. Use various PLC functions and develop small PLC programs iv. Summarize Distributed control system and SCADA system
CO3	Students will be able to connect the peripherals with the PLC iii. Use various PLC functions and develop small PLC programs iv. Summarize Distributed control system and SCADA system
CO4	Students will be able to connect the peripherals with the PLC iii. Use various PLC functions and develop small PLC programs iv. Summarize Distributed control system and SCADA system

Course Name:PE V : Nano Electronics		Course Code:EE2432
CO1	Students will be to understand describe the fundamentals of classical CMOS technology and the issue in scaling MOSFET in the sub100nm regime	
CO2	Students will be to understand explain ideal , nonideal capacitor voltage characteristics MOS transistor and quantum physics of nanomaterials	
CO3	Students will be to understand demonstrate frabrication technology for MOS transistors with new device structure and nano materials	
CO4	Students will be to understand illustrate Chemical process for nano materials used in semiconductor industry to produce thin films.	

Course Name:PE V : Optical Communication		Course Code:EE2433
CO1	Students will be to understand the fundamental principles of optics and light wave to design optical fiber communication systems	
CO2	Students will be to differentiate the types of losses in optical fiber link.	
CO3	Students will be to analyze different types of sources & detectors in fiber optics.	
CO4	Students will be to explore different methods of loss measurement in fiber optics.	

Course Name:PE V : RF Circuit Design		Course Code:EE2434
CO1	Students will have an ability to demonstrate in- depth knowledge of general RF circuits, components, fundamental parameters of transmission line and its constraints in high frequency transmission of information	
CO2	Students will be able to understand and use Smith Chart for developing circuits in RF applications.	
CO3	Students will be able to design impedance matching networks.	
CO4	Students will be able to design passive RF filters and RF power amplifiers.	

Course Name:PE VI : E-Commerce & Data Analytics		Course Code:EE2441
CO1	Students will be able to understand of contemporary ecommerce concepts and terminology, and the processes and management decisions that are involved in launching, operating and managing business activity on the World Wide Web.	

CO2	Students will be able to analyze and understand the human, technological and business environment associated with e-commerce.
CO3	Students will be able to define and analyze the concept of electronic data interchange and its legal, social and technical aspects.
CO4	Students will be able to define and analyze the security issues over the web,the available solutions, future aspects of e-commerce security, concept of E-commerce and electronic payment system

Course Name:PE VI : MEMS		Course Code:EE2442
CO1	Students will be able to understand working principles of MEMS technology.	
CO2	Students will be able to learn the basic principles and applications of Micro fabrication and micromachining processes.	
CO3	Students will be able to discuss various applications of RF MEMS.	
CO4	Students will be able to classify types of microsensors and micro actuators used in Micro systems	

Course Name:PE VI : Biomedical Instrumentation		Course Code:EE2443
CO1	Students will be able to understand the basic concepts of biomedical instrumentation and principle of transducer used in biomedical instrumentation	
CO2	Students will be able to understand cardiovascular, blood pressure measurement and analyze ECG, plethysmograph and spirogram	
CO3	Students will be able to understand various techniques used in generation and measurement of x-rays, EMG and use of pacemakers, defibrillators in health care.	
CO4	Students will be able to understand concept of Telemedicine, its applications and use of internet resource for hospital management system.	

Course Name:PE VI : Computer Organization		Course Code:EE2444
CO1	Students will be able to understand design levels of a computer system, System organization, memory hierarchy and virtual memory concept	
CO2	Students will be able to understand the operation of fixed- and floating-point arithmetic units.	
CO3	Students will be able to analyze hierarchical design of processor and control unit modules.	
CO4	Students will be able to apply the concepts of pipelining and multiprocessing for computer system design.	

| Course Name: Mini Project		Course Code:EE2409
CO1	Students will be able to identify, formulate and analyze complex engineering problems through literature survey.	
CO2	Students will be able to apply knowledge to assess health, social, safety and environmental issues.	
CO3	Students will be able to implement core /multidisciplinary/ industry-based electronics projects in cost effective manner.	
CO4	Students will be able to communicate technical details effectively	

Fourth Year: Semester VIII:

Course Name: Major Project	Course Code:EE2451
CO1	Students will be able to identify, formulate and analyze complex engineering problems through literature survey.
CO2	Students will be able to apply knowledge to assess health, social, safety and environmental issues.
CO3	Students will be able to implement core /multidisciplinary/ industry-based electronics projects in cost effective manner.
CO4	Students will be able to communicate technical details effectively

Dr.R.D. Thakre
HoD, EE

HOD
Department of Electronics Engineering.
YCCE Nagpur
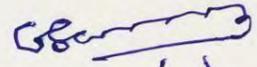
Dr.U.P.Waghe
Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

SEAL
Y.C. COLLEGE OF ENGINEERING
AN AUTONOMOUS INSTITUTION
NAGPUR

9.Electronics and Telecommunication department

Programme Educational Objectives (PEO)

- **PEO-1-**Graduates will be successful in pursuing higher studies in engineering and management or will pursue career path in teaching, research or entrepreneurship.

- **PEO-2-**Graduates will formulate, analyze and solve engineering problems critically with profound scientific and engineering knowledge and research capabilities so as to comprehend, design, create novel systems and solve collaborative multidisciplinary problems in Electronics and Telecommunication Engineering.

- **PEO-3-**Graduates will be engineering professionals with ethical attitude, effective communication skills and an ability to relate engineering to global issues in social context.

- **PEO-4-**Graduates will be able to develop attitude in lifelong learning towards career advancement and respond to changing social needs in a conducive academic milieu.

Programme Outcomes (PO)(UG)

- **PO-1-Engineering knowledge** : Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO-2-Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO-3-Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO-4-Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO-5-Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO-6-The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO-7-Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO-8-Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO-9-Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO-10-Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO-11-Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO-12-Life-long learning**: Recognize the need for, and have the preparation and ability to engage in

independent and life-long learning in the broadest context of technological change.

Program Specific Objectives (PSO)
- **PSO-1**-Knowledge of Thrust Areas: Apply knowledge and hands on competence in the areas of circuit analysis & design, communication systems, signal & image processing and embedded system.
- **PSO-2-**CAD Tool Usage: Create an environment to design and analyze electronics and Telecommunication systems using computer aided design (CAD) tools.

Course Name: Engineering Mathematics-I	Course Code: GE-2101
CO1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures
CO2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.
CO3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.
CO4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name: Engineering Physics (T/P)	Course Code: GE-2105 /GE 2106
CO1	Examine the intensity variation of light due to interference, diffraction and itsapplications.
CO2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
CO3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
CO4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
CO1	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name: Communication Skill	Course Code: GE-2107
CO1	Explain the basics of communication process as well as identify the barriers in communication.
CO2	Classify and describe the different Speech Sounds of English Language.
CO3	Apply different strategies and techniques of presentations, interviews and group communication.
CO4	Drafting reports, memos and emails, considering the professional etiquettes and ethics with appropriate content and context.

Course Name: Engineering Mechanics (T/P)	Course Code: CV2101/ CV2102
CO 1	An ability to apply the concept of applied mechanics and can solve problems on planar force system for friction as well as frictionless surfaces.
CO 2	An ability to analyze pin jointed truss frame structure and beam structure analytically and graphic
CO 3	An ability to understand centroid, moment of inertia, product of inertia and mass moment of inertia and can find properties of surfaces.
CO 4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.

Course Name: Introduction to Computer Programming (T/P)	Course Code: IT2101/ IT2102
CO1	Understand computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C‟ programming language constructs.
CO2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
CO3	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.
CO4	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.

Course Name: Workshop Practice	Course Code: ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications
CO2	Understand the fitting tools, measuring instruments, machineries and its applications
CO3	Understand the smithy tools furnaces and hand and power forging equipment‟s
CO4	Understand Gas and Electric welding processes, utility, tools and its applications

First Year: Semester II: Group A/Semester I Group B

Course Name: Engineering Mathematics-II	Course Code: GE-2102
CO1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
CO2	Analyse the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals
CO3	Use Matrix method to solve linear equations , evaluate eigen values - eigen vectors and its applications.
CO4	Measure the statistical parameters and derive the equations of best fit curves

Course Name: Engineering Chemistry (T/P)	Course Code: GE2103 /GE 2104
CO1	Assess qualitative and quantitative aspects of water as a conventional material for industrial and domestic applications.
CO2	Apply the knowledge of basic electrochemistry to understand battery technology, corrosion process and preventive techniques.
CO3	Know the basics and assess analytical aspects of industrial materials like fuels and lubricants for efficient utilization.
CO4	Recognize the significance of cement and advanced engineering materials in technological applications.
CO5	Analyze and generate analytical and instrumental techniques.

Course Name: Social Science	Course Code: GE-2108
CO1	Explain the basic concepts of Social Sciences.
CO2	Describe the development of various Civilizations and their Culture.
CO3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
CO4	Explain Industrial Organization and Management.

Course Name: Basic Electronics	Course Code: EE 2101
CO1	Characterize Number systems, semiconductors, diodes, transistors and operational amplifiers.
CO2	Design simple analog circuits
CO3	Design simple combinational and sequentiallogic circuits
CO4	Identify functions of digital multimeter, Bridges and transducers in the measurement of physical variables

Course Name:Electrical Engineering (T/P)	Course Code: EL 2101/ EL-2102
CO1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.
CO2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
CO3	Explain construction, working, testing, and applications of various electrical machines.
CO4	Analyse performance of various electrical machines.
CO5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name: Engineering Graphics(T/P)	Course Code: ME2101/ME2102
CO1	Transform orthographic projections into isometric projections and vice versa.
CO2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
CO3	Built the development of lateral surfaces of various solids and their cut section.
CO4	Predict the intersections and intersections of various solid objects.
CO5	Justify the use of software tools used for Two dimensional drawings.

Second Year: Semester III:

Course Name: : Engineering Mathematics-III	Course Code: GE-2201
CO1	Estimate the Calculus of Numerical Function.
CO2	Determine the transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations.
CO3	Discuss the nature of periodic function and express it in terms of series.
CO4	Use appropriate method/s to solve partial differential equations.

Course Name: Electronic Devices and Circuits (T/P)	Course Code:ET2201/ET2202
CO1	Apply the knowledge of semiconductor diodes in circuit analysis.
CO2	Identify the operating conditions of bipolar junction transistors.
CO3	Design and analyze transistor circuit with suitable biasing and stabilization techniques. And analyze the operation of MOSFET in various regions.
CO4	Analyze the response of transistors at low and high frequency
CO5	Analyze the Characteristics of different power amplifier

Course Name:Digital Circuits and Fundamentals of Microprocessor(T/P)	Course Code:ET2203/ET2204
CO1	Explain and compare the digital logic families
CO2	Simplify Boolean expressions using k-map & tabulations method.
CO3	Identify, formulate, and solve combinational logic design problems.
CO4	Describe and Design sequential logic circuits.
CO5	Describe the concept of 8085 and develop programs for it
Course Name: Electronic Measurement & Instrumentation(T/P)	Course Code: ET2205/ET2206
CO1	Describe basic measurement system and analyze errors
CO2	Analyze the behavior of bridge circuits for the measurement of different electrical quantities
CO3	Demonstrate the working of measuring instrument, display devices, generators, spectrum analyzers along with sensors and transducers
CO4	Elaborate application of data conditioning and acquisition

Course Name: Network Analysis	Course Code: ET2207
CO1	Analyze electrical circuits using nodal and mesh analysis
CO2	Design and analyze electrical circuits using network theorems.
CO3	Analyze steady state and transient response of electrical circuits
CO4	Characterize the transfer function for two – port networks.

Second Year: Semester IV:

Course Name: : Advance Mathematical Techniques	Course Code: GE-2204
CO1	Utilize numerical techniques to obtain approximate solutions of mathematical equations
CO2	Design and determine the solution of linear programming problems.
CO3	Measure the Statistical parameters for random variables
CO4	.Explain the basic concept of fuzzy sets, Relations and fuzzy logic.

Course Name:Electromagnetic Fields	Course Code:ET2251
CO1	Compare different types of co-ordinate systems for electromagnetic fields
CO2	Apply the concepts of electric field and magnetic field to solve engineering problems.

CO3	Analyze static and time varying fields using Maxwell"s equations
CO4	Analyze wave propagation in different medium.

Course Name: Microcontroller and Interfacing (T/P)	Course Code: ET2252 / ET2253
CO1	Explain 8051 microcontroller architecture.
CO2	Develop assembly language program.
CO3	Develop embedded C language program.
CO4	Interface 8051 microcontroller to solve real life problems.

Course Name:Analog Communication (T/P)	Course Code: ET2254 / ET2255
CO1	Analyze different analog modulation techniques.
CO2	Evaluate different parameters of communication receivers.
CO3	Analyze and comprehend concept of television transmission and reception.
CO4	Describe and analyze Pulse modulation techniques, noise and wave propagation of signals

Course Name: Microcontroller and Interfacing (T/P)	Course Code: ET2252 / ET2253
CO1	Explain 8051 microcontroller architecture.
CO2	Develop assembly language program.
CO3	Develop embedded C language program.
CO4	Interface 8051 microcontroller to solve real life problems.

Course Name:Control Systems(T/P)	Course Code: ET2256 / ET2257
CO1	Apply block diagram reduction technique and signal flow graph for transfer function
CO2	Analyze the characteristic of feedback control system
CO3	Explain and analyze time response of first and second order control systems for different standard test signals
CO4	Determine the stability of linear control system
CO5	Perform frequency domain analysis of linear control system using bode plot and nyquist stability criterion

Third Year: Semester V:

Course Name: Fundamentals of Economics	Course Code: GE2312
CO1	Recognize consumer"s behavior and analyze Market price
CO2	Extrapolate operations in market with production constraints
CO3	Describe the national income accounting and public finance.
CO4	Analyze international trade and institutions.

Course Name:Analog Integrated Circuits(T/P)		Course Code:ET 2301/ET 2302
CO1	Describe, Design and analyze OP-AMP circuits.	
CO2	Parametric analysis and Design of error compensation network.	
CO3	Design and analyze linear and non- linear OP-AMP applications.	
CO4	Explain special function ICs and design circuits using it.	

Course Name: Fields & Radiating Systems		Course Code: ET 2303
CO1	Analyze transmission lines and perform its parametric analysis.	
CO2	Analyze parallel plane waveguides	
CO3	Analyze and design rectangular waveguides	
CO4	Design antenna arrays	

Course Name: Signals & Systems (T/P)		Course Code: ET 2304/ ET 2305
CO1	Classify systems based on their properties and determine the response of LTI system.	
CO2	Analyze system properties based on impulse response and Fourier analysis.	
CO3	Apply sampling and interpolation to sample and reconstruct signals.	
CO4	Apply the Laplace transform and Z- transform for analysis of continuous-time and discrete-time signals and systems	

Course Name: Lab: Electronics Workshop(P)		Course Code: ET 2306
CO1	Identify and test passive and active electronic components and devices.	
CO2	Identify and Test wires, cables, connectors and interconnected components.	
CO3	Construct mini project and troubleshoot it.	

Course Name: OE I/ OE III: Microcontroller & Embedded Systems		Course Code: ET 2311/ET 2381
CO1	Explain 8051 microcontroller architecture.	
CO2	Develop assembly language program.	
CO3	Develop embedded C language program.	
CO4	Interface 8051 microcontroller to solve real life problems	

Course Name: OE I/ OE III: Principles Of Communication Engineering		Course Code: ET 2312/ET 2382
CO1	Classify systems based on their properties and determine the response of LTI system.	
CO2	Analyze system properties based on impulse response and Fourier analysis.	
CO3	Apply sampling and interpolation to sample and reconstruct signals.	
CO4	Apply the Laplace transform and Z- transform for analysis of continuous-time and discrete-time signals and systems	

Course Name: OE I/ OE III: FundamentalsOf Image Processing	Course Code: ET 2313/ET 2383
CO1	Apply basic image processing algorithms for image enhancement.
CO2	Apply filtering techniques in spatial and frequency domain.
CO3	Describe and analyze various image transform techniques.
CO4	Apply segmentation and compression algorithms on images

Course Name: OE II/ OE IV: Soft Computing	Course Code: ET 2321/ET 2391
CO1	Describe and apply genetic operators and genetic algorithms for problem solving
CO2	Apply Neural Network algorithms in pattern classification
CO3	Apply fuzzy logic and arithmetic to handle uncertainty and solve engineering problems
CO4	Describe and analyze fuzzy implications and fuzzy controller

Course Name: OE II/ OE IV: Industrial Instrumentation	Course Code:ET 2322/ET 2392
CO1	Describe instrumentation system using various transducers.
CO2	Measure and analyze various parameters using transducers.
CO3	Explain and Identify automation system components

Course Name: OE II/ OE IV: Medical Electronics	Course Code:ET 2323/ET 2393
CO1	Describe various parameters of human anatomy and physiology.
CO2	Explain the functioning of different measuring and recording instruments
CO3	Describe radiography equipments
CO4	Explain Biomedical computer application

Course Name: OE II/ OE IV: Display Technology & Applications	Course Code:ET 2324/ET 2394
CO1	Identify and describe different display technologies, their working, Luminescence materials and manufacturing processes.
CO2	Characterize and analyze specifications of display technology, light emission process and analyze matrix addressing.
CO3	Explain the fundamentals of backplane and backlight unit technologies.
CO4	Elaborate materials and applications of displays.

Course Name: OE II/ OE IV: PLCs and SCADA	Course Code:ET2325 /ET2400
CO1	Identify and describe different display technologies, their working, Luminescence materials and manufacturing processes.
CO2	Characterize and analyze specifications of display technology, light emission process and analyze matrix addressing.
CO3	Explain the fundamentals of backplane and backlight unit technologies.

CO4	Elaborate materials and applications of displays.

<mark>Third Year: Semester VI:</mark>

Course Name: Fundamentals of Management	Course Code: GE2311
CO1	Explain the Legal provision and Functions of Management.
CO2	Analyze the role of Human Resource and Financial Management in the organization.
CO3	Analyze the project life cycles.
CO4	Identify tools and techniques for the marketing of goods and services.

Course Name:Digital Signal Processing(T/P)	Course Code:ET2351/ET2352
CO1	Apply discrete Fourier transform and verify its properties.
CO2	Implement digital filters in a variety of structures.
CO3	Design and analyze digital IIR and FIR filter.
CO4	Analyze the effects of finite word length on discrete time system
CO5	Analyze multi-rate discrete time system with unequal sampling rates

Course Name:PE I : Object Oriented Programming(T/P)	Course Code:ET2361/ ET2362
CO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
CO2	Demonstrate the use of various OOPs concepts with the help of C++ programs.
CO3	Design and develop C++ programs for implementing data structures using array and linked list.
CO4	Implement the concept of file handling, template and exception handling to develop the software.

Course Name:PE I : Discrete Structures (T/P)	Course Code: ET2363/ET2364
CO1	Analyze the concept of logic and proofs.
CO2	Apply discrete mathematics to develop recursive algorithms.
CO3	Design and Solve various problems of discrete probability theory.
CO4	Analyze graphs, tree, group theory concepts used in computer science
CO5	Design and analyze network models related to transport network and pumping network

Course Name: PE I : Microprocessors and Peripherals(T/P)	Course Code: ET2365/ET2366
CO1	Explore architecture of 8085 microprocessor and utilize the instruction set of 8085 to develop assembly language programs
CO2	Analyse timing details, develop delay programs & interface memory ICs with 8085

CO3	Interface various off chip peripherals with 8085 & develop programs for the same
CO4	Explore architecture of 8086 microprocessor & compare it with 8088
CO5	Develop programs using 8086 instruction set.

Course Name: PE I : Electronic Instrumentation(T/P)	Course Code: ET2367/ET2368
CO1	Design instrumentation system using various transducers and its calibration process.
CO2	Analyze pressure and temperature using measuring instruments and its calibration process.
CO3	Measure and analyze flow and level using flow transducers.
CO4	Measure and analyze various parameters like level, thickness speed, ph value etc.
CO5	Develop PLC programs by using ladder diagram

Course Name:PE I : Fundamentals of Computing(T/P)	Course Code: ET2371/ET2372
CO1	Describe and develop Pythonprogramming using data types, operators and control structures.
CO2	Develop python programs using loops and decision statements.
CO3	Describe and apply strings, lists, tuples, Numpy and dictionaries in Python programs.
CO4	Develop python programs using functions and recursions

Course Name: PE I : Algorithms and data structures(T/P)	Course Code: ET2373/ ET2374
CO1	Describe fundamental concepts of Object Oriented Programming
CO2	Develop programs for Various types of data structures.
CO3	Analyze Skip-list, hashing and search trees.

