2.6.1 PROGRAM OUTCOMES AND COURSE OUTCOMES FOR ALL PROGRAMES OFFERED BY THE INSTITUTION AND PO'S AND CO'S EVELUATED

In strict adherence to the principles of Outcome-Based Education (OBE), the department responsible for the respective program meticulously formulates the Program Outcomes (POs), Program Specific Outcomes (PSOs), and Course Outcomes (COs). This process involves extensive consultation with all faculty members and stakeholders to achieve a consensus. Once agreed upon, these outcomes are widely disseminated and communicated through various platforms, including:

- The institution's official website
- Curriculum and regulations books
- Classrooms where students are taught
- Departmental Notice Boards
- Laboratories
- Student Induction Programs, which provide an introduction to the program and its outcomes
- Meetings and interactions with potential employers to align the outcomes with industry requirements
- Parent meetings to inform them about the program's objectives and intended learning outcomes
- Faculty meetings to ensure all instructors are aligned with the desired outcomes
- Alumni meetings to seek their feedback and incorporate their insights into the outcomes
- Meetings with professional bodies to validate and enhance the relevance of the outcomes
- Library resources, which may contain information on the program outcomes.

By disseminating these outcomes through various channels, the institution ensures transparency and clarity regarding the expected learning outcomes and aligns its educational processes with the needs of stakeholders, including students, faculty, employers, and professional bodies.

When addressing students, the Heads of Departments (HODs) take the opportunity to raise awareness about Program Outcomes (POs), Program Specific Outcomes (PSOs), and Course Outcomes (COs). Additionally, faculty members, class teachers, mentors, and course coordinators play an essential role in informing and creating awareness among students, emphasizing the importance of achieving these outcomes.

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Program Specific Outcomes (PSOs) represent specific skill requirements and achievements expected of students at a micro level and upon completion of the program. Typically, program coordinators, in consultation with course coordinators, prepare two to four PSOs. These PSOs are then discussed with the Head of the Department and subject experts for approval, which is ultimately endorsed by the Principal.

Program Outcomes (POs) are comprehensive statements outlining the professional accomplishments that the program aims to instill in students by the time they complete their studies. POs encompass a wide range of interconnected knowledge, skills, and personal attributes that students are expected to acquire throughout their graduation journey.

Course Outcomes (COs) are direct statements that precisely describe the essential disciplinary knowledge and abilities students should possess upon completing a specific course. The depth of learning expected from students is also clearly outlined in the COs, which are effectively communicated to the students.
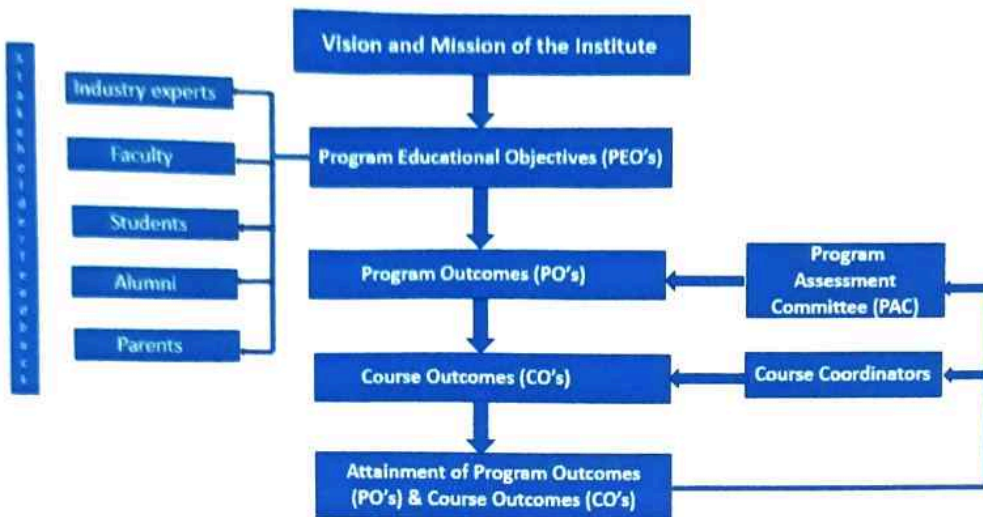
COs are developed during the Department advisory board meeting. A course committee is formed for each course, consisting of course handlers and a subject area expert. In this committee, course outcomes and their alignment with program outcomes and program-specific outcomes are extensively discussed and derived. Although the COs are initially provided by JNTUA along with the syllabus, the course committee members may modify or refine them as necessary.

Through this meticulous process of defining and aligning POs, PSOs, and COs, the institution ensures clarity in the expected learning outcomes and sets the groundwork for the students' academic and professional development.

Course Outcomes (COs) are communicated to the students right from the beginning, during the introductory class. The COs, along with the lesson plan, are printed and distributed to the students during the first class. Throughout the course discussions, special emphasis is given to the course outcomes. At the beginning of each unit and upon its completion, the course outcomes are thoroughly reviewed and assessed.

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Vision and Mission of the Institute

Stakeholder's feedback
- Industry experts
- Faculty
- Students
- Alumni
- Parents

Program Educational Objectives (PEO's)

Program Outcomes (PO's) ← Program Assessment Committee (PAC)

Course Outcomes (CO's) ← Course Coordinators

Attainment of Program Outcomes (PO's) & Course Outcomes (CO's)

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DEPARTMENT OF CIVIL ENGINEERING

Vision:

To empower graduates to excel as competent professionals in the field of Design and Development, focusing on safe, healthy, sustainable, and eco-friendly infrastructure for the holistic development of society.

Mission:

Our mission is to provide quality education through interdisciplinary research and innovative practices, with the aim of contributing to the betterment of human society through effective teaching and learning methodologies. We strive to develop creative solutions to a wide range of challenges in Civil Engineering by adopting modern tools and techniques.

Programme Educational Objectives (PEOs):

The B. Tech (CIVIL) programme aims to achieve the following Programme Educational Objectives:

PEO1: Professional Competence: Graduates will demonstrate professional competence in their chosen careers by effectively utilizing appropriate techniques and modern engineering tools in the successful execution of projects.

PEO2: Problem Solving: Graduates will apply mathematical, scientific, and engineering principles to effectively solve complex problems in Civil Engineering, engaging in lifelong learning to keep abreast of advancements in the field.

PEO3: Multidisciplinary Collaboration: Graduates will actively participate in multidisciplinary projects, assuming professional and ethical responsibilities while working collaboratively with diverse teams.

Programme Outcomes (POs):

PO1: Engineering Knowledge: Apply mathematical, scientific, and engineering fundamentals, along with specialized engineering knowledge, to address intricate engineering problems.

PO2: Problem Analysis: Identify, formulate, and analyze complex engineering problems by conducting research, consulting relevant literature, and applying fundamental principles from mathematics, natural sciences, and engineering.

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PO3: Design/Development of Solutions: Design solutions and system components or processes that meet specific requirements, taking into consideration public health and safety, as well as cultural, societal, and environmental factors.

PO4: Conduct Investigation of Complex Problems: Utilize research-based knowledge and research methodologies, including experimental design, data analysis, interpretation, and synthesis, to draw valid conclusions.

PO5: Modern Tool Usage: Employ appropriate techniques, resources, and modern engineering and IT tools, including predictive modeling, to effectively engage in complex engineering activities while being aware of the limitations associated with these tools.

PO6: Engineer and Society: Utilize contextual knowledge and reasoning to evaluate societal, health, safety, legal, and cultural aspects, recognizing the associated responsibilities pertinent to professional engineering practice.

PO7: Environment and Sustainability: Comprehend the impact of professional engineering solutions within societal and environmental contexts, while demonstrating knowledge of and advocating for sustainable development.

PO8: Ethics: Apply ethical principles, adhering to professional ethics, responsibilities, and norms inherent in engineering practice.

PO9: Individual and Teamwork: Function proficiently both as an individual and as a member or leader in diverse teams and multidisciplinary settings.

PO10: Communication: Effectively communicate complex engineering concepts within the engineering community and to a broader audience, including the ability to comprehend and compose comprehensive reports and design documentation, deliver impactful presentations, and provide and receive clear instructions.

PO11: Project Management and Finance: Display a comprehensive understanding of engineering and management principles, effectively applying them to personal work and team roles, while managing projects and operating in multidisciplinary environments.

PO12: Lifelong Learning: Acknowledge the necessity for continuous and self-directed learning in response to the ever-evolving technological landscape, equipped with the readiness and capability to engage in independent and lifelong learning across diverse domains.

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Programme Specific Outcomes (PSOs):

Engineering graduates will have the ability to:

PSO1: Project Planning and Execution: Plan, analyze, design, and execute cost-effective projects related to Civil Engineering structures, while emphasizing the conservation and protection of natural resources for sustainable growth.

PSO2: Diverse Career Paths: Pursue employment opportunities, establish new start-ups, engage in entrepreneurship, contribute to research and development, and become chartered Engineering professionals, all with a strong commitment to serving society with honesty and integrity.

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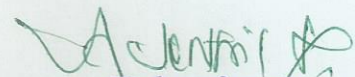Affiliated by JNTUA & Approved by All India Council for Technical Education (AICTE), www.sseptp.org

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Vision:

To establish ourselves as a frontrunner in delivering exceptional education and training in the realm of Electrical and Electronics Engineering, equipping aspiring graduates with the competence to excel in their professional endeavors.

Mission:

To empower graduates with the essential knowledge and skills required for successful employment and continuous growth in the dynamic field of Electrical and Electronics Engineering. We actively engage in applied research, exploring emerging technologies, and offer professional services to contribute to the advancement of the industry.

The Program Educational Objectives (PEOs) of the B. Tech (EEE) program are as follows:

PEO1: Graduates demonstrate professional competence by applying principles from mathematics, science, and engineering to solve complex problems in the field of Electrical and Electronics Engineering and its related disciplines.

PEO2: Graduates maintain relevance in their chosen profession through lifelong learning and exhibit a strong sense of social and ethical responsibility.

PEO3: Graduates exhibit both independent and collaborative abilities by effectively participating in project execution as individuals or as members of a team.

Program Outcomes (POs):

PO1: Engineering Knowledge: Apply mathematical, scientific, and engineering fundamentals, along with specialized engineering knowledge, to address intricate engineering problems.

PO2: Problem Analysis: Identify, formulate, and analyze complex engineering problems by conducting research, consulting relevant literature, and applying fundamental principles from mathematics, natural sciences, and engineering.

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PO3: Design/Development of Solutions: Design solutions and system components or processes that meet specific requirements, taking into consideration public health and safety, as well as cultural, societal, and environmental factors.

PO4: Conduct Investigation of Complex Problems: Utilize research-based knowledge and research methodologies, including experimental design, data analysis, interpretation, and synthesis, to draw valid conclusions.

PO5: Modern Tool Usage: Employ appropriate techniques, resources, and modern engineering and IT tools, including predictive modeling, to effectively engage in complex engineering activities while being aware of the limitations associated with these tools.

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PO12: Lifelong Learning: Acknowledge the necessity for continuous and self-directed learning in response to the ever-evolving technological landscape, equipped with the readiness and capability to engage in independent and lifelong learning across diverse domains.

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Programme Specific Outcomes (PSOs):

Engineering graduates will have the ability to:

PSO1: Employ modern tools and techniques to model and analyze electrical systems, while incorporating safety standards and continuous improvement methodologies.

PSO2: Conceptualize, design, and develop intelligent systems within the field of Electrical and Electronics Engineering, incorporating innovative approaches and advancements.

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DEPARTMENT OF MECHANICAL ENGINEERING

Vision:

To establish ourselves as a leading institution that equips engineers, researchers, entrepreneurs, and managers in the field of Mechanical Engineering with the skills necessary to thrive on a global scale.

Mission:

Our mission is to provide high-quality education through experiential learning, utilizing ICT tools and engaging in socially relevant projects. We aim to involve both faculty and students in fundamental, heavy engineering, and applied research focused on addressing energy, environmental, and safety concerns. Furthermore, we strive to nurture and prepare our students to excel as successful entrepreneurs and managers.

Programme Educational Objectives (PEOs):

The B. Tech (MECH) programme aims to achieve the following Program Educational Objectives:

PEO1: Graduates will demonstrate adaptability to emerging technological challenges while possessing core competence in the field of mechanical engineering.

PEO2: Graduates will effectively apply their technical knowledge and skills to secure suitable positions within various technological organizations, as well as to succeed as entrepreneurs.

PEO3: Graduates will pursue advanced studies in key areas of mechanical engineering, enabling them to conduct scientific and industrial research ethically to meet the current demands of their respective sectors.

Programme Outcomes (POs):

PO1: Engineering Knowledge: Apply mathematical, scientific, and engineering fundamentals, along with specialized engineering knowledge, to address intricate engineering problems.

PO2: Problem Analysis: Identify, formulate, and analyze complex engineering problems by conducting research, consulting relevant literature, and applying fundamental principles from mathematics, natural sciences, and engineering.

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PO3: Design/Development of Solutions: Design solutions and system components or processes that meet specific requirements, taking into consideration public health and safety, as well as cultural, societal, and environmental factors.

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domains.

Programme Specific Outcomes (PSOs):

Engineering graduates will have the ability to:

PSO1: Employ modern tools and technologies for the design, analysis, and manufacturing of mechanical components and systems.

PSO2: Effectively address and solve complex, multidisciplinary problems encountered in manufacturing and related industries.

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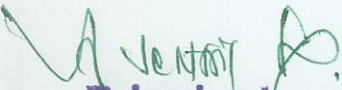## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision:

To establish ourselves as a renowned institution in the field of Electronics and Communication Engineering, recognized for our excellence in education and research.

Mission:

Our mission is to nurture and develop professionals and technology leaders who uphold the highest standards of professional ethics within the domains of Electronics and Communication Engineering. We strive to address societal needs while pushing the boundaries of disciplinary and multidisciplinary research, fostering universal moral values.

Programme Educational Objectives (PEOs):

The B. Tech (ECE) programme aims to achieve the following Programme Educational Objectives:

PEO1: Career Growth: Graduates will experience successful technical or professional career growth as they embark on their professional journey.

PEO2: Knowledge and Skills: Graduates will possess the ability to apply scientific, mathematical, and engineering fundamentals to provide innovative solutions to complex problems in Electronics and Communication Engineering and related fields.
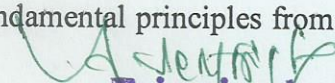
PEO3: Ethics and Lifelong Learning: Graduates will demonstrate a strong commitment to professional and ethical conduct, while actively engaging in continuous lifelong learning to stay abreast of evolving technologies and advancements.

Programme Outcomes (POs):

PO1: Engineering Knowledge: Apply mathematical, scientific, and engineering fundamentals, along with specialized engineering knowledge, to address intricate engineering problems.

PO2: Problem Analysis: Identify, formulate, and analyze complex engineering problems by conducting research, consulting relevant literature, and applying fundamental principles from mathematics, natural sciences, and engineering.

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PO3: Design/Development of Solutions: Design solutions and system components or processes that meet specific requirements, taking into consideration public health and safety, as well as cultural, societal, and environmental factors.

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Programme Specific Outcomes (PSOs):

Engineering graduates will have the ability to:

PSO1: Solutions for Complex Problems: Employ engineering knowledge in the fields of Signal/Image processing and Communication to effectively solve intricate engineering problems.

PSO2: Development of Products: Design system components and develop innovative products that cater to the specific requirements of the industry and society within the realm of Electronics and Communication Engineering.

PSO3: Interpersonal Skills: Cultivate essential interpersonal skills and a positive attitude necessary for ethical leadership and teamwork, including effective listening and communication, proficient presentation abilities, team building skills, and assertiveness.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision:

To cultivate competent software professionals, academicians, and researchers through the provision of quality education.

Mission:

Our mission is to nurture skilled software developers, system designers, and network programmers. We strive to remain updated with the latest advancements and technological transformations in the field of computer science and engineering, leveraging them for the betterment of society.

Programme Educational Objectives (PEOs):

The B. Tech (CSE) programme aims to achieve the following Programme Educational Objectives:

PEO1: Effective Solutions for Industries: Graduates will apply the principles of basic science and engineering fundamentals to provide effective solutions for the software and hardware industries.

PEO2: Professional Competence and Lifelong Learning: Graduates will attain professional competence and achieve success in their careers through continuous lifelong learning.

PEO3: Project Handling and Social Responsibility: Graduates will contribute both individually and as part of a team in managing projects, while demonstrating social responsibility and upholding professional ethics.
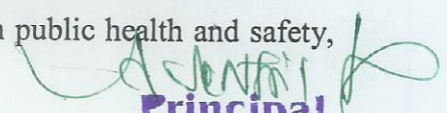
Programme Outcomes (POs):

PO1: Engineering Knowledge: Apply mathematical, scientific, and engineering fundamentals, along with specialized engineering knowledge, to address intricate engineering problems.

PO2: Problem Analysis: Identify, formulate, and analyze complex engineering problems by conducting research, consulting relevant literature, and applying fundamental principles from mathematics, natural sciences, and engineering.

