

P. E. S. College of Engineering, Aurangabad
Department of Computer Science & Engineering
Program outcomes, program specific outcomes

PROGRAM OUTCOMES

After completing four year graduate course of BE (CSE) the students will be able to:

- Understand and proficiently apply the knowledge of mathematics, relevant sciences to CSE, to design software solutions to the given problems.
- An ability to design software & conduct their software simulations and testing to analyze and interpret the results produced and verify their online performance.
- Will be able to design a software automation system for various application areas using efficient algorithms, the computer resources and components, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturing, and sustainability.
- Will be able to Design software projects for multidisciplinary applications areas and will be able to maintain it on field.
- An ability to identify, formulate the problem definitions for which the software solution can be designed and will be able to implement them.
- Will be able to demonstrate commitment by developing professional softwares for various applications as per ethical standards and rules led by society.
- Will be able to communicate with the corporate world effectively by implementing techniques for verbal and nonverbal communication skills taught in syllabus.
- The computer Graduate will be able to understand impact of software solutions in a global economic, environmental and social context.
- Will be able to design software solutions using recent algorithms and also continuously modify them as per the current needs of the society through lifelong learning and professional development.
- Will be able to demonstrate knowledge of contemporary issues.
- Show awareness of and ability to proficiently identify and apply project management tools and methodologies to the planning and execution of software projects leading to software.
- Will be able to plan and use computer resources and other systems efficiently.




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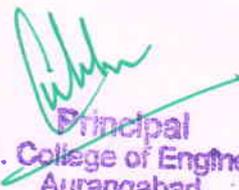
Program Specific Outcomes

The Program Specific outcomes UG in CSE are:

After completing four year graduate course of BE (CSE) the student will be able to:

- 1) Understand and proficiently apply the knowledge of mathematics and relevant sciences and scientific methods to CSE, to design software solutions to given problems.
- 2) An ability to analyze the problem and identify & formulate the hardware, software, other computing requirements to design software solution for it.
- 3) Will be able to design a software automation system for various application areas using efficient algorithms, the computer resources and components, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturing, and sustainability.
- 4) Will be able to Design software projects for multidisciplinary application areas and will be able to maintain it on field.
- 5) Modern Tool usage: An ability to select, modern software tools, apply appropriate software development methodologies, resources necessary for computing.
- 6) The engineer and the Society: The engineer will be able to apply the reasoning about local and global impact of software solutions for problems using contextual knowledge to assess societal, health, safety, legal and cultural issues.
- 7) Environment and sustainability: Understand the impact of software solutions and the need of sustainable development to save environment.
- 8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of software engineering practice.
- 9) Individual and team work: Will be able to function effectively as software engineer and also member or a leader of a software development team and also work on multidisciplinary projects.
- 10) Will be able to communicate effectively on complex engineering activities with the engineering community and with the society at large such as being able to comprehend and to writs effective reports and design documentation make effective presentations and give and receive clear instructions.
- 11) Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles apply those to one's own work as a member and leader in a team to manage projects in multidisciplinary teams.
- 12) Recognize the need for and have the preparation and ability to engage in lifelong learning in the broadcast context of technical change.




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Department of Electronics & Telecommunication Engineering

Program educational objectives

1. Graduates will be able to succeed in positions in engineering practice or research, and in other fields they choose to pursue.
2. Graduates will become a responsible member of society.
3. Graduates will be leaders, both in their chosen profession and in other activities.
4. Graduates will address the complexities of real life engineering problems and be able to formulate solutions that are technically sound, economically feasible & sustainable.

PROGRAM OUTCOMES

Upon successful completion of this course it is expected that electronics graduate will be able to:

- a. Understand and proficiently apply the relevant sciences & scientific methods to Electronics engineering to design solutions to complex problems in electronics systems, electronic circuits & control processes.
- b. Identify, interpret & critically appraise current developments, advanced technologies and apply them to electronic engineering field to enhance reliability and efficiency of electronics based systems, components and programs.
- c. Identify and synthesize the constraints posed by economic factors, safety considerations, environmental impacts and professional standards on Electronics engineering practices and use them for professional judgments in solving the critical field problems for sustainable technological development of nation.
- d. Determine, analyze and proficiently apply theoretical and numerical analysis of Phenomenon to
conceive, control & optimize the performance of Electronics engineering systems used for different applications such as in navigation, automobiles, transportation, and automation.
- e. Identify and critically evaluate the performance of a electronics engineering systems in terms of economics, safety, and social and physical environment and implement approaches to minimize any adverse impact leading to sustainable development of society.