Course Name: PE II : Antenna Theory & Design (T/P)	Course Code: ET2377/ ET2378
CO1	Evaluate various parameters of antennas.
CO2	Analyze performance parameters of various antennas & antenna array
CO3	Perform of antenna measurements by using different antenna measurement techniques.
CO4	Design and Analyze various antennas

Course Name: PE II : Digital System Design (T/P)	Course Code: ET2379/ET2380
CO1	Compare and contrast different FPGA and CPLD architectures.
CO2	Design, develop and analyze combinational circuits.
CO3	Design, develop and analyze sequential circuits.
CO4	Implement digital system using CAD tool.

Course Name:PE II : Internet of Things (IoT) (T/P)	Course Code: ET2381/ET2382
CO1	Explore the physical and Logical design of IoT.
CO2	Explore the M2M and NETCONF.
CO3	Explore python programming.
CO4	Apply basic skills of IoT to solve real life problems.

Course Name:PE II : Optical Communication(T/P)	Course Code: ET2383/ET2384
CO1	Design and analyze an Optical Communication Systems with different types of losses.
CO2	Explore different types of sources and receivers in fiber optics.
CO3	Use different splicing techniques, connectors and coding.
CO4	Explore different methods of loss measurements in fiber optics

Course Name:PE II: Principles of image processing(T/P)	Course Code: ET2385/ET2386
CO1	Apply basic image processing algorithms for image enhancement.
CO2	Apply filtering techniques in spatial and frequency domain.
CO3	Understand noise models and degradation process for image restoration
CO4	Implement the algorithms for image segmentation and compression
CO5	Implement the algorithms for image representation and description

Course Name: PE II: TV & Video Engineering (T/P)	Course Code: ET2387/ET2388
CO1	Describe basic concept of monochrome and color TV.
CO2	Describe and troubleshoot Video Amplifier & luminance circuits.
CO3	Explain and compare PAL, NTSC and SECAM systems.
CO4	Explain and compare analog and digital television-transmission and reception.

Fourth Year: Semester VII:

Course Name: RF & Microwave(T/P)	Course Code: ET 1401/ ET 1402
CO1	Describe and analyze the behavior of linear beam and cross field tubes.
CO2	Apply s-parameters to model and analyze output response of microwave transmission lines.
CO3	Analyze behavior of passive components using s-matrix.
CO4	Measure performance parameters of microwave devices.
CO5	Explain and characterize microwave solid state devices.

Course Name:Principles of Image Processing	Course Code:ET 1403/ ET 1404
CO1	Apply basic image processing algorithms for image enhancement.

CO2	Apply filtering techniques in spatial and frequency domain.
CO3	Explain noise models and apply degradation process for image restoration
CO4	Implement the algorithms for image segmentation and compression
CO5	Describe various image transform techniques.

Course Name:PE III : Optical Communication	Course Code:ET 1405/ ET 1406
CO1	Design and analyze an Optical Communication Systems with different types of losses.
CO2	Explore different types of sources and receivers in fiber optics.
CO3	Use different splicing techniques, connectors and coding.
CO4	Explore different methods of loss measurements in fiber optics

Course Name: PE III : Microwave Integrated circuit	Course Code: ET 1407/ ET 1408
CO1	Identify and describe the different MIC components.
CO2	Design and analyze Microwave Integrated circuit and various Microstrip antennas
CO3	Analyze the design of microstrip circuits in low and High Power circuits.
CO4	Analyze Hybrid MIC"s & Monolithic MIC s fabrication techniques.

Course Name: PE III : Communication Networks	Course Code: ET 1409/ ET 1410
CO1	Apply LAN structure to design data communication system.
CO2	Detect Data transmission errors in communication networks.
CO3	Describe and compare data transmission protocols.
CO4	Describe and compare data and network security protocols.

Course Name: PE III : Analog VLSI	Course Code:ET 1431/ ET 1432
CO1	Apply mathematical methods to analyze Analog VLSI circuits and design MOS amplifier to improve the gain and operating frequency range.
CO2	Design single stage amplifier with various loads and analyze the various characteristic.
CO3	Design and analyze the differential amplifier and Op-AMP with two stage &Cascade stage technique.
CO4	Explain basics of switch capacitor anddesign layout of analog circuits.

Course Name:Industrial Training/ CRT	Course Code:ET 1413
CO1	Write effectively in English.
CO2	Analyze logically and critically on different issues.
CO3	Solve quantitative problems effectively.
CO4	Apply fundamentals of Electronics and Telecommunication for practical applications.

Course Name:Project phase -I	Course Code:ET 1414

CO1	Identify, formulate and analyze complex engineering problems through literature survey.
CO2	Apply knowledge to assess health, social, safety and environmental issues.
CO3	Implement core /multidisciplinary/ industrybased electronics projects in cost effective manner.
CO4	Communicate technical details effectively

<mark>**Fourth Year: Semester VIII:**</mark>

Course Name: Antenna Theory & Design (T/P)		**Course Code:ET 1415/ ET 1416**
CO1	Evaluate various parameters of antennas.	
CO2	Analyze performance parameters of various antennas & antenna array	
CO3	Perform of antenna measurements by using different antenna measurement techniques.	
CO4	Design and Analyze various antennas	

Course Name:CMOS VLSI Design(T/P)		**Course Code:ET 1417/ ET 1418**
CO1	Analyze the characteristics of MOSFET	
CO2	Analyze the voltage transfer characteristics of MOS inverters.	
CO3	Apply the LAMBDA design rules for design of optimized CMOS circuits and describe the process of fabrication for CMOS circuits	
CO4	Analyze switching characteristics and interconnection effects of MOS device	
CO5	Design and analyze the combinational, sequential and advanced techniques in CMOS logic circuits	

Course Name:PE IV : Power Electronics		**Course Code:ET 1419**
CO1	Describe and characterize power electronics devices	
CO2	Describe and Analyze 3 Phase rectifier circuit.	
CO3	Describe and Analyze converters, cycloconverters and inverters.	
CO4	Explain protection circuits.	

Course Name:PE IV : Wireless Mobile Communication Systems		**Course Code:ET 1420**
CO1	Describe the evolution of wireless systems & cellular standards.	
CO2	Apply the concepts of frequency reuse for design of cellular systems and capacity improvement in cellular systems.	
CO3	Quantify causes and effects of path loss and signal fading on received signal characteristics and use various techniques to improve signal quality and link performance.	

CO4	Analyze GSM & CDMA systems & understand the fundamentals of wireless networking.

Course Name:PE IV : Satellite Communication & RADAR Engineering	Course Code:ET 1433
CO1	Explain satellite System and Services in propagation of satellite.
CO2	Describe various systems in Earth Station
CO3	Analyze the effect of weather conditions on Radar Systems.
CO4	Describe and apply the Radar range equation and Doppler principle to detect moving targets and cluster.

Course Name:PE IV : Display Technology	Course Code:ET 1437
CO1	Identify and describe different display technologies, manufacturing process and specifications of display technology.
CO2	Explain and analyze properties of Luminescence materials
CO3	Explain design parameters for displays and analyze matrix addressing.
CO4	Explain backlight unit technologies and elaborate applications of displays.

Course Name:PE IV : Biomedical Instrumentation	Course Code:ET 1434
CO1	Describe and analyze various parameters using ECG,EEG EMG and phonocardiograph.
CO2	Describe and analyze various parameters such as -Blood Pressure, Blood flow rate, Pulse rate, Heart rate, respiration rate and temperature and hearing ability.
CO3	Explain the working principle of radiology equipments
CO4	Describe working principles of advanced medical imaging systems

Course Name:PE V : Fuzzy Logic & Neural Networks (T/P)	Course Code:ET 1422/ET 1423
CO1	Analyze computing algorithms in Fuzzy logic and neural network.
CO2	Describe neural network architecture and apply supervised/unsupervised algorithms for pattern recognition/classification problems.
CO3	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
CO4	Prove and Apply fuzzy arithmetic operations and relations for problem solving.
CO5	Apply Fuzzy implications and Design Fuzzy logic controller for solving real life problems.

Course Name:PE V : RF Circuit Design (T/P)	Course Code:ET 1424/ET 1425
CO1	Apply the fundamentals of RF to design and analyze the RLC circuits at high frequency
CO2	Design and analyze different bandwidth estimation techniques.
CO3	Apply the knowledge of CMOS technology for design ofsupply independent bias circuit.

CO4	Design and analyze the parameters of HF power amplifier circuits
CO5	Describe and analyze Phase detectors.
Course Name:PE V : Multimedia Communications(T/P)	**Course Code:ET 1426/ ET 1427**
CO1	Describe and compare different color models and file formats used for video and audio.
CO2	Analyze and compare digital/ analog video signal and quantization techniques for digital audio signals.
CO3	Apply different compression scheme used for image and video
CO4	Describe and compare various multimedia networks communication protocols.
CO5	Explain content based image retrieval techniques

Course Name:PE V : Advances in Communication(T/P)	**Course Code:ET 1435/ ET 1436**
CO1	Apply the knowledge of switching technologies for digital telephony
CO2	Describe digital subscriber & wireless local loop
CO3	Apply the concept of random variables to characterize the signal behavior in communication.
CO4	Apply the concept of density function to analyze the performance of communication system..

Course Name:Project Phase-II	**Course Code:ET 1428**
CO1	Design and analyze application based electronic systems.
CO2	Implement core / multidisciplinary / industrybased electronics projects in cost effective manner.
CO3	Communicate technical details effectively

10. M.Tech Communication Engineering.

PROGRAM EDUCATIONAL OBJECTIVES (PEO) (PG)

PEO-1-To prepare students to analyze complex Engineering problems critically with profound scientific and engineering knowledge and research capabilities so as to comprehend, design, create novel systems and solve collaborative multidisciplinary problems.

PEO-2-To inculcate in students professional and ethical attitude, effective communication skills, teamwork and an ability to relate engineering to global perspective issues and social context.

PEO-3-To provide student with an academic environment that fosters excellence, ethics, transparency, leadership and promote awareness of lifelong learning.

PROGRAM OUTCOMES (PO) (PG)

- **PO-1-**The Communication Engineering Post Graduate students will have an ability to acquire in depth knowledge of specific discipline, to evaluate, analyze and synthesize complex engineering problems to give optimal solutions for public health and safety, cultural, social and environmental factors.

- **PO-2-**An ability to develop research skills through appropriate research methodologies, techniques and modern engineering tools.

- **PO-3-**An ability to function on collaborative and multidisciplinary terms to manage project efficiency with consideration of economical and financial factors.

- **PO-4-**An ability to communicate effectively with engineering community and society.

- **PO-5-**Recognize the need for and an ability to encourage in lifelong learning with an understanding of professional, ethical and social responsibilities.

- **PO-6-**An ability to observe and examine the outcomes of one"s actions and make corrective measures without external feedback.

Course Outcomes (CO) (PG)

Course Name: Mathematical Foundations for Communication Engineering		Course Code:ET3901
CO-1	Calculate probabilities byapplying probability laws.	
CO-2	Derive probability distributions of functions of random variables.	
CO-3	Identify an appropriate probability distribution for a given discrete or continuous random variable.	
CO-4	Determine covariance and spectral density of stationary random processes.	

Course Name:–Passive RF Circuits and System		Course Code: ET3902
CO-1	Analyze various transmission lines and itscharacteristics.	
CO-2	Analyze various transmission lines and itscharacteristics	
CO-3	Apply the knowledge of various switches,phase shifters and MIC filters.	
CO-4	Explore various MMIC and MEMStechnologies.	

Course Name:–Lab: Passive RF Circuits and System		Course Code: ET3903
CO-1	Analyze various transmission lines and itscharacteristics	
CO-2	Analyze various microwave networkmodels and passive components	
CO-3	Apply the knowledge of various switches,phase shifters and MIC filters.	
CO-4	Explore various MMIC and MEMStechnologies.	

Course Name:–Advanced Digital Communication		Course Code: ET3904
CO-1	Distinguish various digital modulation techniques	
CO-2	Analyze the probability of errors in digital communication systems.	
CO-3	Apply spread spectrum modulation for various applications of communication systems.	
CO-4	Distinguish Multichannel and multicarrier communication systems	

Course Name:– Lab: Advanced Digital Communication		Course Code: ET3905
CO-1	1) Distinguish various digital modulationtechniques	
CO-2	Analyze the probability of errors in digitalcommunication systems.	
CO-3	2) Apply spread spectrum modulation forvarious applications of communication systems.	
CO-4	Distinguish Multichannel and multicarriercommunication systems	

Course Name:–Adaptive Signal Processing		Course Code: ET3906
CO-1	1) Analyse convergence and stability issues using LMS algorithm and its transform domain.	
CO-2	Devise filtering solutions for optimising using Kalman Filtering , Adaptive beam forming& FTRLS algorithm.	

Course Name: Lab: Adaptive Signal Processing		Course Code: ET3907
CO-1	Devise filtering solutions for optimising thecost function using wiener filters.	
CO-2	Analyse convergence and stability issues using LMS algorithm and its transform domain.	
CO-3	Evaluate the performance Recursive Least-Squares (RLS) techniques to improve convergence behaviour..	
CO-4	Devise filtering solutions for optimising using Kalman Filtering , Adaptive beam forming& FTRLS algorithm	

	Course Name:– PE I: Error Control Coding	Course Code: ET3908
CO-1	Apply the knowledge of error correction in data communication and storage systems.	
CO-2	Analyze numerical operations in finite fields by using both exponential and polynomialrepresentations of finite field elements.	
CO-3	Analyze an ability to compare and contrast the strengths and weaknesses of various errors correcting code for a given application.	
CO-4	Demonstrate competence in analyzing and evaluating the practice of different error correcting coded in digital communicationsystem.	

	Course Name: PE I: Embedded Systems & DSP Processor	Course Code: ET3909 –
CO-1	1. Explore different technologies related to embedded systems	
CO-2	2. Effectively utilize the knowledge gained about ARM processor architecture and its instruction set for programming.	
CO-3	3. Explore basics of DSP processor architecture	
CO-4	Effectively utilize the knowledge gained about c3x DSP processor and its instruction set for programming	

	Course Name:– PE I: Pattern Recognition	Course Code: ET3910
CO-1	Identify and describe pattern recognition techniques and their roles I building intelligent machines	
CO-2	Recognize the feasibility of applying pattern recognition methodology for a particular problem in pattern classification and regression	
CO-3	Apply clustering and probability theory tohandle uncertainty and solve engineering problems	
CO-4	Evaluate and compare solutions by various pattern recognition approaches for a givenproblem.	

	Course Name:– PE II: Multimedia Communications	Course Code: ET3911 –
CO-1	Describe features of various image fileformats and image data type	
CO-2	Explain characteristics of video signals like NTSC,PAL,SECAM Implement and describevarious image compression techniques	
CO-3	Explain various video compression technique	
CO-4	Explain various audio compression techniques	

	Course Name:– PE II: Active RF Devices and Circuits	Course Code: ET3912 –
CO-1	Explain different types RF Diodes, Linear&Non linear Diode Models.	
CO-2	Design Two Port power gain, AmplifierStability and for Specified Gain	
CO-3	Devise Characteristics and equivalent circuitof detector and power amplifier.	
CO-4	Perform measurements on mixer, Oscillatorand PLL	

Course Name:– PE II: Soft Computing	Course Code: ET3913 –
CO-1	Identify and describe soft computing techniques and their roles in building intelligent machines
CO-2	Recognize the feasibility of applying a soft computing methodology for particular problem andApply genetic algorithms to optimization problems.
CO-3	Identify supervised/unsupervised neural networks algorithms to solve pattern classification problems
CO-4	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

Course Name:– Advanced Antenna Theory	Course Code: ET3915 –
CO-1	Evaluate various parameters of antennas.
CO-2	Analyze performance parameters of variousantennas & antenna array.
CO-3	Understand smart antenna measurementtechniques.
CO-4	Design and analyze various antenna

Course Name:– Lab: Advanced Antenna Theory	Course Code: ET3916 –
CO-1	Evaluate various parameters of antennas.
CO-2	Analyze performance parameters of variousantennas & antenna array.
CO-3	Understand smart antenna measurementtechniques
CO-4	Design and analyze various antenna

Course Name:– VLSI Signal Processing	Course Code: ET3917 –
CO-1	Design parallel and pipelining processing systems for speed, power and are optimization
CO-2	Implement the pipelined and parallel architectures using folding and unfolding techniques.
CO-3	Analyse Systolic Design for SpaceRepresentations containing Delays
CO-4	Apply algorithmic strength reduction techniques such as Fast Convolution algorithms and FDCT algorithms for increasing the speed of computation
CO-5	Design DSP algorithms with reduced numericalstrength by subexpression sharing techniques

Course Name:– Digital Image Processing	Course Code: ET3918-
CO-1	Apply basic image processing algorithms forimage enhancement.

CO-2	Interpret the digital images in frequency domainby using various transform techniques.
CO-3	Understand noise models and degradationprocess for image restoration
CO-4	Implement the algorithms for imagecompression and segmentation. Implement the algorithms for imagerepresentation and description

Course Name:– Digital Image Processing	Course Code: ET3918–Lab :
CO-1	Apply basic image processing algorithms forimage enhancement.
CO-2	Interpret the digital images in frequency domainby using various transform techniques
CO-3	Understand noise models and degradationprocess for image restoratio
CO-4	Implement the algorithms for imagecompression and segmentation.

Course Name:– Wireless Communications & Networks	Course Code: ET3920 –
CO-1	Quantify causes and effects of path loss and signal fading on received signal characteristic and used various technique to improve signal quality and link performance.
CO-2	Analyze various Multicarrier Modulation and Multiple access techniques for wireless communication
CO-3	Analyze GSM & CDMA systems andunderstand the fundamentals of wireless networking.
CO-4	Elaborate and compare various generations of mobile communication systems

Course Name:—PE III: Selected Topics in Communication Systems	Course Code: ET3921
CO-1	Understand and design physical modeling of channels in free space along with time varying systems.
CO-2	Compare and analyze Non-coherent and Coherent detection Time diversity.
CO-3	Elaborate key features of various standards related to modeling of MIMO,SIMO,MISO
CO-4	Understand and analyze V-BLAST and D- BLAST architecture
CO-5	Design and understand multiplexing tradeoff - Universal code design for scalar channels, parallel channels

Course Name:— PE III: Speech Processing	Course Code: ET3922 –

CO-1	Identify digital speech production model.
CO-2	Process speech using time andfrequency domain method.
CO-3	Analyze speech by linear predictivecoding method.
CO-4	Recognize speech and speaker.

Course Name:— PE III: Real Time Operating System	Course Code: ET3924 –
CO-1	Analyze the various real time systems withreference model
CO-2	Discuss the various functional parameters resources and scheduling.
CO-3	Detect multiple Faults and reduce errorcontainment.
CO-4	Explore the various Memory managementand Input/ Output syst process Management

Course Name:— PE IV: High Speed Networks	Course Code: ET3925 –
CO-1	Analyze different networks and networktopologies
CO-2	Compare different protocols used in highspeed networks
CO-3	Solve Network design issue
CO-4	Compare optical sensors and Networks

Course Name:— PE IV: Wireless Sensor Networks	Course Code: ET3926 –
CO-1	Understand and explain commonwireless sensor node architectures.
CO-2	Carry out simple analysis and planning ofWSNs.
CO-3	Demonstrate knowledge of MACprotocols developed for WSN
CO-4	Demonstrate knowledge of routingprotocols developed for WSN.
CO-5	Understand and explain mobile data-centric networking principles.
CO-6	Be familiar with WSN standards.

Course Name:— Seminar	Course Code: ET3928 –
CO-1	Write effectively in English.
CO-2	Analyze logically and critically ondifferent issues.

CO-3	Solve quantitative problems effectively.
CO-4	Apply fundamentals of Electronics and Telecommunication for practicalapplications.

Course Name:—Project Phase-I		Course Code: ET3939-
CO-1	An ability to understand the advances in structural engineering.	
CO-2	An ability to understand the use of modern tool	
CO-3	An ability to work independently and in a team for effective communication	
CO-4	An ability to understand the importance of life-long learning.	