PO3: Design/Development of Solutions: Design solutions and system components or processes that meet specific requirements, taking into consideration public health and safety, as well as cultural, societal, and environmental factors.

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PO4: Conduct Investigation of Complex Problems: Utilize research-based knowledge and research methodologies, including experimental design, data analysis, interpretation, and synthesis, to draw valid conclusions.

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Programme Specific Outcomes (PSOs):

Engineering graduates will have the ability to:

PSO1: Software Project Management: Apply standard software engineering practices and strategies, utilizing open-source programming environments, to effectively develop software projects and deliver high-quality products for successful business outcomes.

PSO2: Data Analytics: Analyze and interpret data using advanced data analytics models, enabling informed decision-making for complex problems and facilitating interdisciplinary research.

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COURSES OUTCOMES

R15 Regulations

Department of Civil Engineering

Subject Name: 15A01501 Design and Drawing of RCC Structures

Course outcome:

After completing the course, the student

• Will be able to understand the basic concepts of reinforced concrete analysis and design.
• Will be able to understand the behavior and various modes of failure of reinforced concrete members.
• Will be able to analyze and design various reinforced concrete members such as beams, columns, footings and slabs

Subject Name: 15A01502 Estimation, Costing and Valuation

Course outcome:

On completion of the course, the students will be able to:

• apply different types of estimates for different building elements
• carry out analysis of rates and bill preparation different building elements
• understand the concepts of specification writing
• carry out valuation of assets

Subject Name: 15A01503 Geotechnical Engineering – I

Course outcome:

On completion of the course, the students will be able to:

• carry out soil classification
• solve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram
• estimate the stresses under any system of foundation loads solve practical problems related to consolidation settlement and time rate of settlement

Subject Name: 15A01504 Engineering Geology

Course outcome:

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• The students will have the knowledge of principles of engineering geology.
• The students will have the knowledge of properties of various rocks and minerals
• The students will be able to judge the suitability of sites for various civil engineering structures.
• The students will exhibit the ability to use the knowledge of geological strata in the analysis and design the civil engineering structures.
• The students will have the knowledge for deciding the suitability of water and soil conservation projects.

Subject Name: 15A01505 Structural Analysis – II

Course outcome:

On completion of the course, the students will be able to:

• Apply the methods of indeterminate truss analysis
• Analyse the behaviour of arches through different methods of analysis
• Use various classical methods for analysis of indeterminate structures
• Determine the effect of support settlements for indeterminate structures
• Able to analyze the beam and frames for vertical and horizontal loads and draw SFD and BMD.
• Able to calculate forces in members of truss due to load by stiffness method.

Subject Name: 15A01508 Engineering Geology Laboratory

Course outcome:

• Study of physical properties and identification of minerals referred under theory.
• Megascopic description and identification of rocks referred under theory.
• Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
• Simple Structural Geology problems.

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Subject Name: 15A01509 Geotechnical Engineering Laboratory

Course outcome:

- To obtain the properties of soils by conducting experiments, it is necessary for students to understand the behavior of soil under various loads and conditions.

Subject Name: 15A01601 Concrete Technology

Course outcome:

After completing the course, the student will be able to do the following:

- The students will be able to check and recommend different constituent of concrete.
- The students will be able to test strength and quality of plastic and set concrete.
- The students will have understanding of application admixture and its effect on properties of concrete.
- The students will be able to design mix of concrete according to availability of ingredients and design needs.
- The students will be able to test various strengths of concrete by destructive and non-destructive testing methods.

Subject Name: 15A01602 Design and Drawing of Steel Structures

Course outcome:

On completion of course, the student will be in a position -

- Apply the IS code of practice for the design of steel structural elements
- Design compression and tension members using simple and built-up sections
- Students will be able to explain the behaviour and modes of failure of tension members and different connections.
- Students will be able to analyze and design tension members, bolted connections, welded connections, compression members and beams.
- Design welded connections for both axial and eccentric forces

Subject Name: 15A01603 Geotechnical Engineering – II

Course outcome:

On successful completion of the course, the students will have the:

- Ability to apply the principle of shear strength and settlement analysis for foundation system.

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• Check the measurement of non electrical quantities by suitable transducers.
• Explore different types of measuring instruments in real type applications.

Subject – Electrical Measurements lab 15A02507(R15)

• Recognise the functions various types of electrical measuring instruments.
• Understand the concept of calibration of single phase Energy meter using Phantom loading method.
• Apply standard procedures for measurement of resistance, inductance and capacitance.
• Analyze the calibration of various electrical measuring and recording instruments.
• Checking various methods for power measurements in Ac circuit and examine the calibration of meters.
• Generate reactive power measurements in 3-phase circuit using single wattmeter.

Subject – Power system and simulation lab 15A02710(R15)

• Remember the concept of Y bus and Z bus formation, writing programming in MATLAB software.
• Understand the concepts load flow studies, writing programming in MATLAB software.
• Apply the concept of economic load dispatch for develop a program in MATLAB software.
• Analyze the load flow analysis using different algorithms.
• Evaluate the fault analysis by conducting experiment on a LG and LL faults.
• Create the simulink model for single area load frequency problem..

15A02703 R15 UTILISATION OF ELECTRICAL ENERGY

Define economic aspects of illumination & traction concepts
Utilise lawss of illumination for various lighting scheems
Make all calculations associated with eletric traction
Analyze the performance of heating & welding methods
Check the mechanism of train movements & evaluate the parameters of the system

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- Analyze the errors for current transformer, potential transformer, PMMC and electromagnetic relays.
- 5Checking the resistance in kelwins double bridge and wheat stone bridge methods.

Subject – Power system operation and control 15A02702 (R15)

- Remember the various constraints in Thermal and Hydro power stations for solving the optimum load scheduling.
- Understand the concept of economic load dispatch.
- Apply the load to power system to find out the change in frequency.
- Distinguish single area and two area load frequency control.
- Checking the problems in economic load dispatch and load frequency control.
- Generate the mathematical models of the mechanical and electrical components in the power generation for deriving the transfer function of the power system.

Subject – Electrical Distribution system 15A02701 (R15)

- Remembers the principles of substation maintenance.
- Understand the implementation of SCADA for distribution automation.
- Implement the capacitors in distribution system for developing power factor improvement.
- Analyze the voltage drop calculation in given distribution network.
- Checking the locations for optimum allocation of substations.
- Create the Bus bar arrangement in substations.

Subject – Instrumentation 15A02801 (R15)

- Recall the calibration methods for measuring instruments to find out different types of errors.
- Summarize the data transmission and modulation techniques in order to reduce distortions while signal transmission.
- Apply transducers for changing strength of signal in various applications.
- Differentiate different types of digital meters for signal analysis while data transmission.

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Generate solutions for complex engineering probles like in construction field & traction in railways

15A02805 R15 ENERGY RESOURSES AND TECHNOLOGY

Learn about different sources of energy & their principles

Explain how a power plants will operate and maintain

Apply concepts of energy sources & produce quality of energy

Analyse the best energy storage methods

Analyse the economic impact of various energy resources & technologies

Plan for innovative energy production & economic schemes in real time applications within various sectyion & utilisations

POWER ELECTRONICS 15A02503

Students able to understand the operation and characteristics of different types of power swithcing devices

students able to differentiate different types of thyristor rectifiers in power conversion applications

students able to implement DC-DC converters to step up/step down the DC Voltage in Power transmission and distribution

students able to check the working and operation of various voltage source inverters in DC-AC power conversion

students able to generate voltages at different frequencies by using power conversion devices

students able to explore and recall different types of power conversion devices in real time applications

ELECTRICAL MACHINES-III 15A02504   R-15

Summarise the construction and working of different types of synchronous generators

Students able to evaluate the regulation of synchronous generators by various regulation methods

Students able to implement the parallel connection of synchronous generators in power transmission and distribution to achieve load sharing

Differentiate the construction, working and starting methods of synchronous motors compared to Induction motors

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studenta able to recognise the different types odf single phase motors in domestic applications
Exploring different types of AC Motors in real time applications

POWER SEMICONDUCTOR DRIVES 15A02601   R-15

Differentiate electrical drive based system on their applications
Summarise the speed control of different types of motors with the help of choppers
Students able to evaluate choppers in different quardent operations in order to improve performance of motors
critiquing the control of induction motors by using various techniques/methodsto achieve speed control of induction motor
students able to implement various speed control techniques for control of synchronous motors
students able to explore and recall different types of power semiconductor devices in real time applications

POWER ELECTRONICS AND SIMULATION LABORATORY 15A02607 R-15

Students able to recognise different types of power conversion devices in order to operate different loads
students able to differentiate different types of thyristor rectifiers for different modes of operation
Apply commutaion methods in SCR's in order to turn off SCR's
Generate a method for illumination control using TRIAC
Critiquing different types of inverters and converters for operating different loads
Explore different types of power converters in real time applications

ELECTRICAL MACHINES-II LABORATORY   15A02506   R-15

Students able to recall working and characterstics of different types of AC Machines
students able to differentiate different types of AC Motors and transformers for differnt load conditions
Generate Special connection in transformers for converting voltages from 3 phase to 2phase conversion
Implement various tests in transformers and motors to increase performance of machines
Critiquing different types of regulation methods in order to test theperformance of alternators
Explore different types of AC MAchines in Real time applications

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• Ability to design shallow and deep foundations
• Ability to analyze and design earth retaining structures.
• Estimate bearing capacity using IS code methods

Subject Name: 15A01604 Transportation Engineering - I

Course outcome:

On completion of the course, the students will be able to:

• Carry out surveys involved in planning and highway alignment
• Design cross section elements, sight distance, horizontal and vertical alignment
• Implement traffic studies, traffic regulations and control, and intersection design
• Determine the characteristics of pavement materials
• Design flexible and rigid pavements as per IRC

Subject Name: 15A01605 Water Resources Engineering – I

Course outcome:

On completion of the course, the students will be able:

• To understand the basic types of irrigation, irrigation standards and crop water assessment
• To study the different aspects of design of hydraulic structures
• To understand various hydraulic structures such as diversion head works and cross regulators, canal falls and structures involved in cross drainage works

Subject Name: 15A01609 Concrete Technology Laboratory

Course outcome:

• To understand the functional role of ingredients of concrete and apply this knowledge to mix design philosophy
• To develop fundamental knowledge in the fresh and hardened properties of concrete
• To inculcate the testing methodology to evaluate the properties of concrete during fresh and hardened stage
• To impart the knowledge on the behavior of concrete with response to stresses developed

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Subject Name: 15A01610 Transportation Engineering Laboratory

Course outcome:

• To understand the road aggregate tests such as crushing, impact, specific gravity, water absorption and etc.
• To study the bituminous material test like penetration, ductility, softening point, flash and fire point tests
• To understand the traffic Volume Studies at Mid-block and Data Analysis

Subject Name: 15A52602 Advanced English Language Communication Skills (AELCS) Laboratory (Audit Course)

Course outcome:

• To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
• Further, they would be required to communicate their ideas relevantly and coherently in writing.
• To prepare all the students for their placements.

Subject Name: 15A01701 Finite Element Methods

Course outcome:

On completion of the course, the students will be able to:

• Demonstrate the differential equilibrium equations and their relationship
• Apply numerical methods to FEM
• Demonstrate the displacement models and load vectors
• Compute the stiffness matrix for isoperimetric elements
• Analyze plane stress and plane strain problems

Subject Name: 15A01702 Transportation Engineering - II

Course outcome:

On completion of this course, the student will be able to Understand the components of Permanent way and their functions

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- Able to understand the geometric design elements of Railway Track and their design methods

- Understand the aircraft characteristics and their influence on various design elements

- Acquire the knowledge of types of Docks, Ports and Harbours

Subject Name: 15A01703 Environmental Engineering

Course outcome:

On completion of the course, the students will be able to:

• Identify the source of water and water demand
• Apply the water treatment concept and methods
• Apply water distribution processes and operation and maintenance of water supply
• Prepare basic process designs of water and wastewater treatment plants collect, reduce, analyze, and evaluate basic water quality data
• Determine the sewage characteristics and design various sewage treatment plants
• Carry out municipal water and wastewater treatment system design and operation
• Apply environmental treatment technologies and design processes

Subject Name: 15A01704 Water Resources Engineering – II

Course outcome:

On completion of the course, the students will be able to:

• Design various canal systems
• Design head and cross regulator structures
• Identify various types of reservoir and their design aspects
• By the Establishes the understanding of cross drainage works and its design Design different types of dams

Subject Name: 15A01707 Air Pollution and Quality Control

Course outcome:

Students will be able to

• Describe the main chemical components and reactions in the atmosphere and examine the factors responsible for perturbing these
• Implement the methods for monitoring and modeling spatial and temporal patterns of pollution

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- Assess the environmental impacts of atmospheric pollution.

Subject Name: 15A01710 Rehabilitation and Retrofitting of Structures

Course outcome:

After the completion of the course, the student will be able to

- Assess the strength and materials deficiency in concrete structures
- Suggest methods and techniques used in repairing / strengthening existing concrete structures
- Apply Non Destructive Testing techniques to field problems
- Apply cost effective retrofitting strategies for repairs in buildings

Subject Name: 15A01711 CAD Laboratory

Course outcome:

- To understand the 2-D Frame Analysis and Design & Steel Tabular Truss Analysis and Design
- To study the 3-D Frame Analysis and Design & Retaining Wall Analysis and Design
- To understand the simple tower Analysis and Design

Subject Name: 15A01712 Environmental Engineering Laboratory

Course outcome:

At the end of the course, the student will be able to:

- Understand about quality of water and purification process
- Select appropriate technique for treatment of waste water.
- Assess the impact of air pollution
- Understand consequences of solid waste and its management.
- Design domestic plumbing systems.

Subject Name: 15A01801 Urban Transportation Planning

Course outcome:

On completion of this course the student will be able to

Understand the concept of Travel Demand and the factors affecting it

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- Understand the different stages of Urban Transportation Planning and the mathematical models associated with each stage

- Assess the economic impact of new Transportation plans

Subject Name: 15A01804 Environmental Impact Assessment and Management

Course outcome:

On completion of this course the student will be able to

- Perform a critical quality review of an EIA and EIS;

- Structure the EIA working process considering the need for interdisciplinary;

- Perform the screening and scoping of an EIA, based on existing requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA;

- Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process;

- Interpretate an EIA, present its conclusions and translate its conclusions into actions.

Department of Electrical & Electronics Engineering
R-15MICROPROCESSORS & MICROCONTROLLERS COURSE OUTCOMES:

- Understand the concepts o of microprocessors , intel x86 series processors and MSP430 microcontroller.

- Evaluate the architecture, pin diagram, memory organisation of 8086 microprocessor.

- Apply the concepts to design a program on MSP430.

- Analyze the various real time clocks , timers, PWM controllers.

- To implement MSP430 , for interfacing embedded Wi-Fi using CC3100

- Develop the simple assembly language programs for 8086 microprocessor.

R-15MICROPROCESSORS & MICROCONTROLLERS LAB COURSE OUTCOMES:

- Understand the fundamentals of assembly level programming of microprocessors.

- Evaluate sand execution of different programs for 8086 in assembly level language using MASM assembler.

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- Apply the knowledge to execute of different programs using MSP430 microcontroller kit.
- Analyze the interrupt programming examples through GPIOs
- To develop low power modes and energy trace ++
- To implement some specific real time applications.

R-15 ELECTRICAL POWER TRANSMISSION SYSTEMS COURSE OUTCOMES:

- Understand the concept of transmission line parameters
- Apply the knowledge to model a given transmission line
- Analyze the phenomenon of corona and effect of sag in power transmission lines.
- Evaluate the open circuited and short circuited line problems, cable related problems.
- Create the construction, types and grading of under ground cables.
- To get complete idea on insulators.

R-15 NEURAL NETWORK AND FUZZY LOGIC COURSE OUTCOMES:

- Understanding the principles of neural networks and fuzzy logic fundamentals.
- Applying the knowledge of AI technique in engineering applications.
- Differentiate between artificial neural network and biological neural network.
- Evaluate the characteristics of ANN's learning strategies, learning rules and basics of fuzzy logics, fuzzy sets.
- Produce ANN approach in various electrical engineering problems.
- Able to apply the conceptual things to the real world electrical and electronics problems and applications.

R-15 FLEXIBLE AC TRANSMISSION SYSTEMS COURSE OUTCOMES:

- Understand the operating principles of various FACTS devices.
- Implementing the different types of FACTS controllers and their role in improving power system performance.
- Extend the knowledge of active and reactive power and voltage control with FACTS devices.
- Analyse role of SVC&STATCOM in improving the power system dynamics

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- Evaluate the performance and applications of VSI & CSI

- Design simple FACTS controllers and converters for better transmission of electric power.

R-15 POWER SYSTEM ARCHITECTURE COURSE OUTCOMES:

- Understand the concepts and design of renewable and non renewable sources and power generating systems.

- Apply the knowledge on transmission line parameters for different types of lines and also for symmetrical and assymetrical single and three phase lines.

- Differentiate between the transmission line parameters and A,B,C,D constants for transmission lines.