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P.E.S. College of Engineering
Aurangabad

- f. Understand and proficiently apply a systems approach for electronics system design and addressing the broad contextual constraints, leading to sustainable developments of global level electronics technologies and standards.
- g. Show awareness and ability to proficiently apply project management tools and methodologies to the planning and execution of projects leading to electronics engineering solutions of professional standards.
- h. Develop & implement creative and innovative approaches to enhance the reliability, efficiency and economical aspect of electronics systems for sustainable improvement of electronics technologies.
- i. Communicate effectively on both technical and general issues with peers, associate, clients and the general public to find solutions using technical proficiency.
- j. Operate effectively and professionally within a team environment to solve complex problems of analyze, design and development of electronics systems.
- k. Use all fundamental knowledge of electronics engineering, sciences and mathematics to plan, organize and use resources efficiently to reduce adverse effect on environments




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Department of Electrical Engineering

PROGRAM OUTCOMES: Upon successful completion of this course it is expected that electrical graduate will have ability to

- Apply the knowledge of science, mathematics and engineering to solve the problems related to electrical engineering.
- Identify, design and conduct the experiments to analyze and interpret data to verify the performance of electrical systems or equipment's.
- Design an electrical system, component or process to meet the desired EEPs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability using professional standards applicable in electrical engineering practice.
- Proficiently apply theoretical & numerical analysis to conceive, control & optimize the performance of multidisciplinary applications.
- To identify, formulate, and solve engineering problems in terms of economics, safety and the social and physical environment, and implement approaches to minimize any adverse impact leading to sustainable development of society.
- Understand professional and ethical responsibility.
- Communicate effectively on both technical and general issues with peers, associate, clients and the general public to find solutions using technical proficiency.
- Understand; proficiently apply a system approach for electrical system design and addressing the broad contextual constraints, leading to sustainable development of global level electrical technologies and standards.
- Recognition of the need for, and an ability to engage in research and to involve in lifelong learning.
- Knowledge of contemporary issues.
- Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program specific Outcomes:

- 1) To create professional graduates in the field of electrical engineering with capability to apply the knowledge of Electrical engineering and to solve related problems.
- 2) To execute multi-disciplinary profiles through theoretical and numerical analysis conceive , control and optimize the system performance
- 3) To serve for the betterment of mankind in the society professionally with ethics and moral responsibilities.




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Department of Civil Engineering

PROGRAM Objectives (POs)

Engineering Graduates will be able to:

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




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P.E.S. College of Engineering
Nagsenvana, Aurangabad
Department of Mechanical Engineering
Program Outcomes

At the end of the Program/Course the students will be able to

1. Apply the knowledge of Mathematics, Basic Sciences and Mechanical Engineering to formulate engineering problems
2. Identify, formulate and analyze complex Mechanical Engineering problems and give robust solution to them
3. Design, analyze and manufacture various mechanical systems and assemble them to make a project
4. Design, model and analyze various thermal systems
5. Select, create and apply modern mechanical engineering and IT Tools to complex Engineering activities with understanding of limitations.
6. Design, model, simulate and analyze various mechanical components using CAD/CAM/CAE
7. Visualize and to work on multi disciplinary projects
8. Acquire communication, leadership, entrepreneurship skills and implement the knowledge of professional ethical practices for the development of Society.
9. Understand the contemporary issues of the society and provide engineering solutions to them
10. Acquire skills and ability for lifelong learning
11. Understand the engineering and management principle and apply these to the multi disciplinary environment
12. Proficiently identify and apply project management and operation research methodologies for optimization of engineering problems




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P. E. S. College of Engineering, Aurangabad
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Program outcomes, program specific outcomes

Course Outcomes:

Course	Course Outcomes
SE CSE PART-I BSH-201 Engineering Mathematics-III	<ol style="list-style-type: none"> 1. Students will able to understand and proficiently apply the relevant sciences and scientific methods to Engineering Mathematics, to design solutions to complex problems. 2. Students will able to identify, interpret and critically appraise current developments and advanced technologies and apply them to Engineering Mathematics. 3. Students will able to determine analyses and proficiently apply theoretical and numerical analysis of phenomena to conceive, control and optimize the performance of Engineering Mathematics. 4. Students will able to develop and implement creative and innovative approaches to problem solving.
SE CSE PART-I DMS	<ol style="list-style-type: none"> 1. Student will be able to formulate problems precisely and solve the problems. 2. Student will be able to apply formal proof techniques, and explain their reasoning clearly. 3. Students can analyze basics knowledge gained by mathematical logic and apply them. 4. Use algorithms for suitable applications
SE CSE PART-I CAO	<ol style="list-style-type: none"> 1. To train the students with concept of microprocessor and computer architecture and organization. 2. To provide the knowledge of instruction set of 8086 and assembly programming. 3. To analyze the memory operations
SE CSE PART –II Computer Graphics	<ol style="list-style-type: none"> 1. Student will be able to understand the basic graphics primitives. 2. Students will implement the graphical programming techniques to design structures and soft wares. 3. Student will be able to build interactive models with various transformations. 4. Student will be able to implement and analyze geometric algorithms.
SE CSE PART –II OOP using C++	<ol style="list-style-type: none"> 1. Student will be able to understand the features of C++ supporting object oriented programming 2. Student will be able to understand the relative merits of C++ as an object oriented programming language 3. Student will be able to understand how to produce object-oriented software using C++ 4. Student will be able to understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism

<p>TE CSE PART-I</p> <p>Course Code: CSE 301</p> <p>Operating System</p>	<ol style="list-style-type: none"> 1. Will be able to define, formulate problem definitions for designing various modules of operating system. 2. Will be able to design the modules of operating system that meets the realistic constraints such as economic, environmental, health safety & sustainability. 3. The student will be able to analyze use of existing OS (platform independent feature of operating system software), as well as design the operating system for multidisciplinary application areas. 4. Will be able to analyze the impact of design of operating system on various aspects such as environmental, economic, social environment. 5. Will be able to develop the algorithms or modify the existing algorithms to solve the problems in current designs as per the need of application.
<p>TE CSE PART-I</p> <p>Course Code: CSE302</p> <p>Theory of computation</p>	<ol style="list-style-type: none"> 1. Student will be able to define, formulate problem definitions for designing machines 2. Student will be able to identify and formulate the problems in a Finite Automata and also verify the performance of a machine by giving the input. 3. Student will be able to design Regular Expression for multidisciplinary application areas 4. Student will be able to develop and implement creative and innovative approaches to problem solving 5. Student will be able to build the techniques and skills to design syntactically correct Regular Languages using Context Free Grammar 6. Student will be able to use the techniques and skills to design syntactically correct Regular Languages using Context Free Grammar 7. Student will be able to design TM for multidisciplinary application areas. 8. Student will be able to build the programming technique for Turing machine
<p>TE CSE PART-I</p> <p>Course Code: CSE303</p> <p>Database Management System</p>	<ol style="list-style-type: none"> 1. Will be able to define, formulate problem definitions for designing various modules database management system. 2. Will be able to design the database system that meets the realistic constraints such as Economic, Environmental, Health Safety, and Sustainability. 3. The student will be able to analyze existing databases for multidisciplinary application areas. 4. Student will be able will be able to analyze the impact of design of database system on various aspects such as environmental, economic, social environment. 5. Student will be able will be able to develop and modify the existing database systems to solve the 6. Student will be able understand problems in current designs as per the need of application. 7. Student will be able Plan, organize and use computer resources as well as manpower efficiently by developing efficient database applications. 8. Knowledge of contemporary issues. 9. Communicate effectively on both technical and general issues with peers, associates, 10. Clients and the general public to define the problem specification.