Fourth Semester:

Course Name:—Project Phase-II		Course Code: ET3940-
CO-1	An ability to understand the advances in structural engineering	
CO-2	An ability to solve real world structural engineering problems.	
CO-3	An ability to understand the importance of lifelong learning and the use of modern tools.	
CO-4	An ability to work independently and in a team for effective communication.	
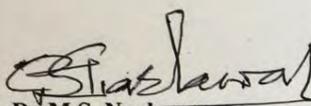
Dr.M.S. Narlawar
HoD, ET

Dr. M.S. NARLAWAR
Head of Department
Electronics & Tele Communication Engg.
YCCE, Nagpur
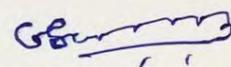
Dr.U.P.Waghe
Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

132

11.Department of Computer Technology:

Program Educational Objectives of the program (PEO)

- **PEO-1- Preparation:** To prepare students to succeed in employment/profession and/or to pursue post graduate and research educations in Computer Technology discipline in particular and allied engineering disciplines in general. (**Preparation**)
- **PEO-2- Core Competence:** To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to formulate, analyse and solve engineering problems requiring knowledge of Computer Technology. (**Core Competence**)
- **PEO-3- Breadth:** To prepare students with engineering breadth to innovate, design, develop software products and to contribute in providing solutions related to multidisciplinary real life problems. (**Breadth**)
- **PEO-4- Professionalism:** To inculcate in students professional and ethical attitude, effective communication skills and teamwork to become a successful professional. (**Professionalism**)
- **PEO-5- Learning Environment:** To provide students with an academic environment that makes them aware of excellence and life-long learning in emerging technologies. (**Learning Environment**)

Program Outcomes(PO)

- **PO-1- Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
- **PO-2- Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO-3- Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
- **PO-4- Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO-5- Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
- **PO-6- The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO-7- Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO-8- Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO-9- Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO-10- Communication**: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO-11- Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO-12- Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program specific Outcomes(PSO)

- **PSO-1-**An ability to acquire skills to design & develop quality software using cutting-edge technologies of Computer Engineering.
- **PSO-2-**An ability to use knowledge of various domains as per thrust areas to formulate and implement ideas for providing innovative solutions.

Course Outcomes (UG):

<mark>First Year: Semester I:</mark>

Course Name: Engineering Mathematics-I(T)	Course Code:GE-2101
GE-2101 CO-1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures
GE-2101 CO-2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.
GE-2101 CO-3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.
GE-2101 CO-4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name: Engineering Mathematics-II (T)	Course Code:GE-2102
GE-2102 CO-1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
GE-2102 CO-2	Analyze the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals
GE-2102 CO-3	Use Matrix method to solve linear equations, evaluate eigen values -eigen vectors and its applications.
GE-2102 CO-4	Measure the statistical parameters and derive the equations of best fit curves

Course Name: Communication Skill (T)	Course Code:GE-2107
GE-2107 CO-1	Explain the basics of communication process as well as identify the barriers in communication.
GE-2107 CO-2	Classify and describe the different Speech Sounds of English Language.
GE-2107 CO-3	Apply different strategies and techniques of presentations, interviews and group communication.
GE-2107 CO-4	Drafting reports, memos and emails, considering the professional etiquettes and ethics with appropriate content and context.

Course Name:Social Science (T)	Course Code:GE-2108
GE-2108 CO-1	Explain the basic concepts of Social Sciences.
GE-2108 CO-2	Describe the development of various Civilizations and their Culture.
GE-2108 CO-3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
GE-2108 CO-4	Explain Industrial Organization and Management.

Course Name:Engineering Physics Course Name: Engineering Physics (Lab.) (T/P)	Course Code:GE-2105 and GE 2106
GE 2105 & GE2106 CO1	Examine the intensity variation of light due to interference, diffraction and its applications.
GE 2105 CO2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
GE 2105 & GE2106 CO3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
GE 2105 & GE2106 CO4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
GE 2105 & GE2106 CO1	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name:Engineering Chemistry /Engineering Chemistry (Lab.) (T/P)	Course Code:GE2103 and GE 2104
GE2103 and GE 2104 CO1	Assess qualitative and quantitative aspects of water as a conventional material for industrial and domestic applications.
GE2103 and GE 2104 CO2	Apply the knowledge of basic electrochemistry to understand battery technology, corrosion process and preventive techniques.
GE2103 and GE 2104 CO3	Know the basics and assess analytical aspects of industrial materials like fuels and lubricants for efficient utilization.
GE2103 and GE 2104 CO4	Recognize the significance of cement and advanced engineering materials in technological applications.
GE2103 and GE 2104 CO5	Analyze and generate analytical and instrumental techniques.

Course Name: Engineering Mechanics/ Engineering Mechanics (Lab.) (T/P)		Course Code:CV2101/ CV2102
CV-2101- CO 1	An ability to apply the concept of applied mechanics and can solve problems on planar force system for friction as well as frictionless surfaces.	
CV-2101- CO 2	An ability to analyze pin jointed truss frame structure and beam structure analytically and graphic	
CV-2101- CO 3	An ability to understand centroid, moment of inertia, product ofinertia and mass moment of inertia and can find properties of surfaces.	
CV-210- 1CO 4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.	

Course Name: Basic Electronics (T)		Course Code:EE 2101
EE 2101CO1	Characterize Number systems, semiconductors, diodes, transistors and operational amplifiers.	
EE 2101CO2	Design simple analog circuits.	
EE 2101CO3	Design simple combinational and sequential logic circuits	
EE 2101CO4	Identify functions of digital multimeter, Bridges and transducers in the measurement of physical variables	

Course Name:introduction to Computer Programming/ Introduction to Computer Programming (Lab.) (T/P)		Course Code:IT2101 Course Code: IT-2102
IT2101, IT2102 CO1	Understand computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C" programming language constructs.	
IT2101 IT2102 CO2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.	
IT2101 IT2102 CO3	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.	
IT2101 IT2102 CO4	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.	

Course Name: Electrical Engineering / Electrical Engineering Lab (T/P)		Course Code:EL 2101/ EL-2102 (Lab.)
EL 2101 & EL 2102- CO-1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.	
EL 2101 & EL 2102- CO-2	Analyse dc circuits, single phase and three phase accircuits for basic electrical quantities such as current, voltage, power etc.	

EL 2101 & EL 2102- CO-3	Explain construction, working, testing, and applications of various electrical machines.
EL 2101 & EL 2102- CO-4	Analyse performance of various electrical machines.
EL 2101 & EL 2102- CO-5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data,
	communicate and present effectively through laboratory journals.

Course Name: Engineering Graphics/ Engineering Graphics Lab (T/P)		Course Code:ME2101/ME-2102
ME2101 ME-2102 CO1	Transform orthographic projections into isometric projections and vice versa.	
ME2101 ME-2102 CO2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.	
ME2101 ME-2102 CO3	Built the development of lateral surfaces of various solids and their cut section.	
ME2101 ME-2102 CO4	Predict the intersections and intersections of various solid objects.	
ME2101 ME-210 2CO5	Justify the use of software tools used for Two dimensional drawings.	

Course Name: Workshop Practice (P)		Course Code: ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications	
CO2	Understand the fitting tools, measuring instruments, machineries and its applications	
CO3	Understand the smithy tools furnaces and hand and power forging equipment"s	
CO4	Understand Gas and Electric welding processes, utility, tools and itsapplications	

<mark>Second Year: Semester III:</mark>

Course Name:Data Structures/ Data Structures Lab(T/P)		Course Code:CT2204/CT2205
CO1	Identify programming constructs needed to solve real world problems.	
CO2	Implement programming logic needed for solving given problem.	
CO3	To elaborate various abstract data types through implementation.	
CO4	To summarize various file handling mechanism	

Course Name:Object Oriented Programming/ Object Oriented Programming Lab(T/P)		Course Code:CT2202/CT2203
CO1	Reveal the knowledge of basic concepts of object-oriented programming and modelling of the problem in terms of classes	
CO2	Apply the concepts of object-oriented concepts like encapsulation, inheritance, polymorphism, and abstraction to the specific problem.	
CO3	Use the knowledge of I/O stream and generic components in the object oriented programming	
CO4	Formulate the standardized event driven solution for the real life scenarios	

:

Course Name:Python Programming Lab(P)	Course Code:CT2206
CO1	Select suitable framework for python programs as per requirement of application
CO2	Select suitable data structures and control statements
CO3	Demonstrate use of file handling and concepts of classes and objects
CO4	Develop advanced applications using functionalities provided under various packages of python

Course Name:Web Technology Laboratory (P)	Course Code:CT2207
CO1	Illustrate various internet technologies
CO2	Design the web pages using some basic techniques
CO3	Implement the XML technology to store the data
CO4	Develop the interactive web pages using the advanced technique

Course Name:Engineering Mathematics-III (T)	Course Code:GE1201
CO1	Estimate the Calculus of Numerical Function.
CO2	Determine the transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations.
CO3	Discuss the nature of periodic function and express it in terms of series.
CO4	Use appropriate method/s to solve partial differential equations.

Course Name:Computer Architecture & Organization (T)	Course Code: CT-2201
CO1	Relate & Identify the function and design of the various units of computers that process data and store the information.
CO2	Analyze and write control signal for executing machine instructions for different processors.
CO3	Explain & Design the organization of memory, memory hierarchy, other peripheral devices, and estimate the cost of computation.
CO4	Compare among different types of I/O operation

Second Year: Semester IV:

Course Name:Database Management Systems/ Database Management Systems Lab(T/P)	Course Code:CT2257/CT2258
CO1	Analyze & compare different levels of abstraction & data independence.

CO2	Design Entity Relationship Diagram for any scenario.
CO3	Solve queries based on relational algebra & SQL.
CO4	Identify functional dependencies & normalize the database and apply ACID properties.
CO5	Analyze transaction management, various concurrency control protocols and crash recovery methods.

Course Name:Mathematical Foundations for Data Analysis/ Mathematical Foundations for Data Analysis Lab (T/P)	Course Code:CT-2255/CT-2256
CO1	Find the hidden meaning from the given data and visualize the results
CO2	Solve the real-life problem using the probability theory and use it for decision making
CO3	Analyze the samples from the population and solve the problem to get predictive solution using the estimation theory
CO4	Apply the sample data and use it to test the assumptions made for the population Parameter

Course Name: Operating Systems/ Operating Systems Lab (T/P)	Course Code:CT2251/CT2252
CO1	Demonstrate different OS & its services.
CO2	Apply & make use of different CPU scheduling algorithm & different ways to synchronize the process.
CO3	Compare different methods to handle deadlock.
CO4	Analyze various memory management techniques.
CO5	Choose various disk scheduling algorithms based on their performances.

Course Name: Discrete Mathematics & Graph Theory (T)	Course Code:GE1206
CO1	Explain the basic concept of classical sets, fuzzy sets, Relations, functions and logical methods.
CO2	Identify the nature of different algebraic structures such as Group, Ring, field
CO3	Analyze the graphs and spanning of trees
CO4	Determine the probability, Expectations of functions of two random variables

Course Name: Fundamental of Economics (T)	Course Code:GE1312
CO1	Recognizes consumer"s behaviour and pricing
CO2	Extrapolates an operations in market with productions constrain.
CO3	Describes the national income accounting and public finance.
CO4	Interprets international trade and institutions.

Course Name:Advanced Data Structures / Advanced Data Structures Lab (T/P)	Course Code:CT-2253CT-2254
CO1	Implement the concept of linked list, skip lists, disjoint sets, trees, graph data structures for real world problem
CO2	Design suitable hash function for given data set
CO3	Perform different operations on multidimensional trees
CO4	Select appropriate data structure for implementation of real world applications

Course Name: Introduction to Geographical Information System/ Introduction to Geographical Information System Lab(T/P)	Course Code:CT2317/CT2318
CO1	Demonstrate the fundamental concepts of GIS
CO2	Develop the apprehension of various concepts in GIS
CO3	Design and share maps

Course Name: Soft Computing(T)	Course Code: CTCT2331
CO1	Reveal different applications of soft computing to solve problems from different domains.
CO2	Demonstrate Fuzzy logic and its applications.
CO3	Explain Rough Set theory and its usage as soft computing.
CO4	Relate single-objective optimization problems using GAs.
CO5	Describe Artificial neural networks and its applications

Course Name:Advanced Web Technologies/ Advanced Web Technologies Lab(T/P)	Course Code:CT2315
CO1	Design Web pages using HTML5, CSS3
CO2	Perform various operations using AJAX
CO3	Use features of Client side programming
CO4	Develop Web pages using JavaScript

Course Name: Computer Graphics/ Computer GraphicsLab(T/P)	Course Code: CT2319 /CT2320
CO1	Draw lines and polygons and fill polygons using basic graphics functions
CO2	Select proper imaging technology to be used for image creation
CO3	Handle interactive software with images & text
CO4	Develop animated programs for various applications.

Course Name:Image Processing(T)	Course Code:CT2327
CO1	Describe basic relationships between pixels.
CO2	Compare various image enhancement techniques in spatial domain and frequency domain.
CO3	Illustrate different image compression techniques to understand the advantage of image compression
CO4	Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.
CO5	Interpret various representation techniques.

Course Name:Current Trends and Technologies(T)	Course Code:CT2335
CO1	Use the basics of internet for deployment of various servers and recourses.
CO2	Design and implement technologies for e-Commerce and e-Learning
CO3	Choose appropriate implementation of Green Computing.
CO4	Make use of Social Networking properly and securely.

Course Name:Multimedia and Animation(T)	Course Code:CT2334
CO1	To understand multimedia basics - hardware and software.
CO2	To develop skills in design, illustration, image manipulation, graphic designing, video editing, visual effects and game designing.
CO3	To develop the skills in Animation software.

Course Name:Operating System Concepts(T)	Course Code: CT2328
CO1	Use LINUX operating system.
CO2	Write Shell scripts

Course Name:Privacy and Security in Online Social Networks/ Privacy and Security in Online Social Networks Lab(T/P)	Course Code:CT2323/CT2324
CO1	Collect online social networking data using different tools and API"s.
CO2	Review privacy and policies in social media.

CO3	Categorize e Crimes and Attacks in OSM.
CO4	Link profiles of user on OSM.

Course Name:Theoretical Foundation of Computer Science(T)	**Course Code:CT2303**
CO1	Construct automata, regular expression for any pattern.
CO2	Write context free grammar for various languages.
CO3	Design push down automata and Turing Machine for a language.
CO4	Derive whether a problem is decidable or not.

Course Name:Randomized Algorithms(T)	**Course Code:CT2311**
CO1	Apply basic concepts of probability calculus in algorithmic context.
CO2	Derive good upper bounds for the expected running time of simple randomized algorithms.
CO3	Design simple randomized algorithms that run fast or that return the correct output with high probability.
CO4	Apply the probabilistic method to show the existence of certain combinatorial objects.

Course Name:Software Testing(T)	**Course Code:CT2332**
CO1	Formulate problem by following Software testing life cycle.
CO2	Design Manual Test cases for Software testing approaches.
CO3	Demonstrate utilization of testing automation though testing tool.

Course Name: Computer Networks/ Computer Networks Lab(T/P)	**Course Code: CT2301/CT2302**
CO1	Identify appropriate design issues and explain network reference model.
CO2	Select appropriate protocol at various layers for the given application.
CO3	Solve problems in the networking domain.
CO4	Analyze the performance of network using different tools

Course Name: Mobile Operating Systems/ Mobile Operating Systems Lab(T/P)	**Course Code: CT2313/CT2314**
CO1	Compare different flavours of mobile operating system and their specific features.
CO2	Create an application using different controls.
CO3	Prepare a project which can manage data and can communicate with native application
CO4	Publish the designed applicationwhich can handle multiple devices with different configurations.

Course Name: Industry Visit and Report(P)	**Course Code: CT2310**

CO1	Demonstrate the applications of IT concepts and principles learned in classroom.
CO2	Illustrate Services and products developed in the IT industries.
CO3	Improve interpersonal skill by communicating directly with industrial personnel.
CO4	Aware of the roles and ethics of Software engineers in related industries.

Third Year: Semester VI:

Course Name: Business Intelligence and its Application/ Business Intelligence and its Application Lab(T/P)	Course Code: CT1349/CT 1350
CO1	Reveal the knowledge of basic concepts of Business Intelligence and multidimensional modelling and able to compare digital data types.
CO2	Build and operate the multidimensional data model for the specific scenario extract the information.
CO3	Analyze the business information to construct the reports from it.
CO4	Decide the mode / channel to implement the business intelligence solution for the specific problem.

Course Name: Current Trends and Technologies(T)	Course Code: CT1352
CO1	Use the basics of internet for deployment of various servers and recourses.
CO2	Design and implement technologies for e-Commerce and e-Learning
CO3	Choose appropriate implementation of Green Computing.
CO4	Make use of Social Networking properly and securely.

Course Name: Digital Image Processing/ Digital Image Processing (T/P)	Course Code: CT2361/CT2362
CO1	Describe Basic relationships between pixels.
CO2	Compare various image enhancement techniques in spatial domain and frequency domain.
CO3	Illustrate different image compression techniques to understand the advantage of image compression
CO4	Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.
CO5	Interpret various representation techniques.

Course Name: Essentials of IT (T)	Course Code: CT2372
CO1	Develop algorithm and write pseudo code for a given problem statement.
CO2	Construct Entity-Relationship Model and design RDBMS for a given problem statement.
CO3	Design static and dynamic web pages using HTML and Javascript and write simple programs in Javascript.
CO4	Apply software engineering concepts in any software project implementation.

Course Name:Customer Relationship Management(T)		Course Code:CT1359
CO1	Apply the knowledge of customer-centred organization and implement the integral processes within an organization that are automated to relate predictability and efficiencies.	
CO2	Design a customized CRM application for organization to suit their business needs.	
CO3	Analyze the result of developed CRM application from various perspectives for implementing it.	

Course Name:Introduction to Natural Language Processing (T)		Course Code:CT-2367
CO1	Describe linguistic phenomena with formal grammars.	
CO2	Illustrate and test algorithms for NLP problems	
CO3	Examine NLP applications	
CO4	Devise real world NLP applications using NLP techniques	

Course Name:Internet Technology(T)		Course Code:CT2383
CO1	Describe the basic concepts for network implementation.	
CO2	Comprehend the technologies and effectively deal with programming issues relating to web page creation	
CO3	Figure out the various security hazards on the Internet and need of security measures.	

Course Name:Internet of Things (T)		Course Code:CT2363
CO1	Develop various IOT environments.	
CO2	Demonstrate IOT architecture and its enabling technologies.	
CO3	Analyze IOT environments using various communication technologies.	
CO4	Apply various IOT enabling technologies for creation of IOT environments.	

Course Name:Image Processing (T)		Course Code:CT2323
CO1	Describe basic relationships between pixels.	
CO2	Compare various image enhancement techniques in spatial domain and frequency domain.	
CO3	Illustrate different image compression techniques to understand the advantage of image compression	
CO4	Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.	
CO5	Interpret various representation techniques.	

Course Name: Language Processors/ Language Processors Lab(T/P)		Course Code:CT2353/CT 2354

CO1	Design lexical analyzer using FLEX tool.
CO2	Implement syntax analyzer using YACC tool.
CO3	Create a syntax-directed definition and an annotated parse tree.
CO4	Demonstrate the use of a symbol table throughout compilation.
CO5	Apply various code optimizing transformations and code generation techniques.

Course Name: Software Engineering / Software Engineering (Lab)(T/P)	Course Code:CT1345/ CT1346
CO1	Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project.
CO2	Select appropriate testing strategy and apply testing principles for testing a given application.
CO3	Apply basics of software configuration management, version control and change control in software development.
CO4	Evaluate cost estimation, effort and severity of software risk for given application.
CO5	Perform basic operations on Sub-version for software version control.

Course Name:Design & Analysis of Algorithms/ Design & Analysis of Algorithms Lab(T/P)	Course Code:CT2351/ CT2352
CO1	Compare different types of asymptotic notations and find the time complexity in terms of asymptotic notations
CO2	Solve recurrences using various techniques.
CO3	Implement divide and conquer strategy, greedy strategy, dynamic programming algorithms and backtracking strategy
CO4	Identify and differentiate between various types of complexity classes.