- Compare under ground and distribution systems.

- Design the schemes to improve the generation and capability of transmission lines to meet day to day power requirements.

- Learn substation and types of substations.

Subject - Power system Analysis 15A02603 (R15)

- Explains the concept of per unit values, Y bus and Z bus formation.

- Understand the concepts load flow studies, symmentrical and unsymmetrical fault calculations.

- Apply the concept of algorithms for the given power system network

- Analyze the behavior of the power system under faulted condition.

- Evaluate the different algorithms for finding load flow solutions.

- Generating the elementary concepts of steady state, dynamic and transient stability.

Subject – Electrical Measurements 15A02501 (R15)

- Develop the knowledge of theoretical and mathematical principles of electrical measuring instruments.

- Examine the functions of various types of electrical measuring instruments.

- Apply standard procedure for the measurement of resistance, inductance and capacitance.

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POWER ELECTRONICS 15A02503

Students able to understand the operation and characterstics of different types of power swithcing devices
students able to differentiate different types of thyristor rectifiers in power conversion applications
students able to implement DC-DC converters to step up/step down the DC Voltage in Power transmission and distribution
students able to check the working and operation of various voltage source inverters in DC-AC power conversion
students able to generate voltages at different frequencies by using power conversion devices
students able to explore and recall different types of power conversion devices in real time applications

ELECTRICAL MACHINES-III 15A02504   R-15

Summarise the construction and working of different types of synchronous generators
Students able to evaluate the regulation of synchronous generators by various regulation methods
Students able to implement the parallel connection of synchronous generators in power transmission and distribution to achieve load sharing
Differentiate the construction, working and starting methods of synchronous motors compared to Induction motors
studenta able to recognise the different types odf single phase motors in domestic applications
Exploring different types of AC Motors in real time applications

POWER SEMICONDUCTOR DRIVES 15A02601   R-15

Differentiate electrical drive based system on their applications
Summarise the speed control of different types of motors with the help of choppers
Students able to evaluate choppers in different quardent operations in order to improve performance of motors
critiquing the control of induction motors by using various techniques/methodsto achieve speed control of induction motor
students able to implement various speed control techniques for control of synchronous motors
students able to explore and recall different types of power semiconductor devices in real time applications

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POWER ELECTRONICS AND SIMULATION LABORATORY 15A02607 R-15

Students able to recognise different types of power conversion devices in order to operate different loads
students able to differentiate different types of thyristor rectifiers for different modes of operation
Apply commutaion methods in SCR's in order to turn off SCR's
Generate a method for illumination control using TRIAC
Critiquing different types of inverters and converters for operating different loads
Explore different types of power converters in real time applications

ELECTRICAL MACHINES-II LABORATORY   15A02506   R-15

Students able to recall working and characterstics of different types of AC Machines
students able to differentiate different types of AC Motors and transformers for differnt load conditions
Generate Special connection in transformers for converting voltages from 3 phase to 2phase conversion
Implement various tests in transformers and motors to increase performance of machines
Critiquing different types of regulation methods in order to test theperformance of alternators
Explore different types of AC Machines in Real time applications

Department of Mechanical Engineering
Fluid Mechanics and Hydraulic Machines

- Expected Course Outcomes: The students will be able to
- Possess a sound knowledge of fundamental properties of fluids and fluid continuum and types of fluid flow.
- Compute and solve problems on hydrostatics, including practical applications
- Apply principles of mathematics to represent kinematic concepts related to fluid flow
- Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications.
- Compute the discharge through pipes can critically analyze the performance of pumps and turbines

Thermal Engineering – II

- Expected Course Outcomes: The students will be able to
- Demonstrate the principles of thermal engineering in power producing fields.
- Differentiate among different internal combustion engine designs
- Recognize and understand reasons for differences among operating characteristics

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of different engine types and designs.

- Analyze engineering systems needed to set-up and run engines in controlled laboratory environments. 5. Compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations.

Dynamics of Machinery

- Expected Course Outcomes: Student will be able to
- Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.
- Compute frictional losses, torque transmission of mechanical systems.
- Analyze dynamic force analysis of slider crank mechanism and design of flywheel.

Machine Tools

- Expected Course Outcomes: Students will be able to:
- Demonstrate the theory of metal cutting related to lathe, milling machines, drilling machine, grinding machines etc.
- Select cutting tool materials metal cutting and tool geometries for different metal cutting operations.
- Select appropriate machining processes for different processes. Understand machine tool structures and machining economics.

Design of Machine Members – I

Expected Course Outcomes: The students will be able to

- Analyze the stress and strain on mechanical components
- Understand, identify and quantify the failure modes for various mechanical parts.
- Demonstrate knowledge on basic machine elements used in machine design;
- Design machine elements to withstand the loads and deformations for a given application, while considering specifications.
- Approach a design problem successfully, taking decisions when there is not a unique answer.
- Demonstrate analytical skill in the process of designing a component.

Fluid Mechanics and Hydraulic Machines Laboratory

- Expected Course Outcomes: The students will be able to
- Utilize the knowledge in the design of water supply pipe networks and measure the rate of flow in pipes and channels.
- Get confidence in the hydraulic design of turbines and should be able to identify suitable pumps and turbines for different working conditions.

Machine Tools Laboratory
Operations Research

Expected Course Outcomes: The students will be able to

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• Apply Operations Research techniques in the planning.
• Use Operations Research techniques in the scheduling.
• Use the various techniques of Operations Research in solving problems.
• Importance of Operations Research in solving dynamic programming problems.
• Apply Operations Research in the manufacturing and business applications

Design of Machine Members – II

Heat Transfer

• Expected Course Outcomes: After learning the course the students should be able to:
• Understand basic concept of heat transfer
• Able to do the analytical solving in the process of heat transfer (conduction, convection and radiation) 3. Design various types of basic heat exchanger.
• Apply scientific and engineering principles to analyze and design aspects of engineering systems that relate to conduction, convection and radiation heat transfer.

Finite Element Method

• Expected Course Outcomes: Student will be able to
• Apply and understand the basic concepts of Finite element analysis procedure.
• Apply the knowledge of mathematics and engineering in solving the problems related to structural and heat transfer.
• Use the commercial FEA packages like ANSYS and modern CAD/CAE tools for solving real life structural problems.

Metal forming Process

At the end of this course students will be able to …
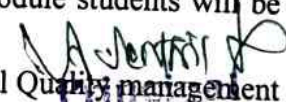
• Determine major process/processes of manufacturing used for given application.
• Explain when and why metal forming is chosen compared to other compatible methods.
• Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications.
• Explain capabilities and applications of bulk metal forming processes and sheet metal work.
• Outline tooling and equipments required for important metal forming processes.
Examine effects of friction & lubrication and causes of common defects in metal forming.

Total Quality Management

Course Learning Outcomes: On successful completion of the module students will be able to:

To get familiarized with the basic concept and framework of Total Quality management

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- To Understand the contribution of Quality Gurus in TQM Journey
- To grasp the nature and importance of various components that constitute TQM
- To describe and discuss the role of techniques used in TQM

Heat Transfer Laboratory

- .Perform steady state conduction experiments to estimate thermal conductivity of different materials for plane, cylindrical and spherical geometries
- . Perform the transient heat conduction experiment and obtain variation of temperature along the length of the pin fin.
- Estimate heat transfer coefficients in forced convection, free convection and determine effectiveness of heat exchangers
- Perform radiation experiments: determine surface emissivity of a test plane and Stefan-Boltzmann's constant and compare with theoretical values
- . Estimate heat transfer coefficients in condensation, boiling and effectiveness of heat pipe

Computer Aided Engineering Laboratory

- .The students will be able to create the different wireframe primitives using parametric representations.
- Create surface primitives using parametric modeling.
- .Create the different solid primitives using the different representation schemes.
- .Apply geometric transformations on the created wireframe, surface and solid models.

Management Science

Defines the basic concepts in the field of management.

- Explains the basic concepts like management and manager.
- Discusses the basic issues of management like decision making and planning.
- Discusses organizational theories and models which are the important infrastructures of the management field.
- Defines classical and neoclassical theories.
- Distinguishes the basic elements of classical and neoclassical theories.
- Defines the basic elements of modern organization theory.
- Interprets the differences between the classical and neoclassical theories and the modern organization theory.
- Explains postmodern current concepts and approaches.
- Categorizes the approaches related to the environmental adaptation and change in the businesses.
- Evaluates the improvement of postmodern current concepts.
- Explains postmodern current applications.

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- Follows the new management concepts and approaches for the future.

Automobile Engineering

Expected Course Outcomes:

- Identify the different parts of the automobile
- Explain the working of various parts like engine, transmission, clutch, brakes
- Describe how the steering and the suspension systems operate.
- Understand the environmental implications of automobile emissions.
- Develop a strong base for understanding future developments in the automobile industry.

CAD/CAM

Expected Course Outcomes: The students will be able to

- Understand geometric transformation techniques in CAD.
- Develop mathematical models to represent curves and surfaces.
- Model engineering components using solid modelling techniques.
- Develop programs for CNC to manufacture industrial components.
- 5.To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Material Handling system.

Metrology and Measurements

Expected Course Outcomes: Students are able to understand

- The Limits, Fits and Tolerance. Indian standard system – International Standard organization system. He will know the principles of working of the most commonly used instruments for measuring linear and angular distances
- The different types of Comparators, optical measuring instruments, flatness measurement methods and measuring methods of surface roughness.
- Screw thread elements and measuring methods, Gear tooth profile measurement, CMM, Alignment tests on lathe, milling and drilling machine tools.
- Working of various instruments used for measuring for displacement, temperature and pressure.
- Working of various instruments used for measuring for flow, speed, stress, strain and Vibration.

Refrigeration and Air – Conditioning

Expected Course Outcomes: The students will be able to

- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health.
- A ability to identify, formulate and solve engineering problems

Production & Operations Management

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- 1.At the end of the course the students can apply the concept of operations management in manufacturing and service sector and will be able to plan and implement production and service related decisions.

- 2. At the end of the course the student will be able to plan production schedules and plan resources (material and machine) required for production

- 3. At the end of the course the students can design maintenance schedules in manufacturing units, identify and propose material handling equipments and implement industrial safety rules.

- 4. At the end of the course the students will be able to apply the concepts of purchase, stores and inventory management and analyze and evaluate material requirement decisions

- 5. At the end of the course the students can measure performance related to productivity and will be able to conduct basic industrial engineering study on men and machines.

CAD/ CAM Laboratory

Expected Course Outcomes: The students will be able to

- Develop 2D and 3D models using modelling software.

- Prepare CNC part programming.

Metrology and Measurements Laboratory

Industrial Engineering

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

- an ability to communicate effectively with a range of audiences

- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Power Plant Engineering

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- Explain the economics involved in Power Plant and identify the factors related to selection of plant.
- Discuss various components of steam power plant and the factors influencing the site selection for the plant.
- Describe the working of various components of diesel power plant and compare it with steam power plant.
- Illustrate the working of gas turbine power plant and its components.
- Explain the components, principles and working of nuclear & non-conventional power plant.
- Describe the electrical, instrumentation & pollution control systems used in power plants.

Department of Electronics & Communication Engineering
15A05402 Computer Organization
Course Outcomes:

- Identify functional units, bus structure and addressing modes
- Design the hardwired and micro-programmed control units.
- Understand pipelined execution and instruction scheduling
- To understand the structure, function, characteristics and performance issues of computer systems.
- To understand I/O transfer mechanism, design of I/O circuit interfaces and examplebus standards (like PCI, SCSI, USB)
- To understand the basic processing unit and how they are connected and how it generates control signals (using hardwired and micro programmed approaches)

15A04501 Antennas and Wave Propagation
Course Outcomes:

- Approximate parametric equations for the calculation in the farfield region.
- Write parametric integral expressions for a given current source.
- Calculate electromagnetic fields for a given vector potential.
- Discover pattern multiplication principle for array antennas.
- Design of antenna arrays: principle of pattern multiplication, broadside andend fire arrays, array synthesis, coupling effects and mutual impedance,parasitic elements, Yagi-Uda antenna.

15A04502 Digital Communication Systems
Course Outcomes:

- Understand the elements of DCS & the fundamentals concepts of sampling theorem along with different coding and modulation techniques
- Understand the basic principles of baseband and passband digital modulation schemes
- Analyze probability of error performance of digital systems and are able todesign digital communication systems

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- The students to be able to understand, analyze, and design fundamental digital communication systems.
- The course focuses on developing a thorough understanding of digital communication systems by using a series of specific examples and problems.

15A04503 Linear Integrated Circuits and Applications

Course Outcomes:

- Understand the basic building blocks of linear integrated circuits and its characteristics.
- Analyze the linear, non-linear and specialized applications of operationalamplifiers.
- Understand the theory of ADC and DAC.
- Realize the importance of Operational Amplifier.
- Design of OPAMPS, Classification of OPAMPs.
- To study and design various linear applications of OPAMPs.
- To study and design various non linear applications of OPAMPs

15A04504 Digital System Design
Course Outcomes:

- Capable of using Computer-aided design tools to model, simulate, verify,analyze, and synthesize complex digital logic circuits.
- Efficient designing of any Digital System using basic structure ICs .
- Able to design and prototype with standard cell technology andprogrammable logic.
- Apply design test for digital logic circuits, and design for testability.
- To be able to model, simulate, verify, analyze, and synthesize with hardwaredescription languages
- To be able to design and prototype with standard cell technology andprogrammable logic

15A04506MEMS & Microsystems

Course Outcomes

- Understand the operation of micro devices, micro systems and their applications
- Apply scaling laws that are used extensively in the conceptual design of micro devices and systems
- Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process
- Simplify the design of micro devices, micro systems using the MEMS fabrication process

15A04507 IC Applications Laboratory

Course Outcomes:

- Students will have a thorough understanding of operational amplifier(741) .
- Students will be able to design circuits using operational amplifiers for various applications.

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- Students will be able to design various combinational circuits using various Digital Integrated IC's.
- They can know the differences between Linear and Digital Integrated IC's.
- Students will demonstrate their knowledge by designing analog circuits & digital circuits.

15A04508 Digital Communication Systems Laboratory

Course Outcomes:

- Able to understand basic theories of Digital communication system in practical.
- Able to design and implement different modulation and demodulation techniques.
- Able to analyze digital modulation techniques by using MATLAB tools.
- Able to identify and describe different techniques in modern digital communications, in particular in source coding using MAT Lab tools.
- Able to perform channel coding

15A04601 MICROPROCESSORS AND MICROCONTROLLERS

Course Outcomes :

- Do programming with 8086 microprocessors
- Understand concepts of Intel x86 series of processors
- Program MSP 430 for designing any basic Embedded System
- Design and implement some specific real time applications Using MSP 430 low power microcontroller.

15A04602 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Outcomes :

- Understand basic principles involved in the meters for measuring voltage, current, resistance, frequency and so on.
- Employ CRO for measuring voltage, current, resistance, frequency and so on.
- Understand principles of measurements associated with different bridges.
- Get complete knowledge regarding working of advanced instruments such as logic analyzers and spectrum analyzers.

15A04603 DIGITAL SIGNAL PROCESSING
Course Outcomes :

- Formulate engineering problems in terms of DSP tasks.
- Apply engineering problems solving strategies to DSP problems.
- Design and test DSP algorithms.
- Analyze digital and analog signals and systems.
- Analyze and compare different signal processing strategies.

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15A04604 VLSI DESIGN
Course Outcomes :

- Complete Knowledge about Fabrication process of ICs
- Able to design VLSIcircuits as per specifications given.
- Capable of optimizingthe design of Arithmetic / logic building Blocks at all levels of Design/Fabrication.
- Can implement circuit through various design styles (semi- Custom, FullCustom)

15A04606 INDUSTRIAL ELECTRONICS
Course Outcomes :

- Get an overview of semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics.
- Understand the characteristics of AC to DC converters.
- Understand about the practical applications Electronics in industries

15A04607 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY
Course Outcomes :

- Understand and apply the fundamentals of assembly level programming of microprocessors,microcontroller and ARM Cortex M0 microprocessors
- Evaluate the execution of different programs for 8086 and 8051 in Assembly Level Language using the MASM Assembler
- Apply the knowledge and skills gained to design and implement specific real-time applications.
- Analyze and debug mixed-language programs to identify and resolve issues related to calling conventions, parameter passing, and stack management between assembly and C code.
- Gain the ability to familiarize with MASM, Embedded C, and Code composer studio.
- Develop and simulate programs using MASM / TASM software.

15A04608   DIGITAL SIGNAL PROCESSING LABORATORY

Course Outcomes :

- Able to design real time DSP systems and real world applications.
- Able to implement DSP algorithms using both fixed and floating pointprocessors.
- Understand the mathematical operation on discrete signals
- Sketch the magnitude and phase response of DFT, Inverse DFT and FFT of discrete time signals
- Calculate linear and circular convolution of discrete sequences.
- Implement Z transform and inverse Z transform of discrete signals
- Model IIR and FIR filter using window techniques

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15A04701 OPTICAL FIBRE COMMUNICATION

Course Outcomes:

- Analyze the performance of both digital and analog optical fiber systems
- Calculate the system bandwidth, noise, probability of error and maximum usable bit rate of a digital fiber system
- Calculate the system link loss, distortion and dynamic range of an RF photonic link
- To perform characteristics of fiber sources and detectors, design as well as conduct experiment in software and hardware, and analyze the results to provide valid conclusions.