<p>TE CSE PART-I Course Code: CSE304 Programming in Java</p>	<ol style="list-style-type: none"> 1. The students will be able to apply object oriented features to real time entities. 2. The students will be able handle exceptions & implement multithreaded programs. 3. The students will be able implement database programming. 4. The students will be able design & implement GUI with event handling 5. The students will be able develop I/O & networking programs.
<p>TE CSE PART-I Computer Network Architecture & Protocols (Elective-I) Course Code: CSE341</p>	<ol style="list-style-type: none"> 1. To understand fundamental concepts of computer networking and functionality of layered network architecture. 2. To understand wireless and mobile networking concepts 3. To apply networking concepts to various situations, classifying networks, analysing performance of computer network infrastructure.
<p>TE CSE PART-I Digital Image Processing (Elective-I) Course Code: CSE342</p>	<ol style="list-style-type: none"> 1. Students should be able to understand digital image processing beyond the fundamental level. 2. To study complete digital image processing steps. 3. Students should be able to choose appropriate image processing algorithm to achieve desired result. 4. Students should be able to properly implement DIP algorithms using modern computing tools Such as MATLAB, interpret and present the results.
<p>TE CSE PART-II CSE352 Design and analysis of Algorithms</p>	<ol style="list-style-type: none"> 1. The student will be able to define, formulate problem definitions for designing algorithms. 2. The student will be able to understand the syntax and design algorithms. 3. The student will be able to use the various design methods and skills to solve the problem like TSP, Knapsack. 4. The student will be able to describe divide and conquer paradigm and explain when an algorithmic design situation calls for it. 5. Will be able to analyze graph algorithms and apply graph concept to model engineering problems. 6. Will be able to design the algorithm that meets the realistic constraints such as Economic, Time constraint, Space constraint 7. The student will be able to conclude which algorithmic method is better for given problem. 8. The student will be able to modify the existing algorithms to solve the problems in current designs as per the need of application.

<p>TE CSE PART –II Software Engineering Course Code: CSE352</p>	<ol style="list-style-type: none"> 1. Will be able to use OOPS concepts, various computer architectures, languages for programming and UML to design software models. 2. Will be able to define, formulate & analyze the problem definition also hardware, software & other computing requirements to design a software solution for it. 3. Will be able to design software using software engineering phases to meet the desired needs of a client within the realistic constraints such as environmental ethical, economic, political, manufacturing, and sustainability. 4. Will be able to design software projects in various application areas like business, research, commercial, banking internet, mobile applications and maintain it. 5. Will develop the software as per software engineering standards, & rules led by the society. 6. Will be able to analyze the impact of software on world economy, social aspects. 7. Will be able to plan organize software development process so that computer resources efficiently.
<p>TE CSE PART –II Advanced Java Course Code: CSE351</p>	<ol style="list-style-type: none"> 1. Develop skills in Enterprise Java 2. Understanding advanced concepts in Java Programming 3. Understanding importance of Service oriented Architecture of today’s web application
<p>BE CSE PART-I Principles of Compilers Design Course Code: CSE403</p>	<ol style="list-style-type: none"> 1. Will be able to define, formulate problem definitions for designing various types of compiler. 2. Will be able to design programs using LEX, YACC tools for multidisciplinary application areas and will be able to maintain it on field. 3. Will be able to use the techniques and skills to design a program by using compiler. 4. Will be able to identify and formulate the problems in a program and also verify the performance of a program. 5. Will be able to design the software program for various application areas using compiler construction tools, the computer resources and components, to meet the desired needs. 6. Will be able to develop and implement creative and innovative approaches to problem solving.
<p>BE CSE PART-I Parallel and Distributed Computing Course Code: CSE402</p>	<ol style="list-style-type: none"> 1. Develop and apply knowledge of parallel and distributed computing techniques and methodologies. 2. Apply design, development, and performance analysis of parallel and distributed applications. 3. Use the application of fundamental Computer Science methods and algorithms in the development of parallel applications. 4. Explain the design, testing, and performance analysis of a software system, and to be able to communicate that design to others.
<p>BE CSE PART-I Data Warehousing & Data mining Course Code : CSE401</p>	<ol style="list-style-type: none"> 1. To understand data warehouse 2. To understand and implement multidimensional model 3. To identify the problems, and apply mining algorithms 4. To describe the business intelligence (BI) methodology and concepts