Course Name:Soft Computing (T)	Course Code: CT2381
CO1	Reveal different applications of soft computing to solve problems from different domains
CO2	Demonstrate Fuzzy logic and its applications
CO3	Explain Rough Set theory and its usage as soft computing
CO4	Relate single-objective optimization problems using GAs.
CO5	Describe Artificial neural networks and its applications

Course Name:Software Testing (T)	Course Code: CT2382
CO1	Formulate problem by following Software testing life cycle.
CO2	Design Manual Test cases for Software testing approaches.
CO3	Demonstrate utilization of testing automation though testing tool.

Course Name:Mini Project(P)	Course Code:CT1329

CO1	Choose and implement the problem definition using advanced tools
CO2	Compare and contrast the results with existing techniques
CO3	Demonstrate the implemented idea with suitable presentation methods

Fourth Year: Semester VII:

Course Name:Machine Learning Techniques(T)		Course Code:CT1454
CO1	Interpret machine learning techniques suitable for a given problem	
CO2	Apply machine learning techniques to solve the problems	
CO3	Design application using machine learning techniques	
CO4	Evaluate different machine learning techniques	

Course Name: Ad-hocWirelessNetwork(T)		Course Code: CT 1407
CO1	Compare the differences between cellular and ad hoc networks and identify the design issues at various layers.	
CO2	Summarize the protocols used at different layers of Adhoc network. Also compare the different protocols in each category.	
CO3	Identify the various types of attack in ad hoc network.	
CO4	Classify QoS approaches and Identify the need of energy management in ad hoc network.	

Course Name: Cloud Computing(T)		Course Code: CT1408
CO1	Explain software and hardware support for enterprise and cloud computing.	
CO2	Perform data modelling for enterprise and cloud knowledge bases.	
CO3	Design enterprise and cloud software applications.	
CO4	Implement and run distributed and cloud applications.	
CO5	Ensure security and privacy in enterprise and cloud application while implementing cloud applications methodologies.	

Course Name: Project Phase I(P)		Course Code: CT 1414
CO1	Identify real life technical problem, conduct literature survey, and find limitations in existing solutions to address societal and industrial concerns.	
CO2	Analyze the problem and identify suitable tools and technologies for finding solution to the problem.	
CO3	Communicate proposed solution effectively with proper presentation methods.	

Course Name: Network Security(T)		Course Code: CT1415
CO1	Identify threats to network security, associated attacks and countermeasures against attack.	
CO2	Use appropriate mathematical techniques in cryptography.	
CO3	Apply various algorithms/ mechanisms to formulate appropriate solution.	
CO4	Use of different security protocols at various networking layers.	

Course Name: Probabilistic Statistical Analysis(T)		Course Code: CT1453
CO1	Reveal the hidden meaning in the data by applying some basic statistical formulae and probability distribution concepts using the tool „R"	
CO2	Employ the sampling techniques to find the estimates and test its validity using hypotheses testing.	
CO3	Analyze and compare sample data to make inference about the population data.	
CO4	Design and implement the predictive model using simple and multiple regression technique	

Course Name: Neural Network & Fuzzy Logic(T)		Course Code: CT1406
CO1	Illustrate the fundamentals of Biological Neural Network and Artificial Neural Network with its working	
CO2	Develop the solution for problem based on ANN using feed forward and Feed backward architecture	
CO3	Comprehend the various concepts of fuzziness involved in fuzzy set theory and solve the problems based on it	
CO4	Formulate fuzzy inference system using fuzzification and defuzzyfication methods	

Course Name: Parallel Computing(T)		Course Code: CT1437
CO1	Identify areas where parallel computing is applicable	
CO2	Implement parallel version of different algorithms using thread programming and OpenMP	
CO3	Find the speedup factor by analyzing parallel programs	
CO4	Develop real life applications using parallel programming	

Course Name: Artificial Intelligence/ Artificial Intelligence Lab (T/P)		Course Code: CT1451/CT 1452
CO1	Describe different concepts of AI, and illustrate working of different types of intelligent agents and co-relate them in real life.	
CO2	Differentiate between searching algorithms and apply appropriate algorithm to solve real life problems as well as in gaming domain	
CO3	Select appropriate knowledge representation technique to represent real life facts	
CO4	Demonstratethe working knowledge of reasoning in the presence of incomplete and/or uncertain information.	
CO5	Analyze learning approaches and recall AI basics for expert system.	

Course Name: Fundamentals of Parallel Computing(T)	Course Code: CT1457
CO1	Identify areas where parallel computing is applicable
CO2	Implement parallel version of different algorithms using thread programming and openMp
CO3	Find the speedup factor by analyzing parallel programs
CO4	Develop real life applications using parallel programming

Course Name: Student Training(P)	Course Code: CT1413
CO1	Infer the Knowledge about current trends in industry
CO2	Deliver Technical presentation
CO3	Communicate effectively
CO4	Simplify and Evaluate on the basis of question /answer.

Course Name:Project Phase I(P)	Course Code:CT 1414
CO1	Identify real life technical problem, conduct literature survey, and find limitations in existing solutions to address societal and industrial concerns.
CO2	Analyze the problem and identify suitable tools and technologies for finding solution to the problem.
CO3	Communicate proposed solution effectively with proper presentation methods.

Course Name:Cyber Forensics/ Cyber Forensics Lab(T/P)	Course Code:CT1455/CT1456
CO1	Investigate hardware parts of a computer system for evidences.
CO2	Use different tools for data acquisition and duplication for forensic study.
CO3	Securely store data and evidence collected.
CO4	Create report of forensic investigation made.

Course Name:Numerical Computing/ Numerical Computing Lab(T/P)	Course Code:CT1445/CT1446

CO1	Apply appropriate formula to find different types of error in numerical computation and mitigate it.
CO2	Choose and apply appropriate numerical techniques for problem solving interpret the results and assess accuracy
CO3	Apply appropriate techniques for numerical integration.
CO4	Demonstrate basics of conditioning of problems and stability of numerical algorithms

Course Name:Digital Image Processing/ Digital Image Processing(Lab) (T/P)	Course Code:CT1418/CT1419
CO1	Describe Basic relationships between pixels.
CO2	Compare various image enhancement techniques in spatial domain and frequency domain.
CO3	Illustrate different image compression techniques to understand the advantage of image compression
CO4	Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.
	Interpret various representation techniques.

Course Name: Introduction to Internet of Things / Introduction to Internet of Things Lab(T/P)	Course Code: CT1458/CT1459
CO1	Design and evaluate various IOT environments.
CO2	Describe IOT architecture and its enabling technologies.
CO3	Analysis IOT environments using various communication technologies.
CO4	Apply various IOT enabling technologies for creation of IOTenvironments

Course Name: Cyber Laws(T)	Course Code: GE1408
CO1	Summarize the laws governing the national/international cyber space, IT Act scope and applications against Cyber Crimes, Data privacy and security (Act & Audits)
CO2	Outline the importance of digital evidence/licensing regulations and develop a implementation strategy through legal provisions through computer crime investigations
CO3	Summarize offences and penalties for cybercrimes under IT Act through case studies.
CO4	Outline implications of cyber laws on issues related to intellectual property rights, commercial transactions and develop a strategy to deal with them.

Course Name: Object Oriented Modeling(T)	Course Code: CT1450
CO1	Analyze the object-oriented modelling technique and able to create & analyze the class model, state diagram and interaction diagram

CO2	Identify, analyze, and model structural and behavioural concepts of the system.
CO3	Apply system design, database management, handling global resources etc
CO4	Implement designed model using the object-oriented language & object-oriented

Course Name: Pattern Recognition / Pattern Recognition Lab(T/P)	Course Code: CT1420 / CT1421
CO1	Demonstrate the concepts of pattern recognition, probability, random variable, density function, different feature extraction techniques and solve problems for thegiven data
CO2	Compute the parameters for different density functions and interpret it
CO3	Design appropriate pattern recognition solutions to classification, regression, and clustering problems.
CO4	Evaluate and interpret the results of the applied techniques to solve pattern recognition problem

Course Name: Major Project Phase II (P)	Course Code: CT 1426
CO1	Analyze the solution and achieve desired results
CO2	Write paper and present the research work in team
CO3	Acquire in-depth knowledge of subject for benefit of society

Course Name: Extra Curricular Activities(P)	Course Code: CT1427
CO1	Develop their hobbies and interests
CO2	Communicate and work in team
CO3	Develop the sense of responsibility

Course Name: Comprehensive Viva(P)	Course Code: CT1425
CO1	Comprehend various subjects applications to computer technology
CO2	Performance in campus recruitments

12.M.Tech- CSE

Program Educational Objectives (PEOs) of M. Tech. (CSE)

- **PEO-1-**To prepare students to succeed in employment/profession and/or to pursue doctoral research in Computer Science discipline.(*Preparation*).
- **PEO-2-**To provide students with scholarly knowledge to innovate, design, analyze, develop engineering problems related to Computer Science and to contribute in providing solutions to multidisciplinary real life problems **(Core *&Breadth*).**
- **PEO-3-**To inculcate in students professional and ethical attitude, effective communication skills and teamwork to become a successful professional (*Professionalism*).
- **PEO-4-**To provide students with an academic environment that makes them aware of excellence and life-long learning in emerging technologies (*Learning Environment*).

Program outcomes (POs)of M. Tech. (CSE)
After successful completion of M.tech Program, Students will have an ability to :

- **PO-1-**Demonstrate in depth knowledge of computer hardware and software.

- **PO-2-**Think critically to identify, conceive, design, analyze and solve complex engineering problems in the area of computer science and allied fields.

- **PO-3-**Carry out research work with independent and introspective learning and to get associated with multidisciplinary team.

- **PO-4-**Communicate effectively and acquire professional, ethical and responsible attitude towards sustainable development of the society.

- **PO-5-**Accept and adapt to the technological changes for lifelong learning with enthusiasm and commitment to improve knowledge and competence continuously.

- **PO-6-**Demonstrate capacity for self-management, decision making, project & finance management to achieve common goals.

- **PO-7-**Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcomes (CO) (PG)

First Year: SemesterI:

Course Name:	Course Code: CSE3901
High Performance Computer Architecture(T)	
CO1	Analyse the working of pipelines to achieve parallelism
CO2	Demonstrate the architectural features in the GPU
CO3	Apply advanced processor technologies to extract maximum performance in a multicore, shared memory execution environment processor.

Course Name: Real Time Systems(T)	Course Code:CSE3902
CO1	Understand RTS, its characteristics and application in Hard and soft Real time domain.
CO2	Compare various RTS scheduling algorithms.
CO3	Choose resource sharing and synchronization techniques in a multiprocessor system.
CO4	Evaluate Commercial Real time System.

Course Name: Algorithm Design Techniques (T/P)	Course Code:CSE3905/CSE3906
CO1	Apply knowledge of different problem solving techniques
CO2	Identify suitable algorithm design technique for solving given problem
CO3	Analyse the given algorithmic technique w.r.t time complexity

Course Name:PE-I: Advanced Digital Image Processing(T)	Course Code:CSE3907
CO1	Identify various Image Enhancement techniques in Spatial Domain and frequency Domain
CO2	Evaluate the methodologies for image segmentation, restoration, compression and Morphology processing
CO3	Apply image processing algorithms in practical applications

Course Name: PE I: Machine Learning(T)	Course Code: CSE3909
CO1	Infer the understanding of a learning system.
CO2	Apply the knowledge of learning to the based on the type of problem
CO3	Combine the inductive and analytical learning techniques

Course Name: PEI: Grid and Cloud Computing(T)	Course Code:CSE3910
CO1	Identify the software and hardware support for enterprise and cloud computing.
CO2	Analyze datamodelling for enterprise and cloud knowledge bases.
CO3	Design enterprise and cloud software applications.
CO4	Implement and run distributed and cloud applications.

Course Name: PE II: Soft Computing Techniques(T)	Course Code:CSE3911
CO1	Describe fuzzy sets using linguistic variables and membership functions
CO2	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
CO3	Analyse appropriate learning method for making decision

Course Name: PE II: Natural Language Processing (T)	Course Code: CSE 3912
CO1	Identify various computational models of languages, organization of NLP systems
CO2	Explore relevance of Syntax and Semantics in natural language processing

CO3	Describe use of knowledge representation in Natural language processing
CO4	Analyse various case studies of NLP applications

Course Name: PEII: Wireless Sensor Network(T)	Course Code:CSE3914
CO1	Architect sensor networks for various application setups.
CO2	Explore the design space and conduct trade-off analysis between performance and resources
CO3	Assess coverage and conduct node deployment planning..
CO4	Devise appropriate data dissemination protocols and model links cost.

Course Name: Software Lab1 (P)	Course Code: CSE 3915
CO1	Explore various operating system commands
CO2	Use suitable advanced data structures
CO3	Compare web technology and networking utilities
CO4	Analyse various open source tools

First Year: Semester II:

Course Name: Data Mining(T)	Course Code:CSE3916
CO1	To identify data mining functionality to be applied for a given mining problem and classify unknown data using various classification algorithms.
CO2	To apply association rule mining to find frequent patterns and strong association rules.
CO3	To apply data visualization techniques and solve prediction problems using regression methods.
CO4	Describe various statistical mining methods such as ANOVA, PCA and graph mining.

Course Name: Optimizing Compilers(T/P)	Course Code:CSE 3918/3919
CO1	Design lexical analyzer using FLEX tool
CO2	Implement syntax analyzer using YACC tool.
CO3	Create a Coarse-Grained Parallelism and Fine-Grained Parallelism
CO4	Apply various code optimization transformations and code generation techniques.

Course Name: Software Architecture (T/P)	Course Code: CSE 3920/3921
CO1	Choose appropriate Software Process Model for given Project depending on requirements and resources at hand
CO2	Perform requirements analysis and create design for a given case study.
CO3	Explore various design patterns
CO4	Analyse various Architecture description languages and case studies of software architectures of various applications

Course Name: Semantic Web and Social Network(T)		Course Code: CSE 3930
CO1	Exploreintelligent web applications	
CO2	Identify various aspects of ontology engineering	
CO3	Describe semantic web applications, services and technology	
CO4	Analyse various case studies of semantic web and social network	

Course Name: PE III: Computer Vision(T)		Course Code:CSE 3923
CO1	Identify basic concepts, terminology, and advancements in the field of computer vision	
CO2	Describe basic methods of computer vision related to content-based image retrieval, virtual reality	
CO3	Explain the mathematics behind stereo, motion and object recognition	

Course Name: PE III: Data Warehousing(T)		Course Code: CSE 3924
CO1	Understand the basic concepts of Data Warehousing, OLAP technology	
CO2	Understand the process of data transformation and OLAP operations	
CO3	Implement the process of space management in data warehouse and performance tuning	
CO4	Understand the concept of Big Data	

Course Name: PE III: Research Methodology and Statistics(T)		Course Code:CSE 3925
CO1	Explain the basic concepts of research and its methodologies	
CO2	Identify appropriate research topics	
CO3	Conduct research in a procedural manner	
CO4	Write a research paper and thesis	

Course Name: PEIII: Information Retrieval System(T)		Course Code: CSE3926
CO1	Explain the underlined problems and concepts related to IR	
CO2	Paraphrase the concepts of vector space and other retrieval models.	
CO3	Describe role of clustering and latent indexing	
CO4	Discuss the basics of XML and Web search	

Course Name: PE IV: Deep Learning(T)	Course Code: CSE 3928
CO1	Explain the basic concepts in Neural Networks and applications
CO2	Implement deep learning algorithms and traverse the layers of data abstraction
CO3	Apply Convolutional Neural Network models to Object Detection and image

Course Name: PE IV: Fundamentals of Bioinformatics(T)	Course Code: CSE 3929
CO1	Describe central dogma of molecular biology
CO2	Analyse different types of biological data using various tools
CO3	Apply computational methods on biological data

Course Name: Software Lab2 (P)	Course Code: CSE 3931
CO1	Use various OS administration commands
CO2	Perform operations using open source cloud platforms relevance of Syntax and Semantics in natural language processing
CO3	Analyse various open source applications

Second Year: Semester III:

Course Name: Project Phase-I(P)	Course Code: CSE 3939
CO1	Identify real life technical problem, conduct literature survey, and find limitations in existing solutions to address societal and industrial concerns
CO2	Analyse the problem and identify suitable tools and technologies for finding solution to the problem
CO3	Communicate proposed solutions effectively with proper presentation methods.

Second Year: Semester IV:

Course Name: Project Phase – II (P)	Course Code:CSE3940
CO1	Analyse the solution and achieve desired results.
CO2	Write paper and present the research work in team
CO3	Acquire in-depth knowledge of subject for benefit of society

Dr.Rakhi Wajagi
HoD, CT

Head
Deptt. of Computer Technology
YCCE, Nagpur
Head
Dept. of Computer Technology
YCCE, Nagpur

Dr.U.P.Waghe
Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

13.Department of Information Technology

Program Educational Objectives of the program (PEO)

- **PEO-1-**To prepare students to succeed in employment, profession and/or to pursue postgraduate education in Information Technology discipline in particular and allied engineering disciplines in general.

- **PEO-2-**To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to formulate, analyse and solve engineering problems related to Information technology in particular and engineering practice in general.

- **PEO-3-**To train students with good scientific and engineering breadth so as to innovate, design and create systems and to contribute in providing solutions to real life problems.

- **PEO-4-**To inculcate in students professional attitude, effective communication skills and teamwork to become a successful professional in global perspective.

- **PEO-5-**To provide student with an academic environment aware of excellence, ethics, transparency, leadership and to promote awareness of life-long learning

Program Outcomes (POs)At the end of Program, Graduate students will have

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

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

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

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

- **PO-5-**Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an under- standing of the limitations

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

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

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

- **PO-9-**Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi disciplinary settings.

- **PO-10-**Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write

effective reports and design documentation, make effective presentations and give and receive clear instructions.

- **PO-11-**Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Program Specific Program Outcomes (PSPOs/PSOs)

- **PSO-1-**The students will be able to Explain and apply the core concepts of Information Technology , principles and Tools to implement IT systems effectively.

- **PSO-2-**The students will be able to integrate broad engineering and interdisciplinary knowledge into IT systems.

Course Outcomes (CO) (UG)

First Year: Semester I:

Course Name: Engineering Mathematics-I	Course Code: GE-2101
GE-2101 CO-1	Apply the knowledge of differentiation to develop the Mathematical equationsand compute geometrical measures
GE-2101 CO-2	Determine the expansion and derivatives of functions of Multiple variablesand use it to find extreme values of functions.
GE-2101 CO-3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.
GE-2101 CO-4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name: Engineering Mathematics-II	Course Code: GE-2102
GE-2102 CO-1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
GE-2102 CO-2	Analyse the functions of complex numbers and variables,prove Mathematical equations and evaluate the complex integrals
GE-2102 CO-3	Use Matrix method to solve linear equations , evaluate eigenvalues - eigen vectors and its applications.
GE-2102 CO-4	Measure the statistical parameters and derive the equations of best fit curves

Course Name: Communication Skill	Course Code: GE-2107
GE-2107 CO-1	Explain the basics of communication process as well as identify the barriers in communication.
GE-2107 CO-2	Classify and describe the different Speech Sounds of English Language.

GE-2107 CO-3	Apply different strategies and techniques of presentations, interviews and group communication.
GE-2107 CO-4	Drafting reports, memos and emails, considering the professional etiquettes and ethics with appropriate content and context.

Course Name: Social Science	Course Code: GE-2108
GE-2108 CO-1	Explain the basic concepts of Social Sciences.
GE-2108 CO-2	Describe the development of various Civilizations and their Culture.
GE-2108 CO-3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
GE-2108 CO-4	Explain Industrial Organization and Management.

Course Name: Engineering Physics Course Name: Engineering Physics (Lab.)	Course Code: GE-2105 and GE 2106
GE 2105 & GE2106 CO1	Examine the intensity variation of light due to interference, diffraction and its applications.
GE 2105 . CO2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
GE 2105 & GE2106 CO3	Develop ability to classify and analyze the characteristics of semiconductor materials interms of crystal structures, charge carriers and energy bands for device applications.
GE 2105 & GE2106 CO4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
GE 2105 & GE2106 CO1	Illustrate working principle of lasers, ultrasonic waves and its properties for usefulapplications in the field of industry.

Course Name: Engineering Chemistry Course Name : Engineering Chemistry (Lab.)	Course Code: GE2103 and GE 2104
GE2103 and GE 2104 CO1	1. Assess qualitative and quantitative aspects of water as a conventional material for industrial and domestic applications.
GE2103 and GE 2104 CO2	2.Apply the knowledge of basic electrochemistry to understand battery technology, corrosion process and preventive techniques.
GE2103 and GE 2104 CO3	2. Know the basics and assess analytical aspects of industrial materials like fuels and lubricants for efficient utilization.
GE2103 and GE 2104 CO4	3. Recognize the significance of cement and advanced engineering materials in technological applications.
GE2103 and GE 2104 CO5	4. Analyze and generate analytical and instrumental techniques.