15A04702 Embedded systems

Course Outcomes:

- Design of embedded systems leading to 32-bit application development.
- Understand hardware-interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.
- Implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.
- Apply and analyze the applications in various processors and domains of embedded system.
- Evaluate Embedded Networking and IoT concepts based upon connected MCUs.
- Create an auto mobile application using different embedded systems.

15A04703 MICROWAVE ENGINEERING

Course Outcomes:

- Ability to analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
- Ability to Use S-parameter terminology to describe circuits and to explain how microwave devices and circuits are characterized in terms of their "S"- Parameters.
- Ability to understanding of microwave transmission lines and how to Use microwave components such as isolators, Couplers, Circulators, Tees, Gyrators etc.

15A04704 DATA COMMUNICATIONS & NETWORKING

Course Outcomes:

- Understand the basics of data communication, networking, internet and their importance.
- Analyze the services and features of various protocol layers in data networks.
- Differentiate wired and wireless computer networks
- Analyse TCP/IP and their protocols.
- Recognize the different internet devices and their functions.
- Explain the principles and mechanisms of switching.

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• Analyze multiple access techniques and network layer protocols

15A04705 RADAR SYSTEMS

Course Outcomes:

• Understand the basic principle of radar system with the help of block diagram.
• Apply the fundamental knowledge of various RADARs, Matched Filter and to find the range between the target and RADAR, frequency and phase of the received signal.
• Analyze the principle of frequency modulated –continuous wave radar and apply it for altimeter applications
• Able to Differentiate the principle of moving target indicator radar and Pulse Doppler radar for moving target indication and clutter rejection
• Compare different types of display devices & duplexers with their functions to determine the performance of radar systems
• evaluate phased array antennas and its radiation pattern for detection and tracking of Multiple objects from different directions

15A04709 CELLULAR & MOBILE COMMUNICATION

Course Outcomes:

• The student will be able to understand impairments due to multipath fading channel.
• Understand the fundamental techniques to overcome the different fading effects.
• To understand Co-channel and Non Co-channel interferences.
• Able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
• Understanding of frequency management, channel assignment and types of handoff.

15A04711 MICROWAVE & OPTICAL COMMUNICATIONS LABORATORY

Course Outcomes:

• Capable of Applying microwave Concepts/ Microwave components and testthem .
• Able to design and analyse an optical fiber communications link

15A04712 VLSI & EMBEDDED SYSTEMS Lab

Course Outcomes:

• Write HDL code for basic as well as advanced digital integrated circuits.
• Implement various combinational and sequential circuits using VHDL on FPGA.
• Describe procedure for designing of programmable circuits.
• Demonstrate the ability to use various EDA tools for digital system design
• Implement schematic and layout of various digital CMOS logic circuits using EDA tools

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15A04802 LOW POWER VLSI CIRCUITS AND SYSTEMS

Course outcomes:

- Understand the concepts of velocity saturation, Impact Ionization and Hot Electron Effect
- Implement Low power design approaches for system level and circuit level measures.
- Design low power adders, multipliers and memories for efficient design of systems.
- Apply advanced power management techniques in VLSI designs.
- Evaluate and analyze power-performance trade-offs in VLSI designs
- Design and optimize low power communication interfaces

15A04804 RF INTEGRATED CIRCUITS

Course outcomes:

- Analyze the performance parameters of radio frequency circuits and identify design trade-off of radio frequency communication systems.
- Identify noise sources and develop noise models for the devices and systems.
- Identify various techniques to improve the bandwidth of RF amplifiers.
- Perform matching with complex loads
- Design of CMOS Low-Noise Amplifier & Mixer
- Design of LC Oscillator & Power amplifier.

Department of Computer Science & Engineering
(15A05101) COMPUTER PROGRAMMING

CO1: Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2: Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3: Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4: Develops the use of the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
CO5: Introduces the more advanced features of the C language

(15A05201) DATA STRUCTURES

CO1: Understand the concept of Dynamic memory management, data types, algorithms, Big -O notation.

CO 2	Know the art of recording the observations of an experiment scientifically.
CO 3	Learn by doing.
CO 4	Handle and operate the various elements/ parts of experiments
CO 5	Understand the importance of experiments in engineering & technology

R19 Regulations

Department of Civil Engineering

(19A54101) ALGEBRA & CALCULUS

Course Outcomes:

At the end of the course, the student will be able to

• develop the use of matrix algebra techniques that is needed by engineers for practical applications
• Utilize mean value theorems to real life problems
• familiarize with functions of several variables which is useful in optimization
• Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
• Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

(19A56102T) ENGINEERING PHYSICS

Course Outcomes:

• After completing this course students will be able to
• Explain physics applied to solve engineering problems
• Apply the principles of acoustics in designing of buildings
• Explains the applications of ultrasonics in various engineering fields
• Apply electromagnetic wave propagation in different Optical Fibers
• Apply the lasers concepts in various applications
• Explains the concepts of dielectric and magnetic materials
• Identify the sensors for various engineering applications

(19A05101T) PROBLEM SOLVING AND PROGRAMMING

Course Outcomes:

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- Construct his own computer using parts
- Recognize the importance of programming language independent constructs
- Solve computational problems
- Select the features of C language appropriate for solving a problem
- Design computer programs for real world problems
- Organize the data which is more appropriated for solving a problem

(19A52101T) COMMUNICATIVE ENGLISH I

Course Outcomes:

At the end of the course, the learners will be able to

- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph interpreting a figure/graph/chart/table

(19A03101) ENGINEERING WORKSHOP

Course Outcomes:

After completion of this lab the student will be able to

- Apply wood working skills in real world applications.
- Build different parts with metal sheets in real world applications.
- Apply fitting operations in various applications.
- Apply different types of basic electric circuit connections.
- Demonstrate soldering and brazing.

(19A56102P) ENGINEERING PHYSICS LAB

Course Outcomes:

The students will be able to

- Operate various optical instruments
- Estimate wavelength of laser and particles size using laser

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- estimate the susceptibility and related magnetic parameters of magnetic materials
- plot the intensity of the magnetic field of circular coil carrying current with distance
- evaluate the acceptance angle of an optical fiber and numerical aperture
- determine magnetic susceptibility of the material and its losses by B-H curve
- identify the type of semiconductor i.e., n-type or p-type using hall effect
- Apply the concepts of sensors for various applications

(19A05101P) PROBLEM SOLVING AND PROGRAMMING LAB

Course Outcomes:

Student should be able to

- Construct a Computer given its parts
- Select the right control structure for solving the problem
- Analyze different sorting algorithms
- Design solutions for computational problems
- Develop C programs which utilize the memory efficiently using programming constructs like pointers.

(19A52101P) COMMUNICATIVE ENGLISH I LAB

Course Outcomes

- To remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- To apply communication skills through various language learning activities
- To analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- To evaluate and exhibit acceptable etiquette essential in social and professional settings
- To create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken Eng

(19A02201T) BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course Outcomes:

- Apply concepts of KVL/KCL in solving DC circuits
- Choose correct rating of a transformer for a specific application

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• Illustrate working principles of induction motor - DC Motor
• Identify type of electrical machine based on their operation.
• Describe working principles of protection devices used in electrical circuits.

(19A54201) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Outcomes:

At the end of the course, the student will be able to

• solve the differential equations related to various engineering fields
• Identify solution methods for partial differential equations that model physical processes (L3)
• interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
• estimate the work done against a field, circulation and flux using vector calculus

(19A51101T) ENGINEERING CHEMISTRY

Course Outcomes:

At the end of the course, the students will be able to

• demonstrate the corrosion prevention methods and factors affecting corrosion
• explain the preparation, properties, and applications of thermoplastics & thermos settings, elastomers & conducting polymers.
• explain calorific values, octane number, refining of petroleum and cracking of oils
• explain the setting and hardening of cement and concrete phase
• summarize the app
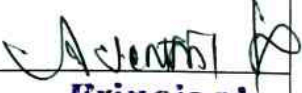
(19A05201T) DATA STRUCTURES

Course Outcomes:

Students should be able to

• Select Appropriate Data Structure for solving a real world problem
• Select appropriate file organization technique depending on the processing to be done
• Construct Indexes for Databases

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- Analyse the Algorithms
- Develop Algorithm for Sorting large files of data

(19A03102) ENGINEERING GRAPHICS LAB

Course Outcomes:

After completing the course, the student will be able to

- draw various curves applied in engineering.
- show projections of solids and sections graphically.
- draw the development of surfaces of solids.
- use computers as a drafting tool.
- draw isometric and orthographic drawings using CAD packages.

(19A02201P) BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

Course Outcomes:

- Describe construction, working and characteristics of diodes, transistors and operational amplifiers
- Demonstrate how electronic devices are used for applications such as rectification, switching and amplification
- Build different building blocks in digital electronics using logic gates
- Explain functionality of flip-flops, shift registers and counters for data processing applications
- Explain functioning of various communication systems

(19A51101P) ENGINEERING CHEMISTRY LAB

Course Outcomes:

At the end of the course, the students will be able to

- determine the cell constant and conductance of solutions
- prepare advanced polymer materials
- determine the physical properties like surface tension, adsorption and viscosity
- estimate the Iron and Calcium in cement
- calculate the hardness of water

(19A05201P) DATA STRUCTURES LAB

Course Outcomes:

At the end of the course students should be able to

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• Select the data structure appropriate for solving the problem
• Implement searching and sorting algorithms
• Design new data types
• Illustrate the working of stack and queue
• Organize the data in the form of files

(19A54301) COMPLEX VARIABLES, TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

Course Outcomes:

After the completion of course, students will be able to

• Understand the analyticity of complex functions and conformal mappings.
• Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
• Understand the usage of Laplace Transforms.
• Evaluate the Fourier series expansion of periodic functions.
• Formulate/solve/classify the solutions of Partial differential equations and also find the solution of one dimensional wave equation and heat equation.

(19A01301T) STRENGTH OF MATERIALS-I

Course Outcomes:

On completion of the course, the student will be able to:

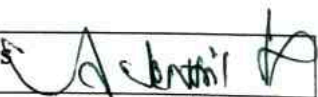| |
|---|
| • Understand the different types of couples and force systems |
| • Determine the centroid and moment of inertia for different cross-sections |
| • Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli and strain energy. |
| • Develop shear force and bending moment diagrams for different load cases. |
| • Compute the flexural stresses and shear stresses for different loading cases and different cross-sections. |

(19A01302T) FLUID MECHANICS

Course Outcomes:

At the end of the course, the student will be able to:

• Understand the principles of fluid statics, kinematics and dynamics
• Familiarize basic terms used in fluid mechanics

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• Understand flow characteristics and classify the flows
• Apply the continuity, momentum and energy principles
• Estimate various losses in flow through channels

(19A01303T) SURVEYING

Course Outcomes:

At the end of the course, the student will be able to:

• Calculate angles, distances and levels
• Identify data collection methods and prepare field notes
• Understand the working principles of survey instruments
• Estimate the volumes of earth work
• Able to use modern survey instruments.

(19A01304) BUILDING MATERIALS AND CONSTRUCTION

Course Outcomes:

At the end of the course, the student will be able

• To understand the characteristics of various building materials such as stone and clay product.
• To evaluate the properties of the binding materials for their suitability in building construction.
• To apply the ferrous and non-ferrous materials in building construction.
• To understand the construction procedure of various building components such as stair cases, masonry and flooring.
• To understand the installation of electrical, sanitary and plumbing fittings in buildings.

(19A05304T) PYTHON PROGRAMMING

Course Outcomes:

Student should be able to

• Apply the features of Python language in various real applications.
• Select appropriate data structure of Python for solving a problem.
• Design object oriented programs using Python for solving real-world problems.
• Apply modularity to programs.

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(19A52301) UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

OUTCOME OF THE COURSE:

By the end of the course,

• Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
• They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
• They would have better critical ability.
• They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
• It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

(19A01301P) STRENGTH OF MATERIALS LABORATORY

Course Outcomes:

• By performing the various tests in this laboratory the student will be able to know the structural behavior various structural elements when subjected to external loads

(19A01302P) FLUID MECHANICS LABORATORY

Course Outcomes:

• By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes.

(19A01303P) SURVEYING LABORATORY

Course Outcomes:

• By performing the various tests in this laboratory the student will be able to know the principles of surveying in chain surveying, compass surveying, plane table surveying, leveling, thedolite surveying and total station

(19A99301) ENVIRONMENTAL SCIENCE

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Course Outcomes:

At the end of the course, the student will be able to

• Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
• Understand flow and bio-geo- chemical cycles and ecological pyramids.
• Understand various causes of pollution and solid waste management and related preventive measures.
• About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
• Casus of population explosion, value education and welfare programmes.

(19A01401) STRENGTH OF MATERIALS-II

Course Outcomes:

On completion of the course, the student will be able to:

• Understand principal stresses and principal planes.
• Determine deflection at any point on a beam under simple and combined loads
• Analyze members under torsion, deformation in springs,
• Know the effect of eccentricity of load in columns; apply failure criteria to implement in design of structural members.
• Know the crippling load for the columns.

(19A01402T) HYDRAULICS AND HYDRAULIC MACHINERY

Course Outcomes:

At the end of the course, the student will be able to
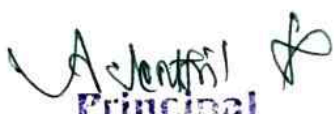
• Understand characteristics of laminar and turbulent flows.
• Analyze characteristics for uniform and non-uniform flows in open channels.
• Design different types of turbines
• Design centrifugal and multi stage pumps

(19A01403) STRUCTURAL ANALYSIS-I

Course Outcomes:

At the end of the course student will be able to

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• Apply energy theorems for analysis of indeterminate structures
• Analyze indeterminate structures with yielding of supports
• Analyze beams using slope deflection and moment distribution methods
• Analyze portal frames using slope deflection and moment distribution methods

(19A01404T) CONRETE TECHNOLOGY

Course Outcomes:

At the end of the course student is able to

• Understand various ingredients of concrete and their role.
• Examine knowledge on the fresh and hardened properties of concrete.
• Design concrete mixes using various methods.
• Perceive special concretes for accomplishing performance levels.

(19A01405T) TRANSPORTATION ENGINEERING

Course Outcomes:

On completion of the course, the students will be able to:

• Understand the importance of highways in economic development of nation.
• Understand the history of road development in India and various road development plans.
• Identify the highway materials and tests related to them.
• Design horizontal and vertical alignment aspects.
• Understand the surveys required for highway planning and design.
• Differentiate between types of pavements and their design features.

(19A01406) ENVIRONMENTAL ENGINEERING

Course Outcomes:

At the end of the course, the student will be able to:

• Understand about quality of water and purification process
• Select appropriate technique for treatment of waste water.
• Assess the impact of air pollution
• Understand consequences of solid waste and its management.
• Design domestic plumbing systems.

(19A01402P) HYDRAULIC MACHINERY LAB

Course Outcomes:
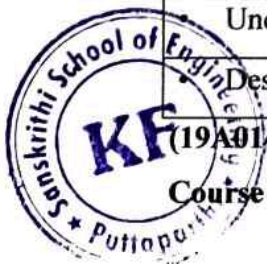
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> By performing the various tests in this laboratory the student will be able to know the performance of various hydraulic machinery and flow characteristics.

(19A01405P) TRANSPORTATION ENGINEERING LAB

Course Outcomes:

> By performing the various tests in this laboratory the student will be able to know the physical characteristics of aggregates and bitumen

(19A99302) BIOLOGY FOR ENGINEERS

Course Outcomes:

After studying the course, the student will be able to:

- Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- Explain about bimolecular, their structure and function and their role in the living organisms. How bimolecular are useful in Industry.
- Briefly about human physiology.
- Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and anim

(19A01501) DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Outcome:

After completing the course, the student will be able to,

- understand the basic concepts of working stress and limit state design methods
- Design various RC elements like beams, columns, footings and slabs.
- Apply design concepts to complex structural systems in advanced courses.

(19A01502) WATER RESOURCE ENGINEERING

Course Outcomes:

At the end of the course the students are able to

- Understand of the theories and principles governing the hydrologic processes.
- Identify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects.

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• Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
• Determine aquifer parameters, yield of wells and model hydrologic processes.
• Understand duty and delta.
• Understand soil, water, plant relationships.
• Design the Hydraulic structures

(19A01503T) ENGINEERING GEOLOGY

Course Outcomes:

At the end of the course student will be able to

• Gain basic knowledge on characteristics of rocks and minerals.
• Identify and differentiate rocks using geological classification.
• Carry out geo physical investigations for infrastructural projects.
• Apply concepts of structural geology for civil engineering structures.
• Understand the seismic zones of India.