<p>BE CSE PART –I</p> <p>Visual Modelling</p> <p>Course Code: CSE404</p>	<ol style="list-style-type: none"> 1. Will be able to define, formulate & analyze the problem definition & also hardware, software & other computing requirements to design a software solution for it. 2. Will be able to design software using software engineering phases to meet the desired needs of a client within the realistic constraints such as environmental ethical, economic, political, manufacturing, and sustainability. 3. Will develop the software as per software engineering standards, & rules led by the Society 4. Will be able to analyze the impact of software on world economy, social aspects. 5. Will be able to plan organize software development process so that computer resources efficiently.
<p>BE CSE PART –I</p> <p>Elective – I Cloud Computing</p> <p>Course Code: CSE441</p>	<ol style="list-style-type: none"> 1. To learn and understand Cloud Technologies 2. To design, develop and deploy Cloud applications 3. To get acquainted with the challenges and security aspects of Cloud Computing. 4. To study Mobile Cloud Applications
<p>BE CSE PART –II</p> <p>Mobile Computing</p> <p>Course Code: CSE452</p>	<ol style="list-style-type: none"> 1. Students will demonstrate the use of languages and operating systems for mobile devices in a small development exercises. 2. They will have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support. 3. Critically analyze security issues of mobile and wireless computing system. 4. Understand current technologies and architectures that provide the network and communications infrastructure for mobile enabled computer systems. 5. Identify the appropriate development toolkits, IDE's and emulators for creating and publishing various mobile applications using WML and WML Script. 6. Develop and implement creative and innovative approaches to problem solving. 7. Communicate effectively on technical issues with clients.
<p>BE CSE PART –II</p> <p>Green IT</p> <p>Course Code: CSE492</p>	<ol style="list-style-type: none"> 1. Explains what green IT is and examines the significance of green IT. 2. Discusses environmental concerns, global warming and the principles of sustainable development. 3. Discusses how data centers, cloud computing, storage systems, software and networks can be made greener. 4. Highlights how IT could help businesses in their environmental initiatives and reduce their carbon emissions. 5. Presents the drivers and benefits of energy-efficient computer networks and communications. 6. Describes energy-efficient networking solutions from the perspective of reduced carbon cost and improved operational sustainability. 7. Presents exemplar context data required for management systems with green objectives across domains. 8. Discusses current research and development on making cloud computing green 9. Outlines future research directions emphasizing holistic efforts needed to make clouds a viable and sustainable computing alternative.

<p>BE CSE PART –II Computer System Security and Laws Course Code : CSE451</p>	<ol style="list-style-type: none"> 1. To understand the five security components and apply them when evaluating a given security mechanism. 2. To understand basic cryptography including symmetric and asymmetric cryptography, message digests, digital signatures and digital certificates. 3. To understand the basics of system security along-with the mechanisms for authentication and authorization. 4. To understand the legal aspect and Forensics in the computer system security.
<p>BE CSE PART –II Soft Computing Course Code: CSE453</p>	<ol style="list-style-type: none"> 1. To understand the scope of soft computing and pattern recognition tasks that can be performed by some of the basic structures of artificial neural networks 2. Analyse feed forward networks and understand the significance of nonlinear output functions of processing unit in feedback network for pattern storage. 3. To describe and explain Core concepts and techniques of fuzzy logic. 4. To understand Fuzzy Logic in database System and information.
<p>M. Tech FY Part 1 High Performance Computing (Elective 2) Sub Code: MTCE1105</p>	<ol style="list-style-type: none"> 1. To transform algorithms in the computational area to efficient programming code for modern computer architectures 2. To write, organize and handle programs for scientific computations 3. To create presentation of using tools for performance optimization and debugging 4. To present analysis of code with respect to performance and suggest and implement performance improvements 5. To present test cases to solve problems for multi-core or distributed, concurrent/Parallel environments.
<p>M. Tech FY Part 2 Software Testing (Elective 3) Sub Code: MTCE1203</p>	<ol style="list-style-type: none"> 1. To ensures the quality of product by preventing and detecting the defect 