Course Name: Engineering Mechanics Engineering Mechanics (Lab.)	Course Code: CV-2101 - CV2102
CV-2101- CO 1	An ability to apply the concept of applied mechanics and can solve problems on planar force system for friction as well as frictionless surfaces.

161

CV-2101- CO 2	An ability to analyze pin jointed truss frame structure and beam structure analytically and graphic
CV-2101- CO 3	An ability to understand centroid, moment of inertia, product of inertia and mass moment of inertia and can find properties of surfaces.

CV-210- 1CO 4	An ability to determine the dynamic variables of moving body, understand working principle of simple lifting machine.
Course Name: Basic Electronics	**Course Code: EE 2101**
EE 2101 CO1	Characterize Number systems, semiconductors, diodes, transistors andoperational amplifiers.
EE 2101 CO2	Design simple analog circuits
EE 2101 CO3	Design simple combinational and sequential logic circuits
EE 2101 CO4	Identify functions of digital multimeter, Bridges and transducers in the measurement of physical variables

Course Name: Introduction to Computer ProgrammingIntroduction to Computer Programming (Lab.)	**Course Code: IT2101** **Course Code: IT-2102**
IT2101, IT2102 CO1	Understand computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C" programming language constructs.
IT2101 IT2102 CO2	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
IT2101 IT2102 CO3	Analyze and apply concepts of different dimensional Arrays as a datastructure & development of programs using the same.
IT2101 IT2102 CO4	Design and develop programs using basics of Strings, Structures, union andFiles in 'C' language.

Course Name:Electrical Engineering Elect. Eng. Lab	**Course Code: EL 2101 EL-2102 (Lab.)**
EL 2101 & EL 2102- CO-1	Reproduce fundamentals of dc circuits, single phase, and three phase accircuits.
EL 2101 & EL 2102- CO-2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
EL 2101 & EL 2102- CO-3	Explain construction, working, testing, and applications of various electrical machines.

EL 2101 & EL 2102- CO-4	Analyse performance of various electrical machines.
EL 2101 & EL 2102- CO-5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name: Engineering Graphics Engineering Graphics Lab.	Course Code: ME2101 ME-2102
ME2101 ME-2102 CO1	Transform orthographic projections into isometric projections and vice versa.
ME2101 ME-2102 CO2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
ME2101 ME-2102 CO3	Built the development of lateral surfaces of various solids and their cutsection.
ME2101 ME-2102 CO4	Predict the intersections and intersections of various solid objects.
ME2101 ME-210 2CO5	Justify the use of software tools used for Two dimensional drawings.

Course Name: Workshop Practice	Course Code: ME 2103
CO1	Understand the carpentry tools, joints, machineries and its applications
CO2	Understand the fitting tools, measuring instruments, machineries and its applications
CO3	Understand the smithy tools furnaces and hand and power forgingequipment‟s
CO4	Understand Gas and Electric welding processes, utility, tools and its applications

<mark>Second Year: Semester III:</mark>

Engineering Mathematics III		GE2201
CO1	1. Estimate the Calculus of Numerical Function.	
CO2	2. Determine the transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations.	
CO3	3. Discuss the nature of periodic function and express it in terms of series.	
CO4	4. Use appropriate method/s to solve partial differential equations.	

Digital Circuits & Microprocessors(T/P)		IT2201/IT2202
CO1	1. Demonstrate the understanding of Digital Circuits and Microprocessor.	
CO2	2. Apply the concepts of digital circuits and microprocessor in switching theory and ARM processor.	
CO3	3. Able to analyze problem statement and interface the various programmable ICs.	
CO4	4. Design and implement programs to simulate the functioning of 8086 processor.	

Object Oriented Programming(T/P)		IT2203/IT2204
CO1	1. Demonstrate the understanding of Object oriented concepts.	

CO2	2. Apply the programming language JAVA efficiently in object oriented software development
CO3	3. Able to analyze problem statement and identify appropriate objects and methods
CO4	4. Design and implement a small programs using classes

Data Structures and Program Design-I(T/P)	IT2205/IT2206
CO1	1. Understand basic data structures like list, stack, queue, tree, graph and hash table.
CO2	2. Apply appropriate data structures in problem solving.
CO3	3. Analyze the performance of sorting and searching algorithms based on data structures.
CO4	4. Design application by using data structures and algorithms for real world Problems

Computer Architecture & Organization	IT2207
CO1	1. Describe fundamentals of computer architecture and organization and able to design control sequence for instructions.
CO2	2. Apply mathematical techniques and perform computer arithmetic operations along with the understanding of processor design.
CO3	3. Design memory organization and understand the concept of cache mapping techniques, Input/output subsystem interfaces and buses

CO1	1. explain the basic data types, built in data structures, control statements and loops in Python
CO2	2. explain the concepts of functions and modules and write simple programs in Python
CO3	3. demonstrate use of classes, modules and packages by writing useful programs.
CO4	4. develop a useful application in Pyth0n

Discrete Mathematics and Probability Theory	GE2206
CO1	1. Explain the basic concept of classical sets, fuzzy sets, Relations, functions and logical methods.

CO2	2. Identify the nature of different algebraic structures such as Group, Ring, field
CO3	3. Determine the probability functions of one and two random variables
CO4	4. Measure the Statistical parameters for random variables

Data Structures and Program Design-II(T/P)	IT2251/IT2252
CO1	1. Understand data structures like Tree, Graph, Set, Hash table.
CO2	2. Apply appropriate data structures in problem solving.
CO3	3. Analyze the performance of operations performed on data structures.
CO4	4. Design application by using data structures for real world problems.

Computer Networks(T/P)	IT2253/IT2254
CO1	1. explain and **visualize t**he different aspects of networks, protocols and network design models.
CO2	2. **illustrate** the different of hardware, software and types of transmission media used in computer networks.
CO3	3. **analyze** various Data Link layer design issues and select appropriate routing algorithms for a network.
CO4	4. **analyze** the important aspects and functions of transport layer, application layer and Cryptography in computer networking.

CO1	1. explain fundamental concepts of operating system and its functions.
CO2	2. explain various algorithms and techniques for managing OS resources
CO3	3. apply and evaluate the performance of algorithms for managing various OS resources based on the given data about processes and resources.
CO4	4. simulate algorithms/techniques for managing various OS resources using computer programs.

Theory of Computation	IT2257
CO1	1. Demonstrate the understanding of basic properties and concepts of formal languages, and Recursive Language,
CO2	2. Apply formal mathematical methods to prove properties of languages, grammars and automata.

CO3	3. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.

Data Base Management Systems(T/P)	IT2301/IT2302
CO1	1) To obtain sound knowledge in the theory, principles and applications of database management system concepts, its structures and query language.
CO2	2) Apply various techniques of SQL Query writing, Normalization techniques, query processing and techniques involved in query optimization useful in transaction.
CO3	3) To Analyse the given problem statement and give robust and cost effective solution.
CO4	4) To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS

Software Engineering	IT2303
CO1	1. Understand different software process, models and appropriate architectural style in software development cycle
CO2	2. Analyze the different software process model and appropriate architectural style to develop software
CO3	3. Apply the software testing techniques in a variety of ways to test the software.
CO4	4. Design and analyze software development process with the help of UML.

PE I: Web Programming(T/P)	IT2311/IT2312
CO1	1.Understand the internet communication technologies & Web browser tools, XML application and ASP.NET.
CO2	2. Apply all the above concepts of web programming for creating a dynamic web site.
CO3	3. Design & develop of web sites by using html and dynamic web sites by using DHTML and design JavaScript WebPages through HTML.
CO4	4. Design interactive websites & promote it online

PE I: Data Analysis and Statistics(T/P)	IT2313/IT2314
CO1	1.Demonstrate an understanding of fundamental concepts of statistics and probability

CO2	2. Apply probability concepts and appropriate statistical methods on simple datasets for data analysis
CO3	3.Formulate and solve problems in a systematic manner and Interpret output obtained from statistical analysis on datasets.
CO4	4. Obtain hands on experience with some popular software (like R)for analysis and visualization of data

PE I: Customer Relationship Management	**IT2315/IT2316**
CO1	1. Understand Features of Salesforce CRM(T/P)
CO2	2. Apply the Advanced Features in Salesforce CRM for development of software
CO3	3. Analyze and Evaluate the security concepts, Automated Business Process and Approval Process of Salesforce CRM
CO4	4. Develop modules using Salesforce CRM

Design & Analysis of Algorithms(T/P)		IT2351/IT2352
CO1	1. Understand asymptotic analysis of iterative and recursive algorithms, complexity of algorithms	
CO2	2. Apply important algorithmic design techniques for problem solving	
CO3	3. Analyze the performance of algorithms	
CO4	4. Synthesize and design efficient algorithms for real world problems	

Principles of Compiler Design(T/P)		IT2353/IT2354
CO1	1. Understand different phases of compilation process, lexical analyzer tool "Lex" OR "Flex" and YACC or Bison tool	
CO2	2. Apply parsing techniques, Syntax directed translation schemes and optimization techniques for recognition of programming language statements	
CO3	3. Design and Implement a Compiler for a Small Programming Language Source Program	

PE II::Machine Learning(T/P)		IT2361/IT2362
CO1	1. explain and compare supervised and unsupervised learning .	
CO2	2. explain various machine learning algorithms.	
CO3	3. identify appropriate machine learning algorithm to solve the given problem.	
CO4	4. construct a machine learning model to meet desired outcomes and apply identified machine learning algorithm to solve the problem.	
CO4	5. Implement the machine learning algorithms for solving the given problem.	

PE II: Business Intelligence(T/P)		IT2363/IT2364
CO1	1. Students will be able to : Assemble BI as a Process, identify its application in various domains and functional area, its roles and responsibilities. Identify functions of building blocks in N_tier BI ecosystem Identify different stages in Lifecycle of a BI project. Differentiate between traditional BI and self service BI	
CO2	2. Apply SQL as a universal language for BI	

CO3	3. Model a business scenario; identify the metrics, indicators, various dimensions, and aggregation strategies and make recommendations to achieve the business goal
CO4	4.Obtain hands on experience with some popular BI software for analysis, reporting on datasets and visualization of results.

PE II: Internet of Things(T/P)	**IT2365/IT2366**
CO1	1. Describe IoT as a Process, its architecture and Management, compare and contrast old and new challenges in IoT.
CO2	2. Apply various communication protocol and its building blocks in IoT applications.
CO3	3. Illustrate relevance of IoT with cloud and Web and analyze various security challenges and also evaluate various control strategies for the same.
CO4	4. Create, Design and Develop various applications based on IoT concepts.

Fourth Year: Semester VII:

Data Mining(T/P)	**IT1427/IT1428**
CO1	1. Understand basic concepts in data mining, Identify the scope and necessity of Data Mining for the society and for business applications.
CO2	2. Apply different data mining algorithms on given data set.
CO3	3. Analyze alternative data mining implementations and what might be most appropriate for a given data mining task.
CO4	4. Develop algorithm for mining application specific data.
CO5	5. Use popular data mining tool and apply the principle algorithms and techniques used in data mining, on different types of dataset, analyze their results, interpret the results using different visualization techniques.

Principle Of Compiler Design(T/P)	**IT1403**
CO1	1. Understand different phases of compilation process, lexical analyzer tool "Lex" OR "Flex" and YACC or Bison tool
CO2	2. Apply parsing techniques, Syntax directed translation schemes and optimization techniques for recognition of programming language statements
CO3	3. Design and Implement a Compiler for a Small Programming Language Source Program

Cloud Computing	IT1432
CO1	1. Understand the different computing paradigm, analyze and apply cloud computing services, deployment model for building cloud
CO2	2. Apply the concepts and techniques in cloud computing
CO3	3. Analyze the problems and apply design considerations for cloud application
CO4	4. Provide the appropriate cloud computing solutions for building cloud Application

Real Time Systems	IT1407
CO1	1. Enumerate the need and the challenges in the design of hard and soft real time systems.
CO2	2. Compare different scheduling algorithms and the schedulability criteria.
CO3	3. Determine schedulability of a set of periodic tasks given a scheduling algorithm.
CO4	4. Devise algorithms to decide the admission criterion of sporadic jobs and the schedule of aperiodic jobs.

Network Security	IT1422
CO1	1. Understand different security techniques of network security
CO2	2. Analyze the vulnerabilities in any computing system and identify the security issues
CO3	3. Apply security mechanisms using rigorous approaches in the network and resolve it.
CO4	4. Design a security solution by Comparing different security standards for electronic mail

Neural Network and Fuzzy Logic(T/P)	IT1415/IT1416
CO1	1. To understand the working of Neural Networks as pattern classifier
CO2	2. Comprehend the Neural Networks as means for computational learning and to analyze the basic network architectures and algorithms
CO3	3. Effectively use existing software tools to solve real problems using a neural network approach

Distributed Systems(T/P)		IT1421/IT1440
CO1	1. Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.	
CO2	2. Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.	

CO3	3. Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constrain	
CO4	4. Design and develop distributed programs using sockets and RPC/RMI.	

Network Programming(T/P)		IT1417/IT1418
CO1	1. Understand the main protocols comprising the Internet.	
CO2	2. Apply the client☐server model in networking applications.	
CO3	3. Analyze the network services such as packages and protocol that communicate through the Internet.	
CO4	4. Develop skills in network programming techniques for Network Management .	

Fourth Year: Semester VIII:

Major Project/ INTERNSHIP		IT2451
CO1	1:Understand the knowledge gained from the various courses undergone in earlier years.	
CO2	2: Able to work in team and adapt professional ethics and practice and how to write technical documents in professional style, and to demonstrate the product/software to technical audience.	
CO3	3: able to evaluate and analyze critically different sources of data available in the literature and apply the knowledge of tools/Technology.	
CO4	4:able to design and develop a system/Software for community or professional use	

Dr.R.C. Dharmik
HoD, IT

Head, Deptt. of Information Tech.,
YCCE, Nagpur - 441110
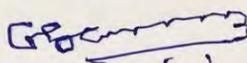
Dr.U.P.Waghe
Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

14. Department of Computer Science Engg.

Program Outcomes (PO)

PO 1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

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

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

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

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

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

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

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

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

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

PO 11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12 - Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: Design and develop effective and efficient software systems byusing the knowledge of computer hardware, algorithms, programming,databases, reusable software components, etc.
PSO 2: Solve real life problems by integrating the broad engineeringand interdisciplinary knowledge with their computing skills.

Introduction to Computing with Python/Lab: Introduction to Computing with Python
22CSE109/22CSE110

CO1	Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python
CO2	Apply the concepts of functions modules and packages and write programs using them
CO3	Design and develop classes in Python.
CO4	Solve real world problems and develop applications using Python

Engineering Mathematics IIIGE2201

CO1	Estimate the Calculus of Numerical Function and Solve difference equations
CO2	Determine the transforms and inverse transforms of various functions and Apply it to solve Mathematical equations.
CO3	Discuss the periodicity of functions and express it in terms of Fourier series.
CO4	Solve partial differential equations.

Computer Architecture and OrganisationCSE2201

CO1	Understand and demonstrate the basic computer architecture concepts related to the working of processors, memory systems, and input output systems.
CO2	Differentiate among various addressing modes and develop ability to write assembly language programs.
CO3	Comprehend information representation in computer and perform arithmetic operations using algorithms suitable for hardware implementation.
CO4	Explain and compare techniques for improving the performance of a computer system components like CPU, main memory, input/output system and pipelining.

Object Oriented Programming(T/P)CSE2202/CSE2203

CO1	Demonstrate the understanding of Object oriented concepts.
CO2	Analyze problem statement and identify appropriate objects and methods for problem solving.
CO3	Make use of predefined classes and frameworks for reducing coding efforts and improving performance.
CO4	Apply features of object oriented programming to write programs to solve real world problems.

Data Structures I(T/P)CSE2204/CSE2205

CO1	To review programming concepts and understand fundamental concepts in data structures
CO2	To apply and analyze algorithms for performing operations on data structures
CO3	To Evaluate the performance of data structures and its applications.
CO4	Simulate the algorithms for performing operations on data structures.

Software Lab-I(P)CSE2206

CO1	Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python
CO2	To understand the concepts of functions modules and packages and write complex

	programs using them.
CO3	To understand defining and handling Python objects and develop classes
CO4	To develop a useful application in Python

Discrete Mathematics & Graph TheoryGE2207

CO1	ply the basic concept of classical sets, mathematical logic and fuzzy sets.
CO2	cuss the nature of Relations and Functions.
CO3	ntify the nature of different algebraic structures such as Group, Ring and Field.
CO4	nstruct graphs and minimal spanning trees.

Operating Systems (T/P)CSE2251/CSE2252

CO1	Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality.
CO2	Explain various OS mechanisms and policies for managing system resources
CO3	Analyze algorithms and techniques for managing various OS resources in a multiprogramming and other environments.
CO4	Simulate and evaluate algorithms/techniques for managing various OS resources

Data Structures II(T/P)CSE2253/ CSE2254

CO1	Create and manipulate various data structures like linked list, disjoint sets, trees, graph for real world problem.
CO2	Apply appropriate data structure for implementation of real world applications
CO3	Analyze the performance of operations performed on data structures.
CO4	Design application by using data structures for real world problems.

Course Name: Introduction to Data Analysis (T/P)CSE2255/ CSE2256

CO1	understand fundamental concepts of statistics and probability for data analysis
CO2	Apply appropriate statistical methods on simple datasets
CO3	Formulate and solve problems in a systematic manner.
CO4	Conduct investigation and Interpret output obtained from statistical analysis on datasets
CO5	Obtain hands on experience with some popular software (like R) for analysis and visualization of data

Course Name:Theory of Computation	Course Code:CSE2257
CO1	Apply basic properties of formal languages and to design finite automata for regular expression and Regular Grammar.
CO2	Construct context free grammar for various languages.
CO3	Solve various problems of push down automata for context free language
CO4	Design Turing Machines for given any computational problem.

Fundamentals of EconomicsGE2312

CO1	Discover the fundamental concept of Economics

CO2	Interpret the concept of micro -economics.
CO3	3Generalize the ideas of macroeconomics.
CO4	Describe national and international trade

Database Management Systems and Lab   CSE2301/CSE2302

CO1	Analyze & compare different levels of abstraction & data independence
CO2	Design Entity Relationship Diagram for any scenario.
CO3	Solve queries based on relational algebra & SQL.
CO4	Identify functional dependencies & normalize the database and apply ACID properties.
CO5	Analyze transaction management, various concurrency control protocols and crash recovery methods.

Design & Analysis of Algorithms and Lab   CSE2303/ CSE2304

CO1	Remember the concepts of algorithms .
CO2	Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms
CO3	Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications.
CO4	Apply the knowledge of different algorithms with discussions on complexity.
CO5	Evaluate the knowledge of algorithms with Complexity and NP-completeness

PE I: Business Intelligence and Lab CSE2311/CSE2312

CO1	Assemble BI as a Process, identify its application in various domains and functional area, its roles and responsibilities.
CO2	Identify functions of building blocks in N_tier BI ecosystem
CO3	Identify different stages in Lifecycle of a BI project.
CO4	Differentiate between traditional BI and self-service BI

PE I: Web Technologies   CSE2313/CSE2314

CO1	Design Web pages using HTML
CO2	Build an interactive website with CSS3
CO3	Develop basic programming skills using JavaScript
CO4	Use features of Client side programming

PE I: Mobile Operating System   CSE2317/CSE2318

CO1	Understand the basics of mobile programming
CO2	Apply mobile programming concepts
CO3	Design user interfaces
CO4	Design mobile database.
CO5	Analyze inter – application communication.