(19A01504) STRUCTURAL ANALYSIS–II

Course Outcomes:

At the end of the course student will be able to

• Analyze the final moments at the ends of the members
• Analyze bending moment, normal thrust and radial shear in the arches
• Analyze the variation of shear force and bending moment in the members due to rolling loads
• Analyze the degree of indeterminacy of the structures, reactions and displacements
• Analyze the formation of plastic hinges in different mechanisms

(19A01505a) BUILDING CONSTRUCTION PRACTICE

PROFESSIONAL ELECTIVES-I

Course Outcomes:

At the end of the course, the student will be able to

• Classify suitable materials for buildings and adopt suitable construction techniques.
• Adopt suitable internal finishes and maintenance work to enhance durability of buildings.
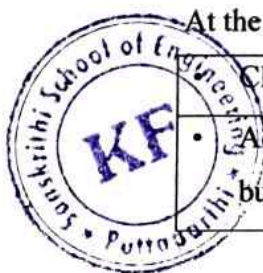
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- Design of high rise buildings.

- Design of power generation structures.

(19A52506a) TECHNICAL COMMUNICATION AND PRESENTATION SKILLS

Course Outcomes

- Understand the importance of effective technical communication

- Apply the knowledge of basic skills to become good orators

- Analyze non-verbal language suitable to different situations in professional life

- Evaluate different kinds of methods used for effective presentations

- Create trust among people and develop employability skills

(19A01507) COMPUTER AIDED CIVIL ENGINEERING DRAWING

Course Outcomes:

At The end of the course the student will be able to

- Develop drawing skills for effective demonstration of building details.

- Draw building plans using Computer Aided Design and Drafting software's.

- Develop engineering project drawings incorporating details and design parameters in 2D & 3D.

- Examine efficacy of CAD design.

(19A01508) ENVIRONMENTAL ENGINEERING LAB

Course Outcomes:

At the end of the course, the student will be able to:

- Understand about quality of water and purification process

- Select appropriate technique for treatment of waste water.

- Assess the impact of air pollution

- Understand consequences of solid waste and its management.

- Design domestic plumbing systems.

(19A01503P) ENGINEERING GEOLOGY LAB

Course Outcomes:

- At the end of the course the students will be able to classify various types of rocks, their properties and they will be familiar with interpretation of geological maps.

(19A99501) MANDATORY COURSE: CONSTITUTION OF INDIA

Course Outcomes:

At the end of the course, students will be able to

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• Understand historical background of the constitution making and its importance for building a democratic India.
• Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
• Understand the value of the fundamental rights and duties for becoming good citizen of India.
• Analyze the decentralization of power between central, state and local self government
• Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

(19A01601T) GEOTECHNICAL ENGINEERING –I

Course Outcomes :

On completion of the course, the students will be able to:

• Classify various types of soils using USCS and IS classification methods
• Understand the behavior of coarse grained and fine grained soils.
• Design earth dams using different methods.
• Calculate the stress distribution in foundations.
• Know the field Compaction control.
• Determination of settlement of foundations.
• Calculate the shear strength of soil under different drainage conditions.

(19A01602) DESIGN OF STEEL STRUCTURES

Course Outcomes:

At the end of this course the student will be able to

• Explain relevant IS codes
• Analysis and design of flexural members and detailing
• Design compression members of different types with connection detailing
• Design Plate Girder and Gantry Girder with connection detailing
• Develop drawings pertaining to different components of steel structures

(19A52601T) ENGLISH LANGUAGE SKILLS

Course Outcomes

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At the end of the course, the learners will be able to

• Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
• Apply grammatical structures to formulate sentences and correct word forms
• Analyze discourse markers to speak clearly on a specific topic in informal discussions
• Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
• Create a coherent paragraph interpreting a figure/graph/chart/table

(19A01603a) MAINTENANCE AND REPAIR OF CONCRETE STRUCTURES

Course outcomes:

• By the end of this course students will have the capability/knowledge of
• Various distress and damages to concrete and masonry structures
• The importance of maintenance of structures, types and properties of repair materials etc
• Assessing damage to structures and various repair techniques

(19A52604a) SOFT SKILLS

Course Outcomes

• Recognize the importance of verbal and non verbal skills
• Develop the interpersonal and intrapersonal skills
• Apply the knowledge in setting the SMART goals and achieve the set goals
• Analyze difficult situations and solve the problems in stress-free environment
• Create trust among people and develop employability skills
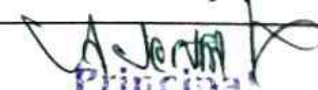
(19A52602a) ENTREPRENEURSHIP& INCUBATION

Course Outcomes:

At the end of the course, students will be able to

• Understand the concept of Entrepreneurship and challenges in the world of competition.
• Apply the Knowledge in generating ideas for New Ventures.
• Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.

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• Evaluate the role of central government and state government in promoting Entrepreneurship.
• Create and design business plan structure through incubations.

(19A01601P) GEOTECHNICAL ENGINEERING LAB

Course Outcomes:

At the end of the course, the student must be able to:

• Identify various soils based on their characteristics.
• Evaluate permeability and seepage of soils.
• Determine plasticity characteristics of various soils.
• Design consolidation process by predicting settlement of soils.

(19A52601P) ENGLISH LANGUAGE SKILLS LAB

Course Outcomes:

• Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
• Apply communication skills through various language learning activities
• Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
• Evaluate and exhibit acceptable etiquette essential in social and professional settings
• Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

(19A99601) MANDATORY COURSE: RESEARCH METHODOLOGY

Course Outcomes:

At the end of the course, students will be able to

• Understand basic concepts and its methodologies
• Demonstrate the knowledge of research processes
• Read. Comprehend and explain research articles in their academic discipline
• Analyze various types of testing tools used in research
• Design a research paper without any ethical issues

Department of Electrical & Electronics Engineering

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(19A02301T) R19 BASIC ELECTRICAL CIRCUITS

Student can be able to recall all laws (such as kirchoff's, Faraday's) to do analysis of various electrical and magnetic circuit configurations (such as series, parallel, voltage source, current source)
Student can be able to distinguish between scalar, vector and phasor quantities To solve 1-ϕ AC circuits with series and parallel combinations of elements R, L and C and understand voltage, current and power relationships.
execute analysis of balanced and unbalanced circuits with different phasor relationships of v,I,P in satr delta connections
apply certain theorems and distinguish the inter relationship between them to both AC & DC network analysis
DETERMINE THE DUAL OF THE NETWORK,DEVELOP THE CUT SET &N TRISET METRICES FOR A GIVEN CIRCUITS
Apply circuit concepts in other suitable fields like micro electronics and instrumentation engineering etc

(19A02301p) R19 BASIC ELECTRICAL CIRCUITS lab

remember various theorems to apply practically
understand & analysis active reactive power measurements in 3-phase balanced and unbalanced circuits
Apply & verify circuit concepts practically
Differentiate various methods of measurements for balanced and unbalanced loads
Check the theoritical & practical variations of the concepts
Plan new experiments involving circuit concepts in other suitable situations such as testing, manufacturing etc

19A02401T R19 ELECTRICAL CIRCUIT ANALYSIS

learn about concepts f locus diagram, Resonance eith different circuit elements under ceertain operating conditions
Interpret the working parameters of T & phi configurations of DC circuits
Apply fourier transforms too electrical circuits excicuted by non sinusoidal sources
Distinguish between classical method & laplace transform approach in analyzing transient phenomenon in DC sinusoidal excitation
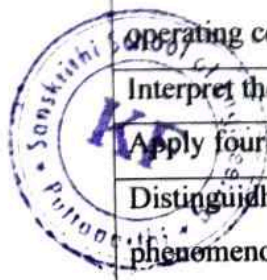
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Design of filters, equalizers & PSPICE programs for circcuit analysis

Implement circuit analysis concepts in other fields & suitable situations like micro electronics, control engineering

19A02401P R19 ELECTRICAL CIRCUIT ANALYSIS LAB

Understand various resonance phenomenon

learn basic techniques of PSPICE simulation techniques and features

Apply & experimentally analyze 2 port network parameters

Analyse various currents locus diagram

check the response of various circuit with various analysis and excitations

Produce different responses for arious circuits with different softwares

POWER ELECTRONICS 19A02403   R-19

Students able to understand the operation and characterstics of different types of power swithcing devices

students able to differentiate different types of thyristor rectifiers in power conversion applications

students able to implement DC-DC converters to step up/step down the DC Voltage in Power transmission and distribution

students able to check the working and operation of various voltage source inverters in DC-AC power conversion

students able to generate voltages at different frequencies by using power conversion devices

students able to explore and recall different types of power conversion devices in real time applications

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students able to explore and recall different types of power conversion devices in real time applications

Department of Mechanical Engineering
Python Programming
After completing this course, you will be able to:

• Create your first program in Python IDLE
• Implement OOPs concepts in your programming
• Use Arrays, and Data structures
• Create an application with the support of graphics in Python
• Implement error handling

Manufacturing Processes

• Analyze and access the use of casting processes in manufacturing and understand the working of various casting processes
• Understand the basics of metal cutting and working of different types of machine tools.
• Explain the conventional and advanced metal forming processes and composite fabrication.
• Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the type of industrial application.

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Engineering Mechanics

Expected Course Outcomes: Students are able to

- Construct free body diagrams and develop appropriate equilibrium equations.
- Understand the concepts of friction and to apply in real life problems.
- Determine the centroid and Moment of Inertia for composite sections.
- Understand the dynamic analysis of rigid body motion.

Material Scienceand Engineering

Expected Course Outcomes: The students will be able to

- Provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application.
- Acquire and develop the necessary background and skills for successful careers in the materials-related industries.
- Furthermore, after completing the program, the student should be well prepared for Management positions in industry or continued education toward a graduate degree

Design Thinking & Product Innovation

- Explain the principles of design thinking and its approaches
- Identify the empathy, define phases in human centred design problems
- Understand the idea generation, prototype and testing in design thinking context
- Apply design thinking techniques for product innovation
- Use design thinking in business process models

Design Thinking & Product Innovation Lab

- Develop a mind maps for design thinking process
- Prepare empathy maps and journey maps for problems.
- Construct mock-up models through ideation and innovation techniques
- Use software for design thinking problems

Manufacturing Processes Lab

- Understanding the properties of moulding sands and pattern making.
- Fabricate joints using gas welding and arc welding.
- Evaluate the quality of welded joints.
- Basic idea of press working tools and performs moulding studies on plastics.

Material Science and Engineering Lab

II-II Sem

Thermodynamics

Expected Course Outcomes:Upon completion of the course students will be able to:

- Use thermodynamic terminology correctly.
- Explain fundamental thermodynamic properties.
- Derive and discuss the first and second laws of thermodynamics.
- Solve problems using the properties and relationships of thermodynamic fluids.

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- Analyse basic thermodynamic cycles.
- Students must have understanding of thermodynamic fundamentals before studying their application in applied thermodynamics.
- The understanding of thermodynamic properties and processes will assist students in other related coursework.

Mechanics of Materials

- Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
- Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
- Apply basic equation of simple torsion in designing of shafts and helical spring
- Calculate the slope and deflection in beams using different methods. Analyze and design thin and thick shells for the applied internal and external pressures.

Fluid Mechanics and Hydraulic Machinery

Expected Course Outcomes: The students will be able to

- Possess a sound knowledge of fundamental properties of fluids and fluid continuum and types of fluid flow.
- Compute and solve problems on hydrostatics, including practical applications
- Apply principles of mathematics to represent kinematic concepts related to fluid flow
- Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications.
- Compute the discharge through pipes can critically analyze the performance of pumps and turbines

Internet of Things

- Explain the real time embedded system and its components.
- Understand basic components and building blocks of Internet of Things.
- Apply skills to conduct interfacing of embedded boards with components, actuators and sensors.

Kinematics of Machinery

Expected Course Outcomes: The students after completing the course will be able to:
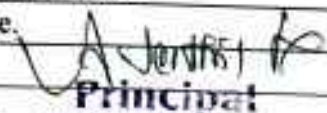
- Familiarity with common mechanisms used in machines and everyday life.
- Identify different mechanisms, Inversions of kinematic chains
- Ability to perform analysis of different types of links, position, velocity, acceleration analyses.

Computer Aided Machine Drawing

Expected Course Outcomes: The students will be able to

- Acquire the knowledge of various standards and specifications about standard machine components. 2. Make drawings of assemblies with the help of given part drawings.
- Select, configure and synthesize mechanical components into assemblies.
- Able to model components of their choice using CAD software.
- Get exposure to advanced CAD packages.

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Mechanics of Materials Lab

III-I Sem

Applied Thermodynamics

Expected Course Outcomes: The students will be able to

• Demonstrate the principles of thermal engineering in power producing fields.
• Differentiate among different internal combustion engine designs.
• Recognize and understand reasons for differences among operating characteristics of different engine types and designs.
• Analyze engineering systems needed to set-up and run engines in controlled laboratory environments. 5. Compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations.

Manufacturing Technology

Expected Course Outcomes: Students will be able to:

• Demonstrate the theory of metal cutting related to lathe, milling machines, drilling machine, grinding machines etc.
• Select cutting tool materials metal cutting and tool geometries for different metal cutting operations. 3. Select appropriate machining processes for different processes. Understand machine tool structures and machining economics.

Heat Transfer

Expected Course Outcomes: After learning the course the students should be able to:

• Understand basic concept of heat transfer
• Able to do the analytical solving in the process of heat transfer (conduction, convection and radiation) 3. Design various types of basic heat exchanger.
• Apply scientific and engineering principles to analyze and design aspects of engineering systems that relate to conduction, convection and radiation heat transfer.

Dynamics of Machinery

Expected Course Outcomes: Student will be able to

• Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.
• Compute frictional losses, torque transmission of mechanical systems.
• Analyze dynamic force analysis of slider crank mechanism and design of flywheel.

Automobile Engineering

Expected Course Outcomes:

• Identify the different parts of the automobile
• Explain the working of various parts like engine, transmission, clutch, brakes
• Describe how the steering and the suspension systems operate.
• Understand the environmental implications of automobile emissions

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- Develop a strong base for understanding future developments in the automobile industry.

Optimization Techniques

- Recall the theoretical foundations of various issues related to linear programming modeling to formulate real-world problems as a L P model
- Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function.
- Identify appropriate optimization method to solve complex problems involved in various industries.
- Demonstrate the optimized material distribution schedule using transportation model to minimize total distribution cost.
- Find the appropriate algorithm for allocation of resources to optimize the process of assignment.
- Explain the theoretical workings of sequencing techniques for effective scheduling of jobs on machines.

Applied Thermodynamics Lab

- The concepts related to the operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics.
- The techniques for improving the efficiencies and performance of compressors and refrigeration systems retained to practical applications such as irrigation, air conditioning and refining oil and gas.
- The performance of Heat Engines in real-time applications by applying the various testing parameters of an engine.

Manufacturing Technology Lab

Expected Course Outcomes: Students shall be able to

- Acquire knowledge about green sand molding process, gates and risers.
- Determine the strength and permeability of the molding sand.
- Demonstrate the welding procedure using Arc, Gas, TIG / MIG welding machines.
- Acquire the knowledge about the process of making the plastic moulds.

Fluid Mechanics & Hydraulic Machinery Lab

- To provide the students with a solid foundation in fluid flow principles
- To provide the students knowledge in calculating performance analysis in turbines and pumps and can be used in power plants
- Students can able to understand to analyze practical problems in all power plants and chemical industries
- Conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports
- Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design
- Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency
- To provide exposure to modern computational techniques in fluid dynamics

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III-II Sem

Design of Machine Elements

Expected Course Outcomes: The students will be able to

- Analyze the stress and strain on mechanical components
- Understand, identify and quantify the failure modes for various mechanical parts.
- Demonstrate knowledge on basic machine elements used in machine design;
- Design machine elements to withstand the loads and deformations for a given application, while considering specifications.
- Approach a design problem successfully, taking decisions when there is not a unique answer.
- Demonstrate analytical skill in the process of designing a component.

Introduction to CAD/CAM

Expected Course Outcomes: The students will be able to

- Understand geometric transformation techniques in CAD.
- Develop mathematical models to represent curves and surfaces.
- Model engineering components using solid modelling techniques.
- Develop programs for CNC to manufacture industrial components.
- 5.To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Material Handling system.
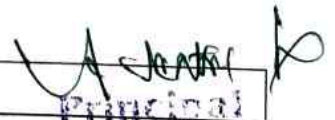
Production and Operations Management

- At the end of the course the students can apply the concept of operations management in manufacturing and service sector and will be able to plan and implement production and service related decisions.
- At the end of the course the student will be able to plan production schedules and plan resources (material and machine) required for production
- At the end of the course the students can design maintenance schedules in manufacturing units, identify and propose material handling equipments and implement industrial safety rules.
- At the end of the course the students will be able to apply the concepts of purchase, stores and inventory management and analyze and evaluate material requirement decisions
- At the end of the course the students can measure performance related to productivity and will be able to conduct basic industrial engineering study on men and machines.