Course Name: Fundamentals of Management	**Course Code:** GE2311

CO1	Explain the Legal provision and Functions of Management
CO2	Analyze the role of Human Resource and Financial Management in the organization
CO3	Analyze the project life cycles
CO4	Identify tools and techniques for the marketing of goods and services

Course Name: Computer Networks		Course Code: CSE2351
CO1	Identify appropriate design issues and explain network reference model	
CO2	Select appropriate protocol at various layers for the given application.	
CO3	Solve problems in the networking domain.	
CO4	Analyze the performance of network using different tools	
CO5	Design computer networks and sub-networks	

Course Name: Compilers		Course Code: CSE2353
CO1	Understand basic concepts of compiler design, Lexical analysis process and apply the knowledge of LEX/Flex tool	
CO2	Explain the role of a syntax analyzer and distinguish between different types of parsers, design and implement a parser using a YACC tool.	
CO3	Apply the knowledge of Syntax directed translation to create intermediate code generation	
CO4	Demonstrate the use of a symbol table throughout compilation	
CO5	Apply various code optimizing transformations and code generation techniques.	

Course Name: – Software Engineering		Course Code: CSE2355
CO1	Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project.	
CO2	Select appropriate testing strategy and apply testing principles for testing a given application	
CO3	Apply basics of software configuration management, version control and change control in software development.	
CO4	Evaluate cost estimation, effort and severity of software risk for given application.	
CO5	Perform basic operations on Sub-version for software version control.	

Course Name: PE II: Digital Image Processing		Course Code: CSE2361
CO1	Describe Basic relationships between pixels.	
CO2	Compare various image enhancement techniques in spatial domain and frequency domain	
CO3	Illustrate different image compression techniques to understand the advantage of image compression	
CO4	Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation	
CO5	Interpret various representation techniques	

Course Name: PE II: Internet of Things		Course Code: CSE2363

CO1	Develop various IOT environments
CO2	Demonstrate IOT architecture and its enabling technologies
CO3	Analyze IOT environments using various communication technologies
CO4	Apply various IOT enabling technologies for creation of IOT environments

Course Name:– PE II: Neural Network and Applications		**Course Code:** CSE2365
CO1	Understand the basic concepts, underlying mathematics, and differences between Networks	
CO2	Apply popular neural network algorithms for solving classification and regression problems	
CO3	Identify and Analyse various ways of selecting suitable model parameters for different neural network algorithms.	
CO4	Design multi-layer feed-forward neural networks and CNNs using deep learning concepts	

15.Department of Artificial Intelligence Machine Learning (AIML)

Program Outcomes (PO)

PO 1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

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

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

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

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

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

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

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

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

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

PO 11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12 - Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: Design and develop effective and efficient software systems byusing the knowledge of computer hardware, algorithms, programming,databases, reusable software components, etc.
PSO 2: Solve real life problems by integrating the broad engineeringand interdisciplinary knowledge with their computing skills.

Programming for Problem Solving /Programming for Problem Solving and Lab**AIML2105/ AIML2106**

CO01	To understand the basics of computer system components and operation, basics of algorithms and flowcharts.
CO2	To design & develop programs using conditional statements and loops
CO3	To design & develop user defined functions, understand the concept of modular programming and pointers.
CO4	To understand and analyze single and multidimensional arrays as a data structure and its use in problem solving.
CO5	To understand the basics of Strings, Structures, Unions, and File handling and its use for problem solving.
CO6	To understand the given problem statement and write programs to solve real-life problems.

Computer Workshop Lab   AIML2104

CO01	To understand the Computer Hardware and networking components and their interconnection
CO2	To work with Linux/UNIX System using shell commands
CO3	To learn to use software tools such as Excel, JASON format, etc.

Object Oriented Programming / Object Oriented Programming and Lab   **AIML2156/ AIML2157**

CO01	Demonstrate the understanding of Object oriented concepts
CO2	Apply the programming language JAVA efficiently in object oriented software development
CO3	Able to analyze problem statement and identify appropriate objects and methods
CO4	Design and implement small programs using classes
CO5	Design, develop, test, and debug programs using object oriented principles of java

Web Technology Lab   AIML2158

CO01	Understand various internet technologies
CO2	To design the web pages using some basic techniques
CO3	To design and implement the interactive web pages
CO4	To use the XML technology to store the data
CO5	To design and develop the interactive web pages using the advanced technique

Discrete Mathematics & Graph TheoryAIML2201

CO01	Identify the importance of statements in deriving valid inferences
CO2	Use relations and ordering methods to identify the relationship among the inferences.
CO3	Select suitable algebraic systems to find solution for real time problems.
CO4	Find the suitable computing methods and applying graph theory concepts to solve complex problems

Formal Language & Automata Theory /Formal Language & Automata Theory and Lab**AIML2202/ AIML2203**

CO01	Apply basic properties of formal languages and to design finite automata for regular expression and Regular Grammar

CO2	Construct context free grammar for various languages.
CO3	Solve various problems of push down automata for context free language
CO4	Design Turing Machines for given any computational problem.

Data Structures / Data Structures and Lab**AIML2204/ AIML2205**

CO1	To understand fundamental concepts in data structures
CO2	To apply and analyse algorithms for performing operations on data structures
CO3	To evaluate the performance of data structures and its applications.
CO4	Simulate the algorithms for performing operations on data structures.

Computer Architecture and Organisation   **AIML2206**

CO1	Understand and demonstrate the basic computer architecture concepts related to the working of processors, memory systems, and input output systems.
CO2	Differentiate among various addressing modes and develop ability to write assembly language programs
CO3	Comprehend information representation in computer and perform arithmetic operations using algorithms suitable for hardware implementation.
CO4	Explain and compare techniques for improving the performance of a computer system components like CPU, main memory, input/output system and pipelining

Software LabAIML2207

CO1	Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python
CO2	Understand the concepts of functions, modules and packages and write complex programs using them.
CO3	Understand defining and handling Python objects and develop classes required for the given application
CO4	Develop a useful application in Python.

Linear Algebra   **AIML2251**

CO1	Solve systems of linear equations using rank of matrix.
CO2	Determine eigenvalues and eigenvectors and solve eigenvalue problems.
CO3	Explain the concepts of vector space and subspace, span and basis.
CO4	Apply principles of matrix algebra to linear transformations and inner product.

Operating Systems /Operating Systems and Lab**AIML2252/ AIML2253**

CO1	Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality
CO2	Explain various OS mechanisms and policies for managing system resources.
CO3	Analyse algorithms and techniques for managing various OS resources in a multiprogramming and other environments.
CO4	Evaluate the performance of algorithms for managing various OS resources

Software Engineering / Software Engineering and Lab**AIML2254/ AIML2255**

CO1	Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project.)
CO2	Select appropriate testing strategy and apply testing principles for testing a given application.
CO3	Apply basics of software configuration management, version control and change control in software development.

CO4	Evaluate cost estimation, effort and severity of software risk for given application.
CO5	Perform basic operations on Sub-version for software version control.

Design & Analysis of Algorithms/ Design & Analysis of Algorithms Lab **AIML2256/ AIML2257**

CO1	Remember the concepts of algorithms
CO2	Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms.
CO3	Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications
CO4	Apply the knowledge of different algorithms with discussions on complexity
CO5	Evaluate the knowledge of algorithms with Complexity and NP-completeness.

Database Management Systems / Database Management Systems and Lab**AIML2258/ AIML2259**

CO1	Understand & compare different levels of abstraction & data independence.
CO2	Design Entity Relationship Diagram for any scenario & normalize the database.
CO3	Solve queries based on relational algebra & SQL.
CO4	Analyze transaction management, various concurrency control protocols and crash recovery methods.

16.Department of Computer Science & Design

List of Program Outcomes (POs)

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

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

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

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

PO5:Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

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

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

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

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

PO10:Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

PO12:Life-long learning: Recognize the need for and have the preparation and

ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes:

	Third Semester
CSD2201	Linear Algebra
	1. Solve systems of linear equations using rank of matrix 2. Determine eigenvalues and eigenvectors and solve eigenvalue problems solve Mathematical equations. 3. Explain the concepts of vector space and subspace, span and basis. 4. Apply principles of matrix algebra to linear transformations and inner product.
CSD2202 + CSD2203	Microprocessors and Microcontrollers+ Lab
	1. Identify a detailed software & hardware structure of the Microprocessor and microcontroller 2. Determine the addressing modes and instruction sets related to programming of 8086 and 8051 3. Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller. 4. Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
CSD2204 + CSD2205	Data Structures + Lab
	1. Understand basic data structures like array, list, stack, queue, tree, and graph. 2. Develop knowledge of basic data structures such as arrays, linked lists 3. Apply appropriate data structures in problem solving 4. Design application by using data structures and algorithms for real world problems.
CSD2206	Computer System Organization
	1. Describe fundamentals of computer architecture and organization and able to design control sequence for instructions. 2. Apply mathematical techniques and perform computer arithmetic operations along with the understanding of processor design. 3. Design memory organization and understand the concept of cache mapping techniques, Input/output subsystem interfaces and buses
CSD2207	Theoretical Foundation of Computer Sciences
	1. To apply basic properties of formal languages & to construct Finite automata, to write regular expression and Regular Grammar. 2. To analyze& design different types of Grammars 3. To apply properties of CFL & design of Push Down Automata 4. To analyze & design Turing machine & demonstrate basic concept of Recursive Language, undeciadibility, post Correspondence problem & Recursive enumerable language

CSD2208	Software Lab-I
	1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python 2. To understand the concepts of functions modules and packages and write complex programs using them. 3. To understand defining and handling Python objects and develop classes required for the given application 4. To develop a useful application in Python.
	Fourth Semester
CSD2251	Discrete Mathematics and Graph Theory
	1. Identify the importance of statements in deriving valid inferences 2. Use relations and ordering methods to identify the relationship among the inferences 3. Select suitable algebraic systems to find solution for real time problems. 4. Find the suitable computing methods and applying graph theory concepts to solve complex problems.
CSD2252 + CSD2253	Operating Systems + Lab
	1. understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality 2. Explain various OS mechanisms and policies formanaging system resources. 3. Analyze algorithms and techniques for managing various OS resources in a multiprogramming and other environments. 4. Evaluate the performance of algorithms for managing various OS resources.
CSD2254	Computer Networks
	1. Understand the fundamental of Computer Network, data link layer issues, protocols, devices, and application level layer concepts. 2. Analyze different error detection mechanism in network layer. 3. Apply different routing algorithm for solving computer network Problem. 4. Analyze the performance of computer Networks and elements of protocol.
CSD2256	Object Oriented Programming +Lab
	5. Demonstrate the understanding of Object oriented concepts. 6. Apply the programming language JAVA efficiently in object oriented software development 7. Able to analyze problem statement and identify appropriate objects and methods 8. Design and implement a small programs using classes
CSD2257 + CSD2258	Design and Analysis of Algorithms+ Lab
	1. Understand asymptotic analysis of iterative and recursive algorithms, complexity of algorithms. 2. Apply important algorithmic design techniques for problem solving. 3. Analyze the performance of algorithms.

	4. Synthesize and design efficient algorithms for real world problems.
CSD2259	Software Lab-II
	1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in C#. 2. To understand the concepts of functions modules and packages and write complex programs using them. 3. To understand defining and handling C# objects and develop classes 4. To develop a useful application in C#.
	Fifth Semester
CSD2301	Cyber Laws & Professional Ethics
	1. State the importance of Engineering Ethics and differentiate between engineering and profession 2. Employ various Ethical Theories and Practice Ethical Engineering 3. Illustrate background and structure of constitution. 4. State federalism in the Indian Context 5. Identify fundamental rights, duties and directive principles enshrined under Constitution of India
CSD2302 + CSD2303	Database Management Systems + Lab
	1. To obtain sound knowledge in the theory, principles and applications of database management system. 2. Design and develop data model given their specifications and within performance and cost constraints. 3. Acquire and understand new knowledge, use them to develop data centric application and to understand the importance of lifelong learning. 4. Perform experiments in different disciplines of database management system.
CSD2304+CSD2305	Principles of Compiler Design+Lab
	1. Understand different phases of compilation process and lexical analyzer tool "Lex" OR "Flex" 2. Apply parsing techniques to design and implement parsers using YACC /Bison tool 3. Apply syntax directed translation scheme to programming language constructs and analyze errors in lexical and syntactic phase of compiler 4. Apply different optimization techniques in the design of compiler and generate target code
CSD2310+CSD2311	Digital Image Processing + Lab:
	1. Understand basic concepts of image processing, in the spatial and frequency domain 2. understand basics of image representation and description. 3. comprehend the basics of color image processing, image segmentation and morphological operations on images 4. understand various algorithms for image processing and apply them on given image data

CSD2312+CSD2313	Machine Learning + Lab
	1. Understand various models of supervised and unsupervised learning 2. analyze a problem and identify the machine learning algorithm appropriate for its solution 3. apply supervised learning for the given set of labelled samples and design the model to meet the desired needs 4. apply unsupervised learning for the given set of samples, and design the model to meet the desired needs
CSD2314+CSD2315	Data Visualization+Lab
	1. To know the history of data visualization and its connection with computer graphics. 2. To know categories of visualization and application areas. 3. To understand the types of transformation the data has undergone to improve the effectiveness of the visualization. 4. To know the methods and algorithms used to map data to graphical depictions 5. To understand the techniques that has been applied to spatial data.
CSD2316+CSD2317	Computer Graphics+Lab
	1. Understand basics of computer graphics. 2. Apply basic algorithms for line, circle and to solve, apply and list geometric transformation matrices including rotation, translation, scaling and reflection to transform a 2D object. 3. Apply basic algorithms and methods for segments, clipping and viewing transformation. 4. Understand various tools and apply to design the animation.
CSD2318 + CSD2319	Internet of Things+Lab
	1. Students will able to describe various communication protocol and its building blocks. 2. Students will able to describe relevance of IoT with cloud and the application areas of IOT. 3. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor 4. Able to understand building blocks of Internet of Things and characteristics. 5. The students will study and implement IoT project by studying different IoT components, electronic board and their uses. OE
CSD2331	Computer Graphics
	1. Understand basics of computer graphics. 2. Apply basic algorithms for line, circle and to solve, apply and list geometric transformation matrices including rotation, translation, scaling and reflection to transform a 2D object. 3. Apply basic algorithms and methods for segments, clipping and viewing transformation. 4. Understand various tools and apply to design the animation.
CSD2332	Multimedia Design
	1. Define what is multimedia and how it works. 2. Understand multimedia components using various tools and

	techniques. 3. Discuss about different types of media format and their properties. And justify the right way of manipulating multimedia systems. 4. To design Multimedia Application.
CSD2341	Advanced Web Designing
	1. Understand the different tags of HTML and Implement interactive web pages using HTML , DHTML and CSS. 2. Apply the concept of Markup languages and Make the use of mark up languages in development of web pages. 3. Develop interactive web pages using java script and client and server side programming. 4. Develop web applications using Node and Angular JS.
CSD2342	Virtual Reality
	1. Describe how VR systems work and list the applications of VR. 2. Understand the design and implementation of the hardware that enables VR systems tobe built. 3. Understand the system of human visionand its implication on perception and rendering. 4. Explain the concepts of motion and tracking in VR systems
	Six Semester
CSD2352	Software Architecture & Design
	5. Analyze and evaluate the different software process model and appropriate architectural style while developing a software 6. Understand and Apply the software testing techniques in a variety of ways to test the software. 7. Analyze and design various UML diagram and UML based design and analysis with the help of various diagrams. 8. Demonstrate an ability to use the techniques and tools necessary for engineering practice
CSD2353+CSD2354	Computer Game Design and Programming+Lab
	1. Understand different types/genres of video games and the components thereof. 2. Able to write scripts which control the behavior of different game components. 3. Able to create realistic scenes and environments. 4. Able to design, write and deploy 2D video games 5. Apply hands-on experience with game engines, e.g., Unity.
CSD2361+CSD2362	Multimedia Design & Processing+Lab
	1. To understand concept of multimedia design & processing 2. To analyze the different multimedia design. 3. To apply various operations using Multimedia tool

	4. To design user interface and case study on different android applications
CSD2363+CSD2364	Advanced Web Designing+Lab
	1) Understand the different tags of HTML and Implement interactive web pages using HTML , DHTML and CSS. 2) Apply the concept of Markup languages and Make the use of mark up languages in development of web pages. 3) Develop interactive web pages using java script and client and server side programming. 4) Develop web applications using Node and Angular JS.
CSD2365+CSD2366	Design Manufacturing and Assembly+Lab
	1. Understand that Design for Manufacture and Assembly (DFMA) is an importantaspect of product development and promotes early involvement of manufacturingin design 2. Learn a systematic procedure to analyze a proposed design from the point of viewof assembly and manufacturing 3. Quantitatively evaluate the impact of design choices on manufacturing cost 4. Get familiar with key concepts in various new manufacturing paradigms andpractices related to lean manufacturing
CSD2367 + CSD2368	UX &UI Design +Lab
	1. Understand the definition and principles of UI/UX Design in order to design with intention. 2. Achieve a deep understanding of the entire life-cycle of design—the process, purpose, and tools. 3. Learn the basics of HCI (human-computer interaction) and the psychology behind user decision-making. 4. Discover the industry-standard tools and specific project deliverables in UI/UX.
CSD2369+CSD2370	Introduction to Deep Learning + Lab
	1. Comprehend the neural networks as means for computational learning and to analyze the basic network architectures and algorithms for supervised and unsupervised learning. 2. Recognize the characteristics of deep learning models that are useful to solve real-world problems. 3. Understand the motivation for different neural network architectures and select the appropriate architecture for a given problem. 4. Build deep learning models and interpret the results

	Seventh Semester
CSD2401+CSD2402	Virtual and Augmented Reality +Lab
	1. Describe how VR systems work and list the applications of VR. 2. Understand the design and implementation of the hardware that enables VR systems to be built. 3. Understand the system of human vision and its implication on perception and rendering. 4 Explain the concepts of motion and tracking in VR systems.
CSD2403+CSD2404	Computer Aided Design+Lab
	1. Distinguish the various CAD CAM tools and also evaluatecriteria for CAD CAM systems 2. Design 2D and 3D Transformation matrices 3. Calculate and analyse the parametric equations for wireframe. surface and solid modeling entities 4. Design the applications of modeling and evaluate dataexchange formats
CSD2411+CSD2412	GPU Computing+Lab
	1. **Compare & Compute** speedup, efficiency, and scaled speedup of parallel computations. 2. **Analyze and resolve** the dependences in single, double and multi-level loops. 3. **Describe** common GPU architectures and programming models to implement efficient algorithm using kernels. 4. Given a problem, **implement** an efficient and correct code to solve it, analyze its performance, and give convincing written and oral presentations explaining the achievements.
CSD2413+CSD2414	Digital Audio Design and Synthesis+Lab
	1) Understand the recording and transmission principles in digital audio. 2) Apply the various compression, Filtering, Linear predictive coding, and audio processing techniques. 3) Analyze and synthesize the various digital audio. 4) Design and analyze the digital audio editing.
CSD2415+CSD2416	Special Effects Techniques +Lab
	1. learn various special effect techniques like morphing, miniature effects, bullet timing, wire removals, practical effects, motions, travelling matte, in-camera effects, rotoscoping, prosthetic effects of the makeup etc 2. Apply the tools for visual effect Storyboards, pre-viz, planning

	workflows 3. develop model and dramatic senses
CSD2417+CSD2418	Animation Principles & Design+Lab
	1. Understand the animation principles and produce, understanding of timing concept 2. Apply animation principles and techniques in design of walk cycle,and also apply industry standard practices in applied creativity 3. Design Storyboarding Shot Composition Directing the Audience Transitions, Creating an Animatic
CSD2419+CSD2420	Product Design and Development+Lab:
	1. Evaluate the product life cycle 2. Analyze and select the materials and manufacturing processes for designed product. 3. Evaluate the product for different design criteria like Value engineering/ analysis, robust design, benchmarking, DFX,etc and estimate the product costing. 4. Explain the various prototyping methods and its economics.
CSD2431	Mobile Computing
	1. Understand different wireless mobilearchitecture. 2. Understand control mechanism and RadioInterfaces. 3. UnderstandtheconceptsofAdhocNetwork. 4. Understandtheneedandthetrendtowardmobility.
CSD2432	Information Retrival
	1. understand different Information retrieval models. 2. know about evaluation methods of the information retrieval model. 3. know the challenges associated with each topic
CSD2433	Image & Video Processing
	1. Demonstrate the understanding of image and video processing techniques 2. Apply edge detection, image segmentation,spatial and frequency domain image filters for image segmentation and enhancement. 3. Design image enhancement, image and video segmentation schemes, image and video filters for various applications
CSD2434	Computer Vision
	1) Appreciate the detailed models of image formation. 2) Apply various algorithms for pattern recognition 3) Analyse the techniques for image feature detection and matching. Also analyze structural pattern recognition and feature extraction techniques 4) Examine various clustering algorithms.

CSD2441	Spatial Computing
	1. Become familiar with technologies used in spatial and temporal data. 2. Use advanced technologies to build applications combined with geographical data. 3. Be familiar with tools and technologies to evaluate and compare systems.
CSD2442	Artificial Intelligence
	1. understand basics of AI, apply and choose proper state space search algorithm for the given problem 2. to make intelligent choices from among available algorithms and knowledge representation schemes subject to specific design and performance constraints. 3. to solve problems with appropriate algorithms, perform its implementation and their experimental evaluation for incomplete and/or uncertain information
CSD2443	Cloud Computing
	1. Understand the different computing paradigm, analyze and apply cloud computing services, deployment model for building cloud 2. Apply the concepts and techniques in cloud computing 3. Analyze the problems and apply design considerations for cloud application 4. Provide the appropriate cloud computing solutions for building cloud application
CSD2444	Industry 4.o
	1) Understand the basics of IoT and basics of Industry 4.0. 2) be Understand Business Model and Reference Architecture 3) understand the different Business issues in Industry 4.0 and how to solve them. 4) to understand the need of Security and Fog Computing and applications of IIoT.
CSD2445	Additive Manufacturing 1. Demonstrate the knowledge of Additive Manufacturing and Rapid Prototyping technologies. 2. Describe different RP techniques. 3. Discuss fundamentals of Reverse Engineering. Eighth Semester
CSD2451	Major Project/Internship
	1. Understand the knowledge gained from the various courses undergone in earlier years.

	2. Able to work in team and adapt professional ethics and practice and how to write technical documents in professional style, and to demonstrate the product/software to technical audience. 3. Able to evaluate and analyze critically evaluate and analyze different sources of data available in the literature. 4. Able to learn and to apply the knowledge of tools/Technology
CSD2452	Extra curricular Activity Evaluation 1. An ability to work initially as well as part of team to achieve set goals. 2. An ability to work to serve society and for betterment of society. 3. An ability to communicate with people at large.

17. Department of IIoT

List of Program Outcomes (POs)

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

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

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

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

PO5:Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

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

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

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

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

PO10:Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

PO12:Life-long learning: Recognize the need for and have the preparation and

Bachelor of Technology
(Department of Electronics Engineering
Industrial Internet of Things (IIoT)

ISemester
IIOT2101:BasicElectricalMachines

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Reproduce fundamentalsof dccircuits&accircuits.
CO2	Explain,construction,workingandapplicationsofvariouselectricalmachines.
CO3	Analyzeperformanceofvariouselectricalmachines.

IIOT2102:Lab.:BasicElectricalMachines
CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	Performlaboratoryexperimentsanddemonstratecompetencyincollecting,interpreting,analysing data,communicateandpresenteffectivelythroughlaboratoryjournals.

IIOT2103:ConstitutionofIndia
CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheability to

CO1	Explainthebasic conceptsof ConstitutionofIndia.
CO2	Describethevarious Fundamentalrights
CO3	AnalyzetheImpactoffederalismontheState
CO4	ExplainIndustrial LawandJudiciary

IIOT2104:Calculus

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Applytheknowledgeofdifferentiation,limitandcontinuitytodeveloptheMathematicalconceptsto solve engineering problems
CO2	DeterminetheexpansionandderivativesoffunctionsofMultiplevariablesanduseittofindextreme Valuesoffunctions
CO3	Evaluatetheimproperintegrals,multipleintegralsandapplyittocomputetheareaandvolumeof various structures.
CO4	Solvehigherorderdifferentialequationsanditsapplications.

IIOT2105:SemiconductorPhysics
CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Co-relatefundamentalsofquantummechanicstosolveproblemsdealingwithquantumparticle.

CO2	Justifythecharacteristicsofsemiconductormaterialsintermsofcrystalstructures,charge carriersandenergybands.
CO3	Identifytherequirementsofsensormaterialfortechnological application
CO4	Illustrateopticalinteractionsassociatedwithsemiconductormaterialsfortheiruseinthe devices.
CO5	Analyzetheelectronmotioninelectricandmagneticfieldcontributingtoelectronicdisplay devices.

IIOT2106:Lab.:SemiconductorPhysics

Course Outcomes	StatementofCourseoutcomes Studentsareableto
CO2	Justifythecharacteristicsofsemiconductormaterialsintermsofcrystal structures, chargecarriers and energy bands.
CO3	Identifytherequirementsofsensormaterialfortechnologicalapplication.
CO4	Illustrateopticalinteractionsassociatedwithsemiconductormaterialsfortheir useinthe devices.
CO5	Analyzetheelectronmotioninelectricandmagneticfieldcontributingto electronic display devices.

IIOT2107:CProgramming

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	UnderstandProgramingLogic
CO2	Writealgorithm&Drawaflowchartforagiven problem
CO3	Design&DevelopprogramsusingdifferentcontrolFlowStatement.
CO4	Design&Developprogramsusingbasicsof Arrays,functions,pointers,structuresetc.

IIOT2108:Lab.:CProgramming

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	UnderstandProgramingLogic
CO2	Writealgorithm&Drawaflowchartforagiven problem
CO3	Design&DevelopprogramsusingdifferentcontrolFlowStatement
CO4	Design&Developprogramsusingbasicsof Arrays,functions,pointers,structuresetc

IIOT2109:EngineeringMaterials

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Classifyengineeringmaterialsbasedonitsstructure.
CO2	distinguishbetweenelasticandplasticbehaviorofmaterials
CO3	Outlinevariousmechanicalpropertiesofengineeringmaterialsandtestthemtoknow properties.
CO4	Discussandcomparedifferentheattreatmentprocessesofsteel.

IIOTGE2131:UniversalHumanValue

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto:-

CO1	Experientialvalidationthroughthewaytoverifyrightorwrong.
CO2	Practicelivinginharmonywithnaturalacceptance
CO3	Realisetheimportanceofrelationships.
CO4	Recognizetheimportanceofsustainableco-existencein existence

IISemester
IIoT2151:ProbabilityTheoryandStatisticalInference

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Identifyanappropriateprobabilitydistributionforagivendiscreteorcontinuousrandomvariable and computeprobabilities.
CO2	Makeuseofprobabilitydistributionstosolveagivenproblem.
CO3	Applyconceptsofsamplingtheorytofindprobabilitiesandestimatesparametersofvariousproblems.
CO4	Testthehypothesisandestimateconfidenceintervalsatdifferentlevels.

IIoT2152:AppliedChemistry

CourseOutcome: Aftercompletionofthecourse,studentwillbeableto

CO 1	Interpretdifferentthermodynamicfunctions.(L2)
CO 2	Describebasic conceptsofelectrochemistryandapplythe knowledgeforenergystorage devices.(L3)
CO 3	Developbetterawarenessaboutglobalenvironmentalconcerns. (L2)
CO 4	Classifyadvanced engineeringmaterialsintechnologicalapplications.(L2)
CO 5	Developanalyticalandinstrumentalskills. (L3)

IIoT2153:Lab.:AppliedChemistry

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO2	Describebasicconceptsofelectrochemistryandapplytheknowledgeforenergystoragedevices.(L3)
CO4	Classifyadvancedengineeringmaterialsintechnologicalapplications.(L2)
CO5	Developanalyticalandinstrumentalskills. (L3)

IIoT2154:EngineeringGraphics

CourseOutcomes: Aftercompletionofthecourse,studentwilldemonstratetheability to

Course Outcome	Statement
CO1	**Construct**orthographicdrawingandisometricdrawingofagivenobject
CO2	**Evaluate**ProjectionsofvariousOneDimensional,Twodimensional,Three-dimensional objects
CO3	**Develop**thelateralsurfacesofvarioussolids,theirsectionandintersection**.**
CO4	**Practice**theuseofsoftwaretoolsusedforTwodimensionaldrawings.

IIoT2155:Lab.:EngineeringGraphics

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

Course Outcome	Statement	Level
CO1	**Construct**orthographicdrawingandisometricdrawingofagivenobject	L3
CO2	**Evaluate**ProjectionsofvariousOneDimensional,Twodimensional,Three dimensional objects	L4
CO3	**Develop**thelateralsurfacesofvarioussolids,theirsectionandintersection**.**	L3
CO4	**Practice**theuseofsoftwaretoolsusedforTwodimensionaldrawings.	L3

IIoT2156:TechnicalCommunication

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheability to

CO1	Applydifferent modesfor effectivecommunication
CO2	Competentlyuse thephonologyofEnglishlanguage
CO3	ApplynuancesofLSRW skills
CO4	Communicatethroughdifferent channels

IIoT2157:FundamentalsofManufacturingProcess

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	DifferentiatevariousManufacturingprocesses
CO2	Elaborateandclassifydifferentcastingandjoiningprocesses.
CO3	Summarizecuttingtoolmaterialsandtoolgeometriesfordifferent metals.
CO4	Analyzeappropriatemachiningprocessesfordifferentmachiningconditions.

IIoT2158:Lab.:FundamentalsofManufacturingProcess

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	DifferentiatevariousManufacturingprocesses
CO2	Elaborateandclassifydifferentcastingandjoiningprocesses.
CO3	Summarizecuttingtoolmaterialsandtoolgeometriesfordifferent metals.
CO4	Analyzeappropriatemachiningprocessesfordifferentmachiningconditions.

IIoT2159:Lab.:PythonProgramming

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

Course Outcome	Statement Onsuccessfulcompletionofthiscourse,studentsshouldbeable:
CO1	To**understand**syntaxandsemanticsoflanguage
CO2	To**understand**and**apply**thebasicsoftheprogramminglanguage
CO3	To**analyse**and**apply**speciallanguagefeatures
CO4	To**evaluate**and**create**functionsforanyapplication

III Semester
IIOT2201:DigitalElectronics

CourseOutcome:Aftercompletionofthecourse,Studentswillhavetheabilityto

CO1	Understand,DefineandsimplifytheconceptofDigitalElectronicsCircuits.
CO2	Applytheconceptofdifferentcombinationallogiccircuitswhichmaybeusedinvariousdigital Systems
CO3	Analyzesequentiallogicandtheirapplications
CO4	DesignandAnalyzethefunctionofdifferenttypesofcountersandMooreandMealymachines.
CO5	Conductexperimentstodemonstratethespecificapplicationofdigitalelectronicsusingsuitabledigital ICs

IIOT2203:LinearAlgebraandGraphtheory

CourseOutcome:Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Solvesystemsoflinearequationsusingrankofmatrixinengineeringfield.
CO2	Determineeigenvaluesandeigenvectorsandsolveeigenvalueproblems.
CO3	Explaintheconceptsofvectorspaceandsubspace,spanandbasisandinnerproduct
CO4	Findthesuitablecomputingmethodsandgraphtheoryconceptstosolvecomplexproblems.

IIOT2204:ElectronicsDevicesandCircuits

CourseOutcome:Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Analyzedifferenttypesofsemiconductordevices,theiroperationandcharacteristics.
CO2	DesignandanalyzetheDCbiascircuitryofBJTandFET.
CO3	AnalyzeandmodelBJT,FETandMOSFETforsmallsignal.
CO4	Applyconceptoffeedbacktoimprovestabilityofcircuits.
CO5	Designcircuitsusingthetransistorsand oscillators.

IIOT2205:Lab.:ElectronicsDevicesandCircuits

CourseOutcome:Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	**AnalyzeandDesign**analogelectroniccircuitstocomputerequiredparameters.
CO2	**Conduct**experimentstodeterminevariousparametersusinghardwareand/orsimulationtools
CO3	**Implement**amini-projectanddemonstratethegivenproblemusingsuitableanalogelectronic components

IIOT2206:AlgorithmsandData Structures

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understandthetrade-offsofalgorithmsandprogrammingaspects
CO2	Applyvariousoperationondata Structure
CO3	AnalyzevarioustypesofData Structure
CO4	Implementvarioustypesofalgorithmsandanalyzeperformanceofsystem
CO5	Developprogramsusingdatastructuresandlatest compilers

IIOT2207:Lab.:AlgorithmsandDataStructures

CO1	Understandthetrade-offsofalgorithmsandprogrammingaspects
CO2	Applyvariousoperationondata Structure
CO3	AnalyzevarioustypesofData Structure
CO4	Implementvarioustypesofalgorithmsandanalyzeperformanceofsystem
CO5	Developprogramsusingdatastructuresandlatest compilers

IIOT2208:EngineeringEconomicsandManagement

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Developperspectiveabouteconomybasedonlogicalreasoningandestimatetheeconomicoutcomes.
CO2	Interpretscomparativeadvantageofresources.
CO3	ExplaintheFunctionsofManagementandidentifytoolsandtechniquesofMarketingofgoodsand Services
CO4	AnalyzetheroleofFinancialAccountancyandManagementintheOrganisation

IIOT2209:Sensors&ActuatorsforIIOT

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	*UnderstandandexplaintheconceptsofSensorsandActuators.*
CO2	Explaintheworkingofmagneticsensorsanditsapplicationsinrealtime scenario
CO3	acquireknowledgeofModellinearactuatorsanddifferentiatevarioussolenoids
CO4	Evaluateperformancecharacteristicsofdifferenttypesofsensors

IVSemester
IIOT2251:ControlSystemEngineering

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understandconceptsrelatedtolinearcontrol system
CO2	ApplytheconceptsofcontrolsystemtoobtainthesystemTransferfunction
CO3	ApplytheconceptsofcontrolsystemtoobtainthesystemTransferfunction
CO4	Applyfrequencydomainanalysismethodtovariouslinearcontrol systems

IIOT2252:Lab.:ControlSystemEngineering

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	Realizetheneed ofcontrolsystemanditsrecentdevelopments.Abletomodelthesystem andsimulate the model.
CO2	Analyzethesystemstabilitybasedontimedomain,frequencydomainandrootlocus techniques.

IIOT2253:Mechatronics
CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Studentswillbeabletomodelvariousmechatronicsystems.
CO2	Studentswillbeabletounderstandtheworkingofvariousmotorsusedinmechatronicsystems
CO3	StudentwillbeabletoanalyzethecharacteristicsandusevariousIC's.
CO4	StudentswillbeabletoanalyzetheinternalhardwarestructureinMechatronicsSystems.

IIOT2254:Lab.:Mechatronics

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	Modelvariousmechatronicsystems.
CO2	Understandtheworkingofvariousmotorsusedinmechatronic systems
CO3	AnalyzethecharacteristicsandusevariousIC's
CO4	AnalyzetheinternalhardwarestructureinMechatronicsSystems.

IIOT2255:MicroprocessorandInterfacing

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	DescribethearchitectureofMicroprocessor
CO2	WriteProgramforanassigned task.
CO3	ApplydifferentaddressdecodingtechniqueswhileinterfacingMemorytoMicroprocessor
CO4	AnalyzeandDesigninterfacingofPeripheraldevicesto Microprocessor

IIOT2256:Lab.:MicroprocessorandInterfacing

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	DescribethearchitectureofMicroprocessor
CO2	WriteProgramforanassignedtask.
CO3	ApplydifferentaddressdecodingtechniqueswhileinterfacingMemorytoMicroprocessor
CO4	AnalyzeandDesigninterfacingofPeripheraldevicestoMicroprocessor
CO5	Createsoftware&Hardwaresolutionsforcomplexproblems

IIOT2257:AnalogandDigital Communication

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Analyzeandcomparedifferentanalogmodulationschemes.
CO2	Analyzethebehaviorofacommunicationsysteminpresenceofnoise.
CO3	Investigatepulsedmodulationsystemandanalyzetheirsystemperformance
CO4	Analyzedifferentdigitalmodulationschemesforcommunicationchannels.

IIOT2258:Lab.:AnalogandDigitalCommunication

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	Toobserveandinterpret theperformanceof AMmodulator anddemodulator under variouschanging parameters.
CO2	TounderstandFMModulationand Demodulation.
CO3	Analyzevariouspulsemodulationtechniques.
CO4	SimulateandconductexperimentsondifferenttypesofAnalogcommunicationsubsystems.

IIOT2259:DesignToolLab-1

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	StudentsWillabletoidentifydifferentElectronicsComponents.
CO2	StudentsWillbeabletoworkinteamwork
CO3	StudentsWillbeabletodoArtwork,printing,etching&drillingofPCB
CO4	StudentswillbeabletodominiprojectstoenhancetheirpracticalKnowledge.

IIOT2260: Lab.: Electronics Workshop

CourseOutcome: After completion of the laboratory work, student will demonstrate the ability to

CO1	**Understand** and identify Different Electronics Components.
CO2	**Apply** the basic knowledge of Electronics Components to select the mini project.
CO3	**Demonstrate** their practical Knowledge to do Artwork, printing, Etching & drilling of PCB for mini project.
CO4	**Build** a mini project and **prepare** a report & small video.

VSemester
IIOT2301:IoTCommunicationNetwork

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understand and explain the concept of Data Communication and networks, layered architecture and their applications,transmissionMedia,MediaAccessControlWirelessLAN,NetworkConnectingDevicesin ComputerNetworks.
CO2	DemonstrateDataLinkLayerProtocols,RoutingAlgorithms,congestionControl,TCP/IPprotocol,IP addressing.
CO3	DescribedesignapplicationlayerprotocolsandinternetapplicationssuchasElectronicMail,andFile Transfer,WWWandHTTPandDNS.
CO4	ExplainCryptography,DigitalSignature,EntityAuthentication,FIREWALLS,SSLServices

IIOT2302:Microcontroller&itsApplications

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	**Describe**thearchitectureof8051,itsfeaturesandinstructions
CO2	Writeprogramforspecifictask
CO3	AnalyzeandInterfacetheperipheralsto8051microcontroller
CO4	Developapplicationusing8051microcontroller
CO5	WriteprogramandDebugusingIDEtoollikeKEIL uVision5

IIOT2303:Lab.:Microcontroller&itsApplications

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	**Describe**thearchitectureof8051,itsfeaturesandinstructions
CO2	Writeprogramforspecifictask
CO3	**Analyze**andInterfacetheperipheralsto8051microcontroller
CO4	**Develop**applicationusing8051microcontroller
CO5	WriteprogramandDebugusingIDEtoollikeKEIL uVision5

IIOT2304:DataAnalytics

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Conceptofdifferenttypesofdataanditsanalytics.
CO2	Understandhowthedataanalysiswillbe done.
CO3	Applythedifferenttechniquesfordatacleaningandvisualization.
CO4	AnalysetheBigDataandobtaininsightusingdataanalyticsmechanisms.
CO5	AnalysetheDataanalyticsconceptsusinglatestsoftware.

IIOT2305:Lab.:DataAnalytics

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	Understandtheconceptofdifferenttypesofdataanditsanalytics.
CO2	Understandhowthedataanalysiswillbe done.
CO3	Applythedifferenttechniquesfordatacleaningandvisualization.
CO4	AnalysetheBigDataandobtaininsightusingdataanalyticsmechanisms.
CO5	AnalysetheDataanalyticsconceptsusinglatestsoftware.

IIOT2306:ObjectOrientedProgramming

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understandtheconceptofconceptsof Object-OrientedProgramming
CO2	Analyzetheusingtheconceptof Inheritance,Polymorphism,Overloading
CO3	Choosetheappropriatedatastructureandalgorithmdesignmethodforaspecifiedapplication
CO4	Developanduselinearandnon-lineardatastructures
CO-5	Createsoftwaresolutionsforcomplexproblems

IIOT2307:Lab.:ObjectOrientedProgramming

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understandthetrade-offsofalgorithmsandprogrammingaspects
CO2	Applyvariousoperationondata Structure
CO3	AnalyzevarioustypesofData Structure
CO4	Implementvarioustypesofalgorithmsandanalyzeperformanceofsystem
CO5	Developprogramsusingdatastructuresandlatest compilers

IIOT2308:CNCandRobotics

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understandworkingofsubtractivemanufacturing
CO2	ImplementCNCprogramsforvariousproductmanufacturing
CO3	haveknowledgeofRobotics,automation,roboticsmotion,sensors,roboticprogrammingandrolesof robotsinindustry
CO4	Understandtheworkingmethodologyofroboticsandautomation,motionandcontrol,machinevision andprogramming,applicationofrobotsinindustry

IIOT2311:PE-I-SystemCProgrming

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratethe abilityto

CO1	Understandthedesignmethodology
CO2	Describetheconceptsofcombinationalmodeling
CO3	modelsynchronouscircuitsandtestbenches
CO4	Verifythe functionalities

IIOT2312:PE-I-Industry4.0andSmartSystems

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	ArticulatetherecentmanufacturingtrendsrelatedtoIndustry4.0andits implementation
CO2	Interpretconceptsandbasicframeworknecessaryforsmart manufacturing
CO3	Developunderstandingaboutharnessingsmartnessintomanufacturingprocessesfromthe data
CO4	Abletofindtheapplicationsofalltheareasindaytoday life.