Industrial Automation

Expected Course Outcomes: The students will be able to

Implement concepts of automation in machine tools and plant

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- Students will understand the fundamentals of control in automation as they apply to manufacturing. 3. Design of Pneumatic Circuit for manufacturing application

- Design of Hydraulic Circuit for manufacturing application

- Ability to apply PLC timers and counters for the control of industrial processes

Managerial Economics And Financial Analysis

- To adopt the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services.

- To assess the functional relationship between Production and factors of production and list out various costs associated with production and able to compute breakeven point to illustrate the various uses of breakeven analysis.

- To outline the different types of business organizations and provide a framework for analyzing money in its functions as a medium of exchange.

- To adopt the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts

- To implement various techniques for assessing the financial position of the business

Heat Transfer Lab

- Perform steady state conduction experiments to estimate thermal conductivity of different materials for plane, cylindrical and spherical geometries

- Perform the transient heat conduction experiment and obtain variation of temperature along the length of the pin fin.

- Estimate heat transfer coefficients in forced convection, free convection and determine effectiveness of heat exchangers

- Perform radiation experiments: determine surface emissivity of a test plane and Stefan-Boltzmann's constant and compare with theoretical values

- Estimate heat transfer coefficients in condensation, boiling and effectiveness of heat pipe
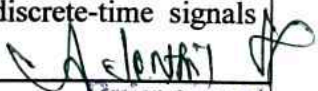
Department of Electronics & Communication Engineering

19A04301   SIGNALS AND SYSTEMS

Course Outcomes:

- Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques.

- Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems.

- Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods.

- Classify the systems based on their properties and determine the response of them.

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19A04302T ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:

- Understand principle, operation, characteristics and applications of Bipolar Junction Transistor and Field Effect Transistor
- Describe basic operation and characteristics of various semiconductor devices.
- Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze low frequency and high frequency models of BJT and FET.
- Design various biasing circuits for BJT and FET.
- Compare the performance of various semiconductor devices.

19A04304 DIGITAL ELECTRONICS AND LOGIC DESIGN

Course Outcomes:

- Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits.
- Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Alsodescribe the various performance metrics for logic families.
- Design combinational and sequential logic circuits.
- Compare different types of Programmable logic devices and logic families.

19A04302P   ELECTRONIC DEVICES AND CIRCUITS LAB

Course Outcomes:

- Understand the basic characteristics and applications of basic electronic devices.
- Observe the characteristics of electronic devices by plotting graphs
- Analyze the Characteristics of UJT, BJT, FET, and SCR
- Design FET based amplifier circuits/BJT based amplifiers for the given specifications.
- Simulate all circuits in PSPICE /Multisim.

19A04303   BASIC SIMULATION LAB

Course Outcomes:

- Understand the basic concepts of programming in MATLAB and explain use of built-infunctions to perform assigned task.
- Generate signals and sequences, Input signals to the systems to perform various operations
- Analyze signals using Fourier, Laplace and Z-transforms.
- Compute Fourier transform of a given signal and plot its magnitude and phase spectrum.
- Verify Sampling theorem, Determine Convolution and Correlation between signals and sequences.

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2-2 SEMESTER
19A04401 ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
Course Outcomes:

• Explain basic laws of electromagnetic fields and know the wave concept.
• Solve problems related to electromagnetic fields.
• Analyze electric and magnetic fields at the interface of different media.
• Derive Maxwell's equations for static and time varying fields.
• Analogy between electric and magnetic fields.
• Describes the transmission lines with equivalent circuit and explain their characteristic withvarious lengths.

19A04402T ELECTRONIC CIRCUITS-ANALYSIS AND DESIGN
Course Outcomes:
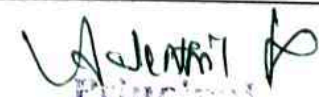
• Understand the working principle of multistage amplifiers, Feedback amplifiers, poweramplifiers, tuned amplifiers, Multivibrator and Time base generators
• Analyse multistage amplifiers, multistage amplifiers, feedback amplifiers, power amplifiers, tuned amplifier and Multivibrators.
• Design multistage amplifiers, feedback amplifiers, oscillators, Multivibrator, power amplifiers and tuned amplifiers for given specification.
• 4. Evaluate efficiency of large signal (power) amplifiers and voltage regulators

19A02404 CONTROL SYSTEMS
Course Outcomes:

• Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis
• Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.
• Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
• Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

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19A04403T   ANALOG COMMUNICATIONS

Course Outcomes:

- Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes and understand the concepts of information theory with random processes.
- Apply the concepts to solve problems in analog and pulse modulation schemes.
- Analysis of analog communication system in the presence of noise.
- Compare and contrast design issues, advantages, disadvantages and limitations of variousmodulation schemes in analog communication systems.
- Solve basic communication problems & calculate information rate and channel capacity ofa discrete communication channel.

19A04404   COMPUTER ARCHITECTURE AND ORGANIZATION

Course Outcomes:

- Conceptualize basics of organizational and architectural issues of a digital computer
- Emphasize representation of data types, numbers employed in arithmetic operations and binary coding of symbols used in data processing
- Develop low-level programs to perform different basic instructions
- Evaluate various modes of data transfer between CPU and I/O devices
- Analyze various issues related to memory hierarchy
- Design basic computer system using the major components

19A04402P   ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

Course Outcomes
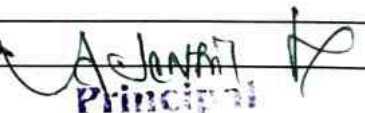
- Understand Characteristics and frequency response of various amplifiers
- Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers.
- Determine the efficiencies of power amplifiers
- Design RC and LC oscillators, Feedback amplifier for specified gain and multistage amplifiers for Low, Mid and high frequencies
- Simulate all the circuits and compare the performance.

19A04403P   ANALOG COMMUNICATIONS LAB

Course Outcomes:

- Understand different analog modulation techniques &Radio receiver characteristics.
- Analyze different analog modulation techniques.
- Design and implement different modulation and demodulation techniques.
- Observe the performance of system by plotting graphs & Measure radio receiver characteristics.
- Simulate all digital modulation and demodulation techniques.

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19A04501T INTEGRATED CIRCUITS AND APPLICATIONS

Course Outcomes:

- Understand DC and AC characteristics of operational amplifiers & Op amp parameters and functionality of specialized ICs such as 555 TIMER, VCO, PLL & Voltage regulators.
- Make use of Op-Amps and specialized ICs to design circuits for various applications.
- Analyze Op-Amp based Comparators, Waveform generators, Active filters, Converters.
- Design of Op amp based Comparators, Waveform Generators, Active filters, Converters, design various multi-vibrator circuits using IC 555 timer
- Compare different types of A/D and D/A Converter circuits.
- A thorough understanding of operational amplifiers with linear integrated circuits.

19A04502 Antenna & wave propagation –

Course Outcomes:

- Understand various antenna parameters, principle of operation of various antennas viz. wired, aperture, micro strip antennas.
- Discuss various EM wave propagation methods in ionosphere and troposphere
- Analyze mathematical aspects of wave propagation, Derive expressions related to radiation mechanisms for antennas
- Design various antennas namely array, micro strip, horn, lens and aperture antennas, etc., for a given application.
- Compare performance of various antennas.
- Create an application by using different antennas in optical communications.

19A52601T ENGLISH LANGUAGE SKILLS

Course outcomes:

- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Develop the ability to understand and identify important moments in a biography

19A04504T Digital Communications

Course outcomes:

- Understand the elements of digital communication system, baseband pulse transmission, pass band digital modulation.
- Apply the concepts of signals and system & statistical theory to evaluate the performance of digital communication systems.
- Analyze the different coding, modulation techniques, Probability of error performance of digital system.

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- Compare the performance of different modulation schemes& error correcting codes.
- Evaluate the digital communication system with spread spectrum modulation.
- Able to create real time applications by using PCM, TDM concepts in power electronics

19A04504a DATA COMMUNICATIONS AND NETWORKING

Course outcomes:

• Understand the basics of data communication, networking, internet and their importance.
• Analyze the services and features of various protocol layers in data networks.
• Differentiate wired and wireless computer networks
• Analyse TCP/IP and their protocols.
• Recognize the different internet devices and their functions.
• Explain the principles and mechanisms of switching.
• 7.Analyze multiple access techniques and network layer protocols

19A52506A TECHNICAL COMMUNICATION AND PRESENTATION SKILLS

Course outcomes:

• Understand the importance of effective technical communication
• Apply the knowledge of basic skills to become good orators
• Analyze non-verbal language suitable to different situations in professional life
• Evaluate different kinds of methods used for effective presentations
• Create trust among people and develop employability skills
• Acquisition of technical communication's generic aspects like Reading Technical Material, Technical Writing, Listening, Thinking and using technical phrases.

19A04501P INTEGRATED CIRCUITS AND APPLICATIONS LAB

Course outcomes

• Understand the working of Op amp ICs & Application specific analog ICs.
• Analyze operational amplifier based circuits for linear and non-linear applications.
• Design Operational amplifiers for linear and nonlinear application, Multivibrator circuitsusing 555 & application specific ICs.
• Simulate all linear and nonlinear application based Op amp Circuits and circuits based onapplication specific ICs.
• Compare theoretical, practical & simulated results in integrated circuits.

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19A52601P ENGLISH LANGUAGE SKILLS LAB

Course outcomes

• Remember and understand the different aspects of the English language proficiency withemphasis on LSRW skills
• Apply communication skills through various language learning activities
• Analyze the English speech sounds, stress, rhythm, intonation and syllable division forbetter listening and speaking comprehension.
• Evaluate and exhibit acceptable etiquette essential in social and professional settings
• Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

19A04503P DIGITAL COMMUNICATIONS LAB

Course Outcomes

• Understand real time behavior of different digital modulation schemes and technicallyvisualize spectra of different digital modulation schemes.
• Design and implement different modulation and demodulation techniques.
• Analyze digital modulation & demodulation techniques.
• Simulate all digital modulation and demodulation techniques in MATLAB.

19A04601T MPMC

COURSE OUTCOMES

• Understand the fundamentals of Microprocessors and Microcontrollers
• Evaluate the architecture, memory organization of microprocessor 8085, 8086 and microcontroller 8051.
• Compare between microprocessor and microcontroller, 8085& 8086 microprocessors, design applications using microcontrollers.
• Analyze the functioning of hardware devices and interfacing them into x86 family
• Apply the programing knowledge for arithmetic and logical operations in 8086 & 8051
• Able to explain architecture, addressing modes,instruction set of ARM Cortex M0+.

19A04602T   DIGITAL SIGNAL PROCESSING

COURSE OUTCOMES

• Understand the mathematical operation on discrete signals.
• Analyze the magnitude and phase response of DFT, Inverse DFT and FFT of discrete time signals.
• Design of analog and digital Filters for a given specification..
• Compare and Verify various transform techniques and filters
• Apply the concepts of transform techniques in realizing discrete time signals.
• Able to design FIR filter using window techniques and and basic concepts of Digital Signal Processor architecture

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19A04603 DIGITAL SYSTEM DESIGN THROUGH VHDL
COURSE OUTCOMES

- Understand the architecture of FPGAs, tools used in modelling of digital design and modelling styles in VHDL.
- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
- Model complex digital systems at several levels of abstractions, behavioural, structural.
- Design complex digital CPU, vending machine and washing machines etc and analyze the case studies.

19A04605d EMI
COURSE OUTCOMES

- Understand the basic principles of various meters, CROs, signal generators and analyzers, bridges, sensors and transducers.
- Analyze the functioning of various types of probes, derive the balanced condition for various bridges.
- Compare the principles of working of wave analyzer and spectrum analyzer, types of bridge circuits.
- Evaluate different types of sensors and transducers used in electronic measurements.
- Develop the ability to measure temperature and pressure accurately using appropriate sensors and instruments
- Apply the fundamental principles and techniques of electronic measurements and instrumentation to accurately measure various electrical parameters.

19A04602P Digital Signal Processing Lab
COURSE OUTCOMES

- Understand the mathematical operation on discrete signals
- Sketch the magnitude and phase response of DFT, Inverse DFT and FFT of discrete time signals
- Calculate linear and circular convolution of discrete sequences.
- Implement Z transform and inverse Z transform of discrete signals
- Model IIR and FIR filter using window techniques

19A04601P MPMC LAB
COURSE OUTCOMES

- Understand and apply the fundamentals of assembly level programming of microprocessors, microcontroller and ARM Cortex M0 microprocessors
- Evaluate the execution of different programs for 8086 and 8051 in Assembly Level Language using the MASM Assembler

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- Apply the knowledge and skills gained to design and implement specific real-time applications.
- Analyze and debug mixed-language programs to identify and resolve issues related to calling conventions, parameter passing, and stack management between assembly and C code.
- Gain the ability to familiarize with MASM, Embedded C, and Code composer studio.
- Develop and simulate programs using MASM / TASM software.

Department of Computer Science & Engineering

(19A05101T) PROBLEM SOLVING AND PROGRAMMING

CO1: Understand the fundamental concepts of computers, algorithms, flowcharts and problem solving techniques.
CO2 Apply the basic knowledge of mathematical factoring methods to model an algorithm, flowchart for a given problem.
CO3 Apply sorting, searching and text processing techniques to develop algorithms.
CO4 Analyze the given problem, use appropriate array technique and write an effective report.

(19A05201T) DATA STRUCTURES

CO1: Recognize the importance of Graphs in solving real world problems
CO2: Apply various graph traversal methods to applications
CO3: Design a minimum cost solution for a problem using spanning trees
CO4: Select the appropriate hashing technique for a given application
CO5: Design a hashing technique

(19A05301) DIGITAL LOGIC DESIGN

CO1: Analyze the number systems and codes
CO2: Decide the Boolean expressions using Minimization methods
CO3: Design the sequential and combinational circuits
CO4: Apply state reduction methods to solve sequential circuits
CO5: Describe various types of memories.

(19A05302T) DATABASE MANAGEMENT SYSTEMS

CO1: Design a database for a real world information system
CO2: Define transactions which preserve the integrity of the database
CO3: Generate tables for a database

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CO4: Organize the data to prevent redundancy
CO5: Pose queries to retrieve the information from database.

(19A05303T) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

CO1: To solve real world problems using OOP techniques.
CO2: To apply code reusability through inheritance, packages and interfaces
CO3: To solve problems using java collection framework and I/O classes
CO4: To develop applications by using parallel streams for better performance.
CO5: To develop applets for web applications.
CO6: To build GUIs and handle events generated by user interactions.

(19A05304T) PYTHON PROGRAMMING

CO1: Apply the features of Python language in various real applications.
CO2: Select appropriate data structure of Python for solving a problem.
CO3: Design object oriented programs using Python for solving real-world problems.
CO4: Apply modularity to programs.

(19A05401) COMPUTER ORGANIZATION

CO1: Understand computer architecture concepts related to design of modern processors, memories and I/Os
CO2: Identify the hardware requirements for cache memory and virtual memory
CO3: Design algorithms to exploit pipelining and multiprocessors
CO4: Understand the importance and tradeoffs of different types of memories.102 Page
CO5: Identify pipeline hazards and possible solutions to those hazards
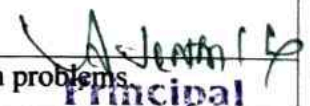
(19A05402T) DESIGN AND ANALYSIS OF ALGORITHMS

CO1: Determine the time complexity of an algorithm by solving the corresponding recurrence equation
CO2: Apply the Divide and Conquer strategy to solve searching, sorting and matrix multiplication problems.
CO3: Analyze the efficiency of Greedy and Dynamic Programming design techniques to solve the optimization problems.
CO4: Apply Backtracking technique for solving constraint satisfaction problems.

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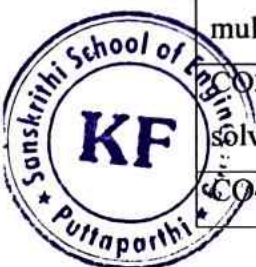
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CO5: Analyze the LC and FIFO branch and bound solutions for optimization problems, and compare the time complexities with Dynamic Programming techniques.
CO6: Define and Classify deterministic and Non-deterministic algorithms; P, NP, NP –hard and NP-complete classes of problems.

(19A05403T) OPERATING SYSTEMS

CO1: Understand the basics of operating systems like kernel, shell, types and views of operating systems
CO2: Describe the various CPU scheduling algorithms and remove deadlocks.
CO3: Explain various memory management techniques and concept of thrashing
CO4: Use disk management and disk scheduling algorithms for better utilization of external memory.
CO5: Recognize file system interface, protection and security mechanisms.
CO6: Explain the various features of distributed OS like UNIX, Linux, windows etc

(19A05404T) SOFTWARE ENGINEERING

CO1: Summarize various methods of software quality management.
CO2: Instruct the quality management standards ISO 9001, SEI CMM, PSP, and Six Sigma.
CO3: Outline software quality assurance, quality measures, and quality control.
CO4: Identify the basic issues in software maintenance, CASE support, and software reuse.