IIOT2313:PE-I-Advanced Microprocessor

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	DescribethearchitectureofMicroprocessor
CO2	WriteProgramforanassignedtask.
CO3	ApplydifferentaddressdecodingtechniqueswhileinterfacingMemorytoMicroprocessor
CO4	AnalyzeandDesigninterfacingofPeripheraldevicestoMicroprocessor

VI Semester
IIOT2351:DigitalSystemDesign

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Understandhardwaredescriptionlanguageandabletodesignandsimulatedigitalsystemsusing Differentabstractionlevels
CO2	Designandanalysecombinationalandsequentiallogiccircuits.
CO3	Understandandapplytimingissuesinmultiplecontextsanddesignthecircuit.
CO4	Understandprogrammabledevicesandabletodesigndigitalsystemsusingmoderndesigntools

IIOT2353:EmbeddedSystemDesign
CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	DescribetheARMmicroprocessorarchitectures,itsfeaturesandinstructions
CO2	Writeprogramforspecifictask
CO3	AnalyzeandInterfacetheperipheralstoARMbasedmicrocontroller

CO4	DevelopembeddedsystemapplicationusingARMbasedmicrocontroller
CO5	WriteprogramandDebugusingIDEtoollikeKEILMDK410andCodeComposerStudioforARM

IIOT2354:Lab.:EmbeddedSystemDesign

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	DescribetheARMmicroprocessorarchitectures,itsfeaturesandinstructions
CO2	Writeprogramforspecifictask
CO3	AnalyzeandInterfacetheperipheralstoARMbasedmicrocontroller
CO4	DevelopembeddedsystemapplicationusingARMbased microcontroller
CO5	WriteprogramandDebugusingIDEtoollikeKEILMDK410andCodeComposerStudioforARM

IIOT2355:DataAcquisition&SignalConditioning

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	**Understand**theDataacquisitionsystemandSignalConditioningComponents.
CO2	**Analyze**theKnowledgeofSerialdataCommunicationandinterfacestandards.
CO3	**Remember**thedifferentboardsandfieldbusesusedfordataacquisition Systems.
CO4	**Understands**theuseofEthernet,MediumAccesscontrolandUSB

IIOT2356:MachineLearningforIIoT

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	**Apply**theknowledgeofMathematicsandprogrammingtobuildmachinelearningmodels
CO2	**Analyze**differentusecasestoevaluatetheperformanceofthemodels
CO3	**Designanddevelop**applicationmodelsusingsupervisedandunsupervisedlearningalgorithms
CO4	**Compare**differentmachinelearningtechniquesand**demonstratethecomprehension**ofthetrade-offsinvolvedindesignchoices

IIOT2357:Lab.:MachineLearningforIIoT

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	**Apply**theknowledgeofMathematicsandprogrammingtobuildmachinelearningmodels
CO2	**Analyze**differentusecasestoevaluatetheperformanceofthemodels
CO3	**Designanddevelop**applicationmodelsusingsupervisedandunsupervisedlearningalgorithms
CO4	**Compare**differentmachinelearningtechniquesand**demonstratethecomprehension**ofthetrade-offsinvolvedindesignchoices

IIOT2358:DesignToolLab-2

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Analyze the data acquisition systems
CO2	DesignanddevelopWireless applications
CO3	DevelopprojectsonARMprocessor
CO4	Solvescientificproblemsusingsoftwareprogramming

IIOT2359:CryptograpghyforIIoT

CourseOutcome: Aftercompletionofthecourse,studentwilldemonstratetheabilityto

CO1	Solveandrelatemathematicconceptsbehindthecryptographicalgorithms.
CO2	Explainbasicconceptsandalgorithmsofcryptography
CO3	Evaluatetheroleplayedbyvarioussecuritymechanismslike passwords
CO4	UnderstandIP security

IIOT2361:PE-IIDigitalImageprocessing

Aftercompletionofthecourse,studentwilldemonstratetheabilityto:

Course Outcome	CourseOutcomeStatement	Bloom's TaxonomyLevel
CO1	A**pply**thebasicconceptsofdigitalimageprocessinganddigitalimagegeometry to interpret image data	L3
CO2	A**pply**theimageenhancementandrestorationtechniquesinspatialand frequency domain to improve quality of image	L3
CO3	A**nalyze** digital Image usingedge detection and region merging/splitting/growing techniques for image segmentation	L4
CO4	A**pply**differentcompressiontechniquesto**estimate**imagecompression	L3
CO5	**Conduct**experimentsusingMATLABforprocessingthedigitalimages	L3

IIOT2362:PE-II:Lab.:DigitalImageprocessing

CourseOutcome: Aftercompletionofthelaboratorywork,studentwilldemonstratetheabilityto

CO1	A**pply**thebasicconcepts ofdigital imageprocessinganddigital imagegeometry tointerpretimage data
CO2	A**pply**the image enhancement and restoration techniques in spatial and frequency domain to improve quality of image
CO3	A**nalyze** digital Image usingedge detection and region merging/splitting/growing techniques for image segmentation
CO4	A**pply**differentcompressiontechniquesto**estimate**imagecompression
CO5	**Conduct**experimentsusingMATLABforprocessingthedigitalimages

IIOT2363:PE-II Flexible Manufacturing System

CourseOutcome: After completion of the course, student will demonstrate the ability to

CO1	Develop FMS using the most appropriate technique
CO2	Implement FMS concept in a manufacturing environment
CO3	Explain the role of automation in manufacturing
CO4	Classify automation equipment and assembly systems into different categories

IIOT2364:PE-II:Lab::Flexible Manufacturing System

CourseOutcome: After completion of the laboratory work, student will demonstrate the ability to

CO1	Develop FMS using the most appropriate technique
CO2	Implement FMS concept in a manufacturing environment
CO3	Explain the role of automation in manufacturing
CO4	Classify automation equipment and assembly systems into different categories

IIOT2365:PE-II Digital Signal Processing

CourseOutcome: After completion of the course, student will demonstrate the ability to

CO1	**Apply the** concepts of trigonometry, complex algebra, Fourier transform, z-transform and concepts of signals and system to analyze DSP problems and demonstrate it using software tool
CO2	**Acquire knowledge, Apply and analyze** the operations on Digital signals Systems and demonstrate it using software tool
CO3	**Design, implement, analyze and demonstrate digital** filters for processing of discrete time signals in basic and advance form like multi-rate filters
CO4	**Design and demonstrate** fundamental knowledge of Digital signal processing using modern Engineering tool. Also develop creative and innovative designs that achieve desired performance criteria within specified objectives and constraints, understand the need for lifelong learning and continuing professional education

IIOT2366:PE-II:Lab:Digital Signal Processing

CourseOutcome: After completion of the laboratory work, student will demonstrate the ability to

CO1	**Apply the** concepts of trigonometry, complex algebra, Fourier transform, z-transform and concepts of signals and system to analyze DSP problems and demonstrate it using software tool
CO2	**Acquire knowledge, Apply and analyze** the operations on Digital signals Systems and demonstrate it using software tool
CO3	**Design, implement, analyze and demonstrate digital** filters for processing of discrete time signals in basic and advance form like multi-rate filters
CO4	**Design and demonstrate** fundamental knowledge of Digital signal processing using modern Engineering tool. Also develop creative and innovative designs that achieve desired performance criteria within specified objectives and constraints, understand the need for lifelong learning and continuing professional education

VIII Semester
IIOT2451:Major Project/ Industrial Internship Evaluation

CO	Statement
1	Students will deliver oral presentation, with particular emphasis on the logical organization of relevant content and information, use of appropriate style, pacing and body language, proper handling of questions, and effective time management.(Presentation Skill)
2	Students will demonstrate knowledge of contemporary issues in their chosen field of research.
3	Students will demonstrate the competency to work in team.(Team Work)
4	Students will Critically analyze a selected topic to recognize, formulate and solve problem and apply problem solutions to achieve appropriate practical outcomes.(Literature survey and innovativeness)
5	Students will Competent in team for a project, by participating in competitions.

Dr.U.P.Waghe

Principal,YCCE
Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

18. Department of Artificial Intelligence & Data Science (AIDS)

Program outcomes (PO)

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 analyse complex Engineering problems reaching substantiate conclusions using first principle of mathematics, natural sciences and Engineering sciences.

3. **Design/development of solutions**: Design solution for complex Engineering problems and design system components or process 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 modelling 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 v 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 number 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 lifelong learning in the broadest context of technological change.

Course Outcomes

First Semester

AIDS2106/AIDS2107	Foundations of Data science/Lab
CO1	understand the techniques of data analysis and terminologies related to Big data
CO2	calculate measures of central tendency and dispersion
CO3	calculate and classify the probability of given event
CO4	use approximations techniques for given probability distributions
CO5	understand the use of data science techniques in various domains

AIDS2108 /AIDS2109	Computer Programming
CO1	understand the computer system, basics of writing the algorithm & designing of flowchart.
CO2	write straight line program by using basic„C" programming language constructs..
CO3	write programs using different loop control structures.
CO4	design & develop user defined functions, understand the concept of pointers & modular programming
CO5	understand and analyze different dimensional Arrays as a data structure & development of programs.
CO6	understand the basics of Strings, Structures, union and File handling in 'C' language.

Second Semester

AIDS2158 /AIDS2159	Data Structures
CO1	implement appropriate data structures for solving real life problems
CO2	demonstrate various operations on linked list, skip list based on the requirements of real-life problems.
CO3	implement various hashing techniques.
CO4	implement different types of trees and graph data structures and use them to solve problems dealing with non-linear data.

AIDS2155	Computer Organisation and Architecture
CO1	relate the function of the various units of computers that process data and store the information
CO2	write control signal for executing machine instructions for different processors.

CO3	design the organization of memory, memory hierarchy, other peripheral devices, and estimate the cost of computation
CO4	compare among different types of I/O operation

AIDS2156 /AIDS2157	Object oriented Programming
CO1	understand the concept of object-oriented programming and modeling
CO2	apply the knowledge of object-oriented programming to solve the given problem
CO3	analyze the problem to provide the object-oriented solution using advanced programming concepts
CO4	design the event-driven web-based solution for the problem

Third Semester

22ADS302	Statistics for Data Science (SDS)
CO1	Understand the various statistical techniques to interpret and analyze the data
CO2	Apply probability theory to solve the given problem
CO3	Perform sampling distribution to estimate the given data and predict the solution using regression
CO4	Analyze the data using hypothesis and other testing methods

AIDS2205/AIDS2206	Software Engineering (Th)/ Software Engineering (Lab)
CO1	Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project
CO2	Select appropriate testing strategy and apply testing principles for testing a given application
CO3	Apply basics of software configuration management, version control and change control in software development
CO4	Evaluate cost estimation, effort and severity of software risk for given application
CO5	Perform basic operations on Sub-version for software version control

AIDS2203/AIDS2204	Computer Networks/Computer Networks Lab
CO1	understand design issues of layers and network reference model
CO2	solve the given problems related to networking domain.
CO3	analyze different networking protocol at various layers
CO4	evaluate the performance of network using different tools

AIDS 2207	Operating Systems
CO1	describethe different services provided by Operating System at different level.
CO2	apply knowledge of different operating system algorithms to solve a given problem
CO3	analyze various approaches used to improve system performance
CO4	differentiatevarious disk scheduling algorithms based on their performances.

Fourth Sem

AIDS2252	Theoretical Foundation of Computer Science
CO1	Construct automata, regular expression for any pattern.
CO2	Construct context free grammar for various languages.
CO3	Construct push down automata and Turing Machine for a language.
CO4	Evaluate and justify whether a problem is decidable or not.

AIDS2257	Bayesian Data Analysis
CO1	Demonstrate the fundamental theories of Bayesian statistics
CO2	Construct a probability model for computing the posterior distribution
CO3	Examine the model using model checking techniques
CO4	Estimate the predictive model accuracy and expand in the direction of improvement

AIDS2253	Design and Analysis of Algorithm
CO1	Analyze different types of asymptotic notations and find the time complexity in terms of asymptotic notations
CO2	Solve recurrences using various techniques.
CO3	Implement and analyze different algorithms like divide and conquer strategy, greedy strategy, dynamic programming algorithms and backtracking strategy
CO4	Compare different types of complexity classes and categorize algorithms into specific complexity class

19.First year all Department

Program outcomes (PO)

13. **Engineering knowledge:** Apply the knowledge of mathematics, Science, Engineering fundamentals and an Engineering specialization to the solution of complex Engineering problems**.**

14. **Problem Analysis:** Identify, formulate, review research literature and analyse complex Engineering problems reaching substantiate conclusions using first principle of mathematics, natural sciences and Engineering sciences.

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

16. **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.

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

18. **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 v practice.

19. **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.

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

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

22. **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.

23. **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.

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

Course Name:

Course Name: Engineering Mathematics-I	Course Code: GE2101
CO-1	Apply the knowledge of differentiation to develop the Mathematical equations and compute geometrical measures
CO-2	Determine the expansion and derivatives of functions of Multiple variables and use it to find extreme values of functions.
CO-3	Evaluate the integrals of single, multiple variables and use it to measure the dimensions of various geometrical figures.
CO-4	Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single, multiple variables.

Course Name: (Course Code:)

Course Name: Engineering Mathematics-II	Course Code: GE2102
CO-1	Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems
CO-2	Analyse the functions of complex numbers and variables, prove Mathematical equations and evaluate the complex integrals
CO-3	Use Matrix method to solve linear equations, evaluate eigen values - eigen vectors and its applications.
CO-4	Measure the statistical parameters and derive the equations of best fit curves

Course Name: Communication Skills	Course Code: GE2107
CO-1	Explain the basics of communication process as well as identify the barriers in communication.
CO-2	Classify and describe the different Speech Sounds of English Language.
CO-3	Apply different strategies and techniques of presentations, interviews and group communication.
CO-4	Prepare and draft reports, memos and emails with appropriate content and context.

Course Name: Social Science	Course Code: GE2108
CO-1	Explain the basic concepts of Social Sciences.
CO-2	Describe the development of various Civilizations and their Culture.
CO-3	Analyze the Impact of Industrialization on society and discuss the Fundamental Concepts of Society.
CO-4	Explain Industrial Organization and Management.

Course Name: Engineering Physics (T/P)	Course Code: GE2105/ GE2106
CO-1	Examine the intensity variation of light due to interference, diffraction and its applications.
CO-2	Explain fundamentals of quantum mechanics and its application to problems dealing with quantum particle.
CO-3	Develop ability to classify and analyze the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands for device applications.
CO-4	Analyze the motion of charged particle in electric and magnetic fields and its applications to electron optic devices.
CO-5	Illustrate working principle of lasers, ultrasonic waves and its properties for useful applications in the field of industry.

Course Name: Engineering Chemistry	Course Code: GE2103/GE2104
CO-1	Assess qualitative and quantitative aspects of water as a conventional material for industrial and domestic applications.
CO-2	Apply the knowledge of basic electrochemistry to understand battery technology, corrosion process and preventive techniques.
CO-3	Know the basics and assess analytical aspects of industrial materials like fuels and lubricants for efficient utilization.
CO-4	Get introduced to the science and significance of cement and advanced engineering materials in technological applications
CO-5	Analyze and generate analytical and instrumental techniques

Course Name: Engineering Mechanics	Course Code: CV2101/CV2102
CO-1	Describe the fundamental concepts of statics and dynamics.
CO-2	Apply the basic concepts of applied mechanics for solution of problemson planar force system.
CO-3	Determine the properties of surface like centroid, moment of inertia, etc.for planar surfaces and mass moment of inertia for rigid body
CO-4	Analyze pin jointed truss frame structure and beam structure analyticallyand graphically.
CO-5	Evaluate the dynamic variables of kinetics of particles and simple lifting machine

Course Name: Basic Electronics	Course Code: EE2101
CO-1	Characterize Number systems, semiconductors, diodes, transistors and operational amplifiers.
CO-2	Design simple analog circuits
CO-3	Design simple combinational and sequential logic circuit.
CO-4	Identify functions of digital millimeter, Bridges and transducers in the measurement of physical variables

Course Name: Introduction to Computer Programming (T/P)	Course Code: IT2101/IT2102
CO-1	Know about computer system, basics of algorithm & flowchart, and demonstrate straight line program using basic „C‟ programming language constructs.
CO-2	Implement basic Linux commands and simple programs using different constructs in C.
CO-3	Design & Develop programs using different loop control structures, user defined functions, and Pointers.
CO-4	Analyze and apply concepts of different dimensional Arrays as a data structure & development of programs using the same.
CO-5	Design and develop programs using basics of Strings, Structures, union and Files in 'C' language.

Course Name:Electrical Engineering (T/P)	Course Code: EL2101/EL2102
CO-1	Reproduce fundamentals of dc circuits, single phase, and three phase ac circuits.
CO-2	Analyse dc circuits, single phase and three phase ac circuits for basic electrical quantities such as current, voltage, power etc.
CO-3	Explain construction, working, testing, and applications of various electrical machines.
CO-4	Analyse performance of various electrical machines.
CO-5	Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Course Name:Engineering Graphics	Course Code: ME2101/ME2102
CO-1	Transform orthographic projections into isometric projections and vice versa.
CO-2	Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects.
CO-3	Built the development of lateral surfaces of various solids and their cut section.
CO-4	Predict the intersections and intersections of various solid objects.
CO-5	Justify the use of software tools used for Two dimensional drawings.

Course Name:Workshop Practice	Course Code: ME2103
CO-1	Discuss about various manufacturing process like smithy, carpentry, assembling, welding etc and different machines.
CO-2	Operate the various hand tools used in the basic mechanical engineering workshop sections-smithy, carpentry, assembling, welding etc.
CO-3	Distinguish different measuring devices according to the work.
CO-4	Develop various shapes through different manufacturing methods

Dr.Manjusha Gandhi

Head, Department of Applied
Mathematics and Humanities
Yashwantrao Chavan College
of Engineering, Nagpur

SEAL

Dr.U.P.Waghe

Principal YCCE
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,

Declaration by the Head of the Institution

I hereby declare that the data, information and support documents attached herewith are genuine and correct to my knowledge.

Dr. U.P. Waghe
Principal

Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

2.6 Student Performance and Learning Outcomes

Contents

2.6.1 Programme Outcomes and Course Outcomes for all Programme offered by the institution are stated and displayed on the website and communicated to teachers and students:

2.6.2Attainment of Programme Outcomes and Course Outcomes as evaluated by the institution:

2.6.1 Programme Outcomes and Course Outcomes for all Programmes offered by the institution are stated and displayed on the website and communicated to teachers and students:

Yes, Programme Outcomes and Course Outcomes for all Programmes are displayed on institute website. Further following procedure is adopted for its dissemination among various stake holders.

The Programe outcomes (PO) and Course outcomes (CO) of Departments published as following

- Institute Website : www.ycce.edu

- Display on student Notice Board and Flex board

- Distributed to parents during parent teacher meeting (PTM).

- Distributed to alumni during Alumni Meet & Mentioned on Institute web page for Alumni

- Distributed to faculty and Experts of Board of studies

- Displayed at major locations in the Department.

Describe Course Outcomes (COs) for all courses and the mechanism of communication to teachers and students within a maximum of 200 words.

Mechanism of Communication:

Clear learning outcomes of the programs and courses are stated by the college. Following is the mechanisms which are followed by the institution to communicate the learning outcomes to the teachers and students. Hard Copy of syllabi and Learning Outcomes are available in the departments for ready reference to the teachers and students Learning Outcomes of the Programs and Courses are displayed on departmental notice board.

Soft Copy of Curriculum and Learning Outcomes of Programs and Courses are

Declaration by the Head of the Institution

I hereby declare that the data, information and support documents attached herewith are genuine and correct to my knowledge.

Dr. U.P. Waghe
Principal

Principal
Yeshwantrao Chavan
College of Engineering
Wanadongri Hingna Road,
NAGPUR-441110

SEAL
Y.C. COLLEGE OF ENGINEERING
AN AUTONOMOUS INSTITUTION
NAGPUR