(19A05501) FORMAL LANGUAGES AND AUTOMATA THEORY

CO1: Explain formal machines, languages and computations
CO2: Design finite state machines for acceptance of strings
CO3: Develop context free grammars for formal languages
CO4: Build pushdown automata for context free grammars
CO5: Apply Turing machine for solving problems
CO6: Validate decidability and un-decidability

(19A05502T) ARTIFICIAL INTELLIGENCE

CO1:	Apply	searching	techniques	for	solving	a	problem
CO2:		Design		Intelligent			Agents
CO3:	Develop	Natural	Language	Interface	for		Machines

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CO4:	Design	mini	robots

CO5: Summarize past, present and future of Artificial Intelligence

(19A05503T) OBJECT-ORIENTED ANALYSIS DESIGN AND TESTING

CO1: Analyze the problem from object oriented perspective

CO2:	Model	complex	systems	using	UML	Diagrams
CO3:	Choose	the	suitable	design	patterns	in	software	design
CO4:	Adapt	Object-Oriented	Design	Principles

CO5: Identify the challenges in testing object-oriented software.

(19A05505b) WEB TECHNOLOGIES

CO1: Construct a basic website using HTML and Cascading Style Sheets.
CO2: Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
CO3: evelop server side programs using Servlets and JSP.
CO4: onstruct simple web pages in PHP and represent data in XML format.

CO5: Utilize AJAX and web services to develop interactive web applications.

(19A05601) CRYPTOGRAPHY AND NETWORK SECURITY

CO1: Identify various type of vulnerabilities of a computer network
CO2: Outline various security algorithms
CO3: Design secure systems
CO4: Investigate the threats and identify the solutions for threats

(19A05602T) BIG DATA ANALYTICS

CO1: Explain the concepts and challenges of big data
CO2: Determine why existing technologies are inadequate to analyze the large data.
CO3: Outline the operations viz. collect, manage, store, query, and analyze various forms of big data.
CO4: Apply large-scale analytic tools to solve some of the open big data problems.
CO5: Analyze the impact of big data for business decisions and strategies.
CO6: Design different big data applications.

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(19A05603a) SYSTEMS SOFTWARE AND COMPILER DESIGN

CO 1: Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.
CO 2: Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.
CO 3: Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.
CO 4: Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
CO 5: Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.

(19A05603b) MACHINE LEARNING

CO1: Identify machine learning techniques suitable for a given problem.
CO2: Solve the real world problems using various machine learning techniques.
CO3: Apply Dimensionality reduction techniques for data preprocessing.
CO4: Explain what is learning and why it is essential in the design of intelligent machines.
CO5: Implement Advanced learning models for language, vision, speech, decision making etc.

(19A05603c) DESIGN PATTERNS

CO1: Develop own way of working with design patterns.
CO2: Critique well-known design patterns
CO3: Distinguish different categories of design patterns
CO4: Apply common design patterns to incremental/iterative development
CO5: Identify appropriate patterns for solving a given problem.

(19A05701T) INTERNET OF THINGS

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CO1: Choose the sensors and actuators for an IoT application
CO2: Select protocols for a specific IoT application
CO3: Utilize the cloud platform and APIs for IoT applications
CO4: Experiment with embedded boards for creating IoT prototypes
CO5: Design a solution for a given IoT application

(19A05702T) SOFTWARE TESTING

CO1: Choose Test cases that are geared to discover the program defects
CO2: Design test cases before writing code and run these tests automatically
CO3: Formulate test cases for testing different programming constructs.
CO4: Test the applications using different testing methods and automation tools.

(19A05703a) CLOUD COMPUTING

CO1: Outline the procedure for Cloud deployment
CO2: Distinguish different cloud service models and deployment models
CO3: Compare different cloud services.
CO4: Design applications for an organization which use cloud environment.

(19A05703b) NATURAL LANGUAGE PROCESSING

CO1: Build NLP applications using Python.
CO2: Apply various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
CO3: Explain the fundamentals of CFG and parsers and mechanisms in ATN's.
CO4: Apply Semantic Interpretation and Language Modeling.
CO5: Interpret Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

(19A05801b) DEEP LEARNING

CO1: Apply linear algebra and probability theory in the deep learning applications
CO2: Elaborate the challenges and motivations to Deep learning
CO3: Differentiate the architectures of deep neural network
CO4: Build a convolution neural network

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CO5: Build and train RNN and LSTMs

(19A05801c) AD HOC AND SENSOR NETWORKS

CO1: List the design issues for Adhoc and sensor networks
CO2: Analyze the use of TCP in Wireless networks.
CO3: Justify the need for new MAC Protocols for Adhoc networks.
CO4: Extend the existing protocols to make them suitable for Adhoc Networks.
CO5: Evaluate the performance of Protocols in Adhoc and sensor networks.
CO6: Design new Protocols for Adhoc and Sensor networks

Department of Humanities & Sciences
19A51101T Chemistry

Course Outcomes	
CO 1	Recall the theoretical concepts of chemistry and their limitations in depth
CO 2	Explain chemical reactions and their properties in terms of energy transfer, time frame, synthesis and applications.
CO 3	Utilize the laws of chemistry to solve problems.
CO 4	Use working principles of basic chemistry to gain the knowledge on existing and future materials and technology.
CO 5	Explain the data of quantitative chemical analysis and make use of simple model, equations to solve problems related to basic chemistry.

19A51101T P Chemistry Lab

CO 1	Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, pH, turbidity, refractive index, chloride content of water, etc.
CO 2	Estimate concentration of an unknown sample via acid-base and redox titrations..
CO 3	. Synthesize a small drug molecule and analyze a salt sample.
CO 4	Identify the acid base radicals.
CO 5	Separate the components present in a mixture by TLC

19A54101 MATHEMATICS-I (M 101)

Course Outcomes	
CO 1	Summarize the concepts of matrix algebra

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CO 2	Solve the problems of Successive differentiations; Mean value theorems, Reduction formula
CO 3	Understand the theory of functions of several variables
CO 4	Determine the convergence of Infinite series.
CO 5	Describe and Utilize the concepts of Vector algebra and calculus for solving problems

19A52101T Communicate English Theory

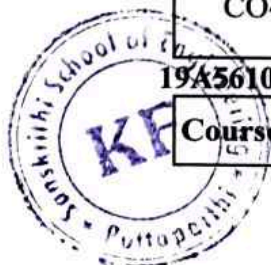| Course outcome	
CO 1	Write grammatically correct English to express in a lucid manner
CO 2	Summarize technical and non technical passages written in English
CO 3	Understand and write different organizational communications like Notice, Memorandum, Circular, Agenda Job Application letter CV, Resume , Business Letters, Technical Reports.
CO 4	Explain the various concepts of Technical Communication and its utility in profession.

19A52101P Communicate English Lab

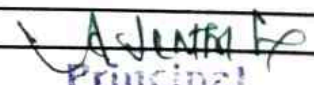| Course Outcome	
CO 1	Develop listening and reading skills for better comprehension ability.
CO 2	Coordinate in a group on contemporary topics to enhance speaking ability and presentation skills.
CO 3	Build vocabulary to enhance speaking and writing skills.
CO 4	Demonstrate proper body language while expressing one's ideas or opinions.
CO 5	Interpret their views in English so as to overcome stage fear and build self confidence.

19A56102T ENGINEERING PHYSICS

Course Outcome	
CO1	Recognize and identify real life examples from the basic fundamentals of Physics such as classical, quantum, statistical mechanics, dielectric and magnetic properties and solid state
CO2	Explain the concepts of Physics required for technology.
CO3	Utilize different theoretical formulation of Physics in solving engineering problems.
CO4	Compare the quantitative and qualitative results obtained from various Physical phenomena.

19A56102P ENGINEERING PHYSICS

Course Outcome	

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CO 1	Verify the theoretical formulations/concept of Physics..
CO 2	Know the art of recording the observations of an experiment scientifically.
CO 3	Learn by doing.
CO 4	Handle and operate the various elements/ parts of experiments
CO 5	Understand the importance of experiments in engineering & technology

B. Tech R20 Regulation
Department of Civil Engineering

Subject Name: 20A03101TEngineering Drawing

Course outcome:

At the end of this unit the student will be able to

• understand the significance of engineering drawing
• know the conventions used in the engineering drawing
• identify the curves obtained in different conic sections
• draw different curves such as cycloid, involute and hyperbola

Subject Name: 20A03101PEngineering Graphics Lab

Course outcome:

After completing the course, the student will be able to

• Use computers as a drafting tool.
• Draw isometric and orthographic drawings using CAD packages.

Subject Name: 20A01201TStrength of Materials

Course outcome:

At the end of this unit, the students will be able to

• Understand the basic concepts of forces
• Draw Free body Diagrams for forces
• Determine the centroid and moment of inertia for different cross section areas

Subject Name: 20A01201PStrength of Materials Lab

Course outcome:

By performing the various tests in this laboratory, the student will be able to know the structuralbehavior various structural elements when subjected to external loads

Subject Name: 20A54301Probability and Statistics for Civil Engineering

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Course outcome:

At the end of the course, student will be able to

• Understand the concepts of probability, sampling distributions, test of hypothesis and curve fitting.
• Explain the characteristics through correlation and regression tools.
• Apply Probability theory to find the chances of happening of events.
• Understand various probability distributions and calculate their statistical moments.
• Solve the problems on testing of hypothesis on large samples and small samples and fitting of the curves.

Subject Name: 20A01301Advanced Strength of Materials

Course outcome:

• Determine deflection at any point on a beam under simple and combined loads
• Apply energy theorems for analysis of indeterminate structures
• Analyze indeterminate structures with yielding of supports
• Analyze beams and portal frames using slope deflection and moment distribution methods
• Analyze bending moment, normal thrust and radial shear in the arches

Subject Name: 20A01302TFluid Mechanics and Hydraulic Machines

Course outcome:

• Familiarize basic terms used in fluid mechanics
• Understand the principles of fluid statics, kinematics and dynamics
• Understand flow characteristics and classify the flows and estimate various losses in flow through channels
• Analyze characteristics for uniform and non-uniform flows in open channels.
• Design different types of turbines, centrifugal and multistage pumps.

Subject Name: 20A01303T SURVEYING

Course outcome:

At the end of the course, the student will be able to:

• Calculate angles, distances and levels
• Identify data collection methods and prepare field notes

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- Understand the working principles of survey instruments
- Estimate the volumes of earth work
- Able to use modern survey instruments.

Subject Name: 20A01304Basic Civil Engineering Laboratory

Course outcome:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials and tools to make a job as per given specification/drawing.

Subject Name: 20A01302PFluid Mechanics and Hydraulic Machines Lab

Course outcome:

- By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes and working principles of various pumps and motors.

Subject Name: 20A01303PSurveying Lab

Course outcome:

- By performing the various tests in this laboratory the student will be able to know the principles of surveying in chain surveying, compass surveying, plane table surveying, levelling, theodolite surveying and total station

Subject Name: 20A05305Skill oriented course - I Application development with Python
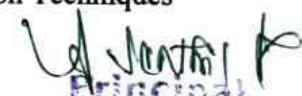
Course outcome:

Students should be able to

- Identify the issues in software requirements specification and enable to write SRS documents for software development problems
- Explore the use of Object oriented concepts to solve Real-life problems
- Design database for any real-world problem
- Solve mathematical problems using Python programming language

Subject Name: 20A54401Mathematical Modeling& Optimization Techniques

Course outcome:

After the completion of Course, students will be able to

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• Know about the classifications and stages of mathematical modeling
• Understand building of mathematical models
• Study the behavior of mathematical models
• formulate a linear programming problem and solve it by various methods
• give an optimal solution in assignment jobs, give transportation of items from sources to destinations.

Subject Name: 20A01401TEngineering Geology

Course outcome:

At the end of the course student will be able to

• Gain basic knowledge on characteristics of rocks and
• Gain basic knowledge on characteristics of minerals.
• Identify and differentiate rocks using geological classification.
• Carry out geo physical investigations for infrastructural projects.
• Apply concepts of structural geology for civil engineering structures

Subject Name: 20A01402Structural Analysis – I

Course outcome:

• Determine deflection at any point on a beam under simple and combined loads
• Apply energy theorems for analysis of indeterminate structures
• Analyze indeterminate structures with yielding of supports
• Analyze beams and portal frames using slope deflection and moment distribution methods
• Analyze bending moment, normal thrust and radial shear in the arches

Subject Name: 20A01403TConcrete Technology

Course outcome:

At the end of the course student is able to

• Understand various ingredients of concrete and their role.
• Examine knowledge on the fresh and hardened properties of concrete.
• Examine the the behavior of concrete with response to stresses developed
• Design concrete mixes using various methods.
• Perceive special concretes for accomplishing performance levels

Subject Name: 20A01404TEnvironmental Engineering - I

Course outcome:

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At the end of the course, the student will be able to:

•	Understand about quality of water and purification process
•	Select appropriate technique for treatment of wastewater.
•	Assess the impact of air pollution
•	Understand consequences of solid waste and its management
•	Design domestic plumbing systems

Subject Name: 20A01401PEngineering Geology Lab

Course outcome:

- At the end of the course the students will be able to classify various types of rocks, their properties and they will be familiar with interpretation of geological maps.

Subject Name: 20A01405Concrete Materials Lab

Course outcome:

At the end of the course, the student will be able

•	To find the characteristics of fine and coarse aggregates
•	To understand the workability behaviour of concrete through various tests

Subject Name: 20A01404PEnvironmental Engineering Lab

Course outcome:

•	At the end of the course, the student will be able to Understand about quality of water standards

Subject Name: 20A52401**Skill oriented course – II** Soft Skills

Course outcome:

By the end of the program students should be able to

•	Memorize various elements of effective communicative skills
•	Interpret people at the emotional level through emotional intelligence
•	apply critical thinking skills in problem solving
•	analyse the needs of an organization for team building
•	Judge the situation and take necessary decisions as a leader
•	Develop social and work-life skills as well as personal and emotional well-being

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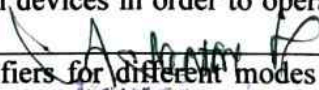## Electrical and Electronics Engineering

POWER ELECTRONICS	20A02401T
Students able to understand the operation and characterstics of different types of power swithcing devices	
students able to differentiate different types of thyristor rectifiers in power conversion applications	
students able to implement DC-DC converters to step up/step down the DC Voltage in Power transmission and distribution	
students able to check the working and operation of various voltage source inverters in DC-AC power conversion	
students able to generate voltages at different frequencies by using power conversion devices	
students able to explore and recall different types of power conversion devices in real time applications	

AC MACHINES	20A02402T
Students able to understand different types of winding connections used in different types of ac machines	
Check the performance of different types of Induction motors by conducting various tests.	
Summarise the construction and working of different types of synchronous generators	
Differentiate the construction, working and starting methods of synchronous motors compared to Induction motors	
Implement different constructions of single phase motors in domestic applications	
Exploring different types of AC Motors in real time applications	

ELECTRICAL CIRCUIT ANALYSIS	20A02301T
Students able to recognise different types of active and passive circuits used in ac and dc circuits	
Students able to differntiate different types of port parameters used in transformed variables	
Critiquing different combination of circuits for obtaining transiant response by different methods	
Generate Fourier transform equation in application of electrical circuits	
Implement different types of filters to reduce distortions while signal transmission	
Explore different types of circuit elements and combinational circuits in real time applications.	

POWER ELECTRONICS LAB	20A02401P
Students able to recognise different types of power conversion devices in order to operate different loads	
students able to differentiate different types of thyristor rectifiers for different modes of operation	

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Apply commutaion methods in SCR's in order to turn off SCR's

Generate Dual conversion circuit to operation different types of loads simtanously.

Critiquing different types of inverters and converters for operating different loads

Explore different types of power converters in real time applications

AC MACHINES LAB	**20A02402P**
Check the performance of different types of induction motors by conducting various tests	
students able to differentiate different types of AC Motors for different load conditions	
Critiquing different types of regulation methods in order to test theperformance of alternators	
Generate speed control circuit for induction motor	
Students able to recognise different types of AC Machines by their construction	
Explore different types of AC Motors in Real time applications	

Subject – Measurements & Sensors lab 20A02503P (R20)

1Recognise the functions various types of electrical measuring instruments.
2 Understand the concept of calibration of single phase Energy meter using Phantom loading method.
3 Apply standard procedures for measurement of resistance, inductance and capacitance.
4 Analyze the calibration of various electrical measuring and recording instruments.
5 Checking various methods for power measurements in Ac circuit and examine the calibration of meters.
6 Generate reactive power measurements in 3-phase circuit using single wattmeter.

Subject – Power system Analysis lab 20A02601P (R20)

1 Remember the concept of Y bus and Z bus formation, writing programming in MATLAB software.
2 Understand the concepts load flow studies, writing programming in MATLAB software.
3 Apply the concept of economic load dispatch for develop a program in MATLAB software.
4 Analyze the load flow analysis using different algorithms.
5 Evaluate the fault analysis by conducting experiment on a LG and LL faults.
6 Create the simulink model for single area load frequency problem..

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Mechanical Engineering

Fluid Mechanics & Hydraulic Machines

Expected Course Outcomes: The students will be able to

1. Possess a sound knowledge of fundamental properties of fluids and fluid continuum and types of fluid flow.
2. Compute and solve problems on hydrostatics, including practical applications
3. Apply principles of mathematics to represent kinematic concepts related to fluid flow
4. Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications.
5. Compute the discharge through pipes can critically analyze the performance of pumps and turbines

Manufacturing Processes

1 Analyze and access the use of casting processes in manufacturing and understand the working of various casting processes
2 Understand the basics of metal cutting and working of different types of machine tools.
3 Explain the conventional and advanced metal forming processes and composite fabrication.
4 Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the type of industrial application.

Thermodynamics

Expected Course Outcomes:Upon completion of the course students will be able to:

1. Use thermodynamic terminology correctly.
2. Explain fundamental thermodynamic properties.
3. Derive and discuss the first and second laws of thermodynamics.
4. Solve problems using the properties and relationships of thermodynamic fluids.
5. Analyse basic thermodynamic cycles.
6. Students must have understanding of thermodynamic fundamentals before studying their application
in applied thermodynamics.
7. The understanding of thermodynamic properties and processes will assist students in other related
coursework.

Mechanics of Materials

1. Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
2. Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
3. Apply basic equation of simple torsion in designing of shafts and helical spring
4. Calculate the slope and deflection in beams using different methods. Analyze and design thin and thick shells for the applied internal and external pressures.

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Fluid Mechanics & Hydraulic Machines Lab

To provide the students with a solid foundation in fluid flow principles

• To provide the students knowledge in calculating performance analysis in turbines and pumps and can be used in power plants
• Students can able to understand to analyze practical problems in all power plants and chemical industries
• Conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports
• Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design
• Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency
• To provide exposure to modern computational techniques in fluid dynamics

Manufacturing Processes Lab

Expected Course Outcomes: Students shall be able to

1. Acquire knowledge about green sand molding process, gates and risers.
2. Determine the strength and permeability of the molding sand.
3. Demonstrate the welding procedure using Arc, Gas, TIG / MIG welding machines.
4. Acquire the knowledge about the process of making the plastic moulds.

Mechanics of Materials Lab

Expected Course Outcomes: The students will be able to

1. Ability to perform different destructive testing
2. Ability to characteristic materials

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Applied Thermodynamics

Expected Course Outcomes: The students will be able to

1. Demonstrate the principles of thermal engineering in power producing fields.
2. Differentiate among different internal combustion engine designs.
3. Recognize and understand reasons for differences among operating characteristics of different engine types and designs.
4. Analyze engineering systems needed to set-up and run engines in controlled laboratory environments. 5. Compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations.

Kinematics of Machinery

Expected Course Outcomes: The students after completing the course will be able to:

1. Familiarity with common mechanisms used in machines and everyday life.
2. Identify different mechanisms, Inversions of kinematic chains
3. Ability to perform analysis of different types of links, position, velocity, acceleration analyses.

Manufacturing Technology

Expected Course Outcomes: Students will be able to:

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1. Demonstrate the theory of metal cutting related to lathe, milling machines, drilling machine, grinding machines etc.

2. Select cutting tool materials metal cutting and tool geometries for different metal cutting operations.

3. Select appropriate machining processes for different processes. Understand machine tool structures and machining economics.

Managerial Economics & Financial Analysis

1. To adopt the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services.

2. To assess the functional relationship between Production and factors of production and list out various costs associated with production and able to compute breakeven point to illustrate the various uses of breakeven analysis.

3. To outline the different types of business organizations and provide a framework for analyzing money in its functions as a medium of exchange.

4. To adopt the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts

5 To implement various techniques for assessing the financial position of the business

Applied Thermodynamics Lab

1. The concepts related to the operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics.

2. The techniques for improving the efficiencies and performance of compressors and refrigeration systems retained to practical applications such as irrigation, air conditioning and refining oil and gas.

3. The performance of Heat Engines in real-time applications by applying the various testing parameters of an engine.

Manufacturing Technology Lab

Expected Course Outcomes: Students shall be able to

1. Acquire knowledge about green sand molding process, gates and risers.

2. Determine the strength and permeability of the molding sand.

3. Demonstrate the welding procedure using Arc, Gas, TIG / MIG welding machines.

4. Acquire the knowledge about the process of making the plastic moulds.

Computer Aided Machine Drawing

Course Outcomes: At the end of the course, the student will be able to

1 Use the conventional representations of materials and machine components

2 Model various riveted, welded and key joints

3 Generate solid models and sectional views of machine components

4 Develop solid models of machine parts and assemble them

5 Generate the sectional views of assembled components

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Electronics and Communications Engineering
20A04101T   Electronic Devices & Circuits
COURSE OUTCOMES:-

1.	Understand principle of operation, characteristics and applications of Semiconductor diodes, Bipolar Junction Transistor and MOSFETs.
2.	Applying the basic principles solving the problems related to Semiconductor diodes, BJTs, and MOSFETs.
3.	Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze biasing circuits of BJTs, and MOSFETs
4.	Design of diode circuits and amplifiers using BJTs, and MOSFETs.
5.	Compare the performance of various semiconductor devices.

(20A04101P) ELECTRONIC DEVICES & CIRCUITS LAB
COURSE OUTCOMES:-

1.	Understand the basic characteristics and applications of basic electronic devices.
2.	Observe the characteristics of electronic devices by plotting graphs.
3.	Analyze the Characteristics of UJT, BJT, MOSFET
4.	Design MOSFET / BJT based amplifiers for the given specifications
5.	Simulate all circuits in PSPICE /Multisi

20A54301T SIGNALS AND SYSTEMS
COURSE OUTCOMES:-

- Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques.
- Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems.
- Analyze the frequency spectra of various continuous-time and discrete-time signals usingdifferent transform methods.
- Classify the systems based on their properties and determine the response of them.

20A04302T ANALOG CIRCUITS
COURSE OUTCOMES:-

- Understand the characteristics of differential amplifiers, feedback and power amplifiers.
- Examine the frequency response of multistage and differential amplifier circuits using BJT & MOSFETs at low and high frequencies.
- Investigate different feedback and power amplifier circuits based on the application.
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LCoscillator circuits.
- Evaluate the performance of different tuned amplifiers and multivibrators
- Design analog circuits for the given specifications and application.

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SIMULATION LAB(R20,2-1)
COURSE OUTCOMES

- Understand how to use the MATLAB software and know syntax of MATLAB programming.
- Acquire the ability to generate and manipulate different types of signals, such as continuous-time and discrete-time signals, using simulation software.
- Apply the concepts of signals to determine their energy, power, psd etc
- Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals.
- Evaluate the effectiveness of simulation techniques in capturing the behavior of signals and systems, comparing simulated results with theoretical analysis or experimental measurements.
- Compare the statistical properties of the signals such as mean, standard deviation, variance, or correlation to assess their similarities or differences.

20A04302P ANALOG CIRCUITS LAB
COURSE OUTCOMES:-

- Know about the usage of equipment/components/software tools used to conduct the experimentsin analog circuits.
- Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit (viz. Voltage gain, Current gain, bandwidth, input and output impedances etc) experimentally.
- Analyze the given analog circuit to find required important metrics of it theoretically.
- Draw the relevant graphs between important metrics of the system from the observed measurements.
- Compare the experimental results with that of theoretical ones and infer the conclusions.
- Design the circuit for the given specifications.

20A04303T Digital Logic Design
COURSE OUTCOMES

- Understand number systems and its conversion; simplify Boolean expressions by different methods and implementation using logic gates.
- Apply the Boolean algebra knowledge of mathematics to analyze combinational and sequential digital electronic circuits using K-map and QM technique.
- Able to Design combinational and sequential circuits for the given specifications/constraints.
- Design & Synthesize the state diagram, state table, state equation for Finite state machine.
- Compare the characteristics of logic families for implementing combinational & sequential circuits.
- Analyze and Demonstrate the applications of digital circuits

20A04401 ELECTROMAGNETIC WAVES ANDTRANSMISSION LINES
COURSE OUTCOMES

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- Explain basic laws of electromagnetic fields and know the wave concept.
- Solve problems related to electromagnetic fields.
- Analyze electric and magnetic fields at the interface of different media.
- Derive Maxwell's equations for static and time varying fields.
- Analogy between electric and magnetic fields. (
- Describes the transmission lines with equivalent circuit and explain their characteristic withvarious lengths.

20A04402T COMMUNICATION SYSTEMS
COURSE OUTCOMES

- Recognize/List the basic terminology used in analog and digital communication techniques fortransmission of information/data.
- Explain/Discuss the basic operation of different analog and digital communication systems atbaseband and passband level.
- Compute various parameters of baseband and passband transmission schemes by applying basicengineering knowledge.
- Analyze/Investigate the performance of different modulation & demodulation techniques tosolve complex problems in the presence of noise.
- Evaluate/Assess the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency.

20A04403T LINEAR AND DIGITAL IC APPLICATIONS
COURSE OUTCOMES

- Understanding of the different families of digital integrated circuits and their characteristics. List out the characteristics of Linear and Digital ICs.
- Discuss the various applications of linear & Digital ICs.
- Solve the application based problems related to linear and digital ICs.
- Analyze various applications based circuits of linear and digital ICs.
- Design the circuits using either linear ICs or Digital ICs from the given specifications.
- A thorough understanding of operational amplifiers with linear integrated circuits.

20A04303P DIGITAL LOGIC DESIGN LAB
Course Outcomes :

- Understand the pin configuration of various digital ICs used in the lab.
- Construct Boolean functions using logic gates.
- Conduct the experiment and verify the properties of various logic circuits.
- Analyze the sequential and combinational circuits.
- Design sequential and combinational logic circuits and verify their properties.
- Design of any sequential/combinational circuit using Hardware/ HDL.

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20A04402P COMMUNICATION SYSTEMS LAB

Course Outcomes:

- Know about the usage of equipment/components/software tools used to conduct the experimentsin analog and digital modulation techniques.
- Conduct the experiment based on the knowledge acquired in the theory about modulation and demodulation schemes to find the important metrics of the communication system experimentally.
- Analyze the performance of a given modulation scheme to find the important metrics of thesystem theoretically.
- Draw the relevant graphs between important metrics of the system from the observedmeasurements.
- Compare the experimental results with that of theoretical ones and infer the conclusions

20A04403P LINEAR AND DIGITAL IC APPLICATIONS LAB

Course Outcomes:

- Understand the pin configuration of each linear/ digital IC and its functional diagram.
- Conduct the experiment and obtain the expected results.
- Analyze the given circuit/designed circuit and verify the practical observations with theanalyzed results.
- Design the circuits for the given specifications using linear and digital ICs.
- Acquaintance with lab equipment about the operation and its use.
- Design of Linear and Non Linear Applications using IC 741

Computer science and Engineering

OBJECT ORIENTED PROGRAMMING THROUGH JAVA (20A05302T)

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.Demonstrate knowledge on:
• Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.   • Packages, interfaces, multithreading, exception handling, event handling.
CO2.Analyze complex engineering problems using object oriented concepts.
CO3.Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
CO4.Apply AWT and Applets to create interactive Graphical User Interfaces.
CO5.Use advanced programming languages to develop web applications
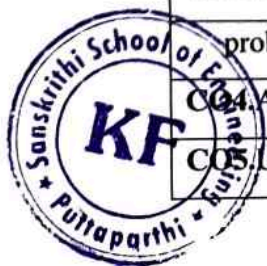
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CO6.Build Java Applications suitable for societal requirements. (PO6)

ADVANCED DATA STRUCTURES & ALGORITHMS (20A05301T)

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.Demonstrate knowledge on:

- Algorithm Complexities and Asymptotic notations.

- Algorithm Design techniques-Divide and Conquer, Greedy Method, dynamic programming, Back tracking, Branch and Bound.

CO2.Analyze the performance of algorithms with respect to Time and Space complexities.

CO3.Design the algorithms for solving real world problems.

CO4.Solve sorting and searching problems using Divide and Conquer method.

CO5.Use dynamic programming and backtracking in finding shortest paths.

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SOFTWARE ENGINEERING (20A05403T)

COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1.Demonstrate knowledge on:
• Fundamental concepts of software engineering.
• Process models.
• Software development life cycle.
CO2.Analyze software requirements and process models required to develop a software system
CO3.Design and develop a quality software product using design engineering principles.
CO4.Develop software product as per user and societal requirements.
CO5.Follow standards for software development and quality management.
CO6.Demonstrate skills in applying risk and quality management principles for effective management of software projects.

FORMAL LANGUAGES AND AUTOMATA THEORY (20A05503)

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.	Demonstrate knowledge on Formal languages and automata.
CO2.	Analyze the classification of languages, automata's and their computing power.
CO3.	Design grammars and automata (recognizers) for regular expressions and Formal languages.
CO4.	Solve computational problems using automata.
CO5.	Apply theorems to translate automata's and identify the class of languages.

CLOUD COMPUTING (20A05701A)

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and Virtualization.
CO2.Analyze the issues in cloud computing Data, Network and Host security.
CO3.Apply API development skills in web applications for Cloud deployment.
CO4.Use research based knowledge to build cloud applications.

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CO5.Use advanced programming languages to access cloud services.

CO6.Build cloud environment suitable for societal requirements.

BIG DATA TECHNOLOGIES (20A05504C)

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.	Demonstrate knowledge on Big Data characteristics, storage, processing, querying and reporting.
CO2.	Analyze large dataset issues and solve using data analytic techniques.
CO3.	Design and Develop classification and clustering models for dataset analysis.
CO4.	Use research knowledge to manage large datasets.
CO5.	Apply MapReduce, Hive, Pig, Sqoop, HBase, and Zookeeper tools for data analytics.
CO6.	Use data analytics tools to solve societal problems.

CRYPTOGRAPHY & NETWORK SECURITY (20A05702B)

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.Demonstrate knowledge on:

- Cryptographic algorithms and their mathematical models
- Message Authentication
- Digital Signatures
- Malicious Software
- Intrusion Detection
- Phishing and Identity Theft

CO2.Analyze vulnerabilities and threats on information systems based on various Security parameters

CO3.Apply security and privacy methods to protect and prevent cyber crimes

CO4.Solve information privacy issues using encryption and digital signatures

CO5.Use firewall and PGP to protect network and e-mail respectively

CO6.Follow standards in implementation of network security

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COMPUTER NETWORKS (20A05501T)

On successful completion of the course, the student will be able to:

CO1. Identify the software and hardware components of a computer network
CO2. Design software for a computer network
CO3. Develop new routing, and congestion control algorithms
CO4. Assess critically the existing routing protocols
CO5. Explain the functionality of each layer of a computer network
CO6. Choose the appropriate transport protocol based on the application requirements

ARTIFICIAL INTELLIGENCE (20A05502T)

On successful completion of the course, the student will be able to:

CO1. Apply searching techniques for solving a problem
CO2. Design Intelligent Agents
CO3. Develop Natural Language Interface for Machines
CO4. Design mini robots
CO5. Summarize past, present and future of Artificial Intelligence

MACHINE LEARNING (20A05602T)
COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

CO1.Demonstrate knowledge on:
• Decision Trees and Bayesian Networks
• Artificial Neural Networks and Association Rules
• Support Vector Machines, Data Science fundamentals.
CO2.Analyze complex datasets and identify suitable machine learning algorithms.
CO3. Design decision making algorithms using supervised and unsupervised approaches.
CO4. Solve complex data analytical problems using machine learning and data science techniques.
CO5. Use Apache Spark and R tools for real-time and batch processing applications.
CO6. Develop machine learning based solutions as per societal needs.

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DATABASE MANAGEMENT SYSTEMS (20A05401T)

COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1. Identify the basic concepts and various data models used in Data Base Design ER modeling concepts and architecture use and design queries using SQL.
CO2 .Apply relational Data Base theory and be able to describe relational algebra expression, tuple and domain relational calculus for queries
CO3 .Recognize and identify the use of normalization and functional dependency indexing and hashing technique used in DB design.
CO4. Analyze and implement the purpose of query processing, optimization and also demonstrate the basic of query evaluation.
CO5. Apply and relate the concept of transaction management, concurrency control and recovery management.
CO6. Develop ER-Diagram for hospital Management.

OPERATING SYSTEMS (20A05402T)

COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1. Describe the basics of operating systems.
CO2. Analyze various issues related to inter process communication like process scheduling, resource management and deadlock.
CO3. Discuss the storage management policies with respect to different storage management techniques.
CO4. Illustrate different conditions for deadlock and their possible solutions.
CO5. list out various security measures of operating system.
CO6. Able to analyze problems related to security and protection.

COMPUTER ORGANIZATION (20A05303)

On successful completion of the course, the student will be able to:

CO1. Understand computer architecture concepts related to the design of modern processors, Memories and I/Os
CO2. Identify the hardware requirements for cache memory and virtual memory

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CO3. Design algorithms to exploit pipelining and multiprocessors
CO4. Understand the importance and trade-offs of different types of memories.
CO5. Identify pipeline hazards and possible solutions to those hazards

COMPILER DESIGN (20A05601T)

On successful completion of the course, the student will be able to:

CO1. Differentiate the various phases of a compiler
CO2. Design code generator
CO3. Apply code optimization techniques
CO4. Identify the tokens and verify the code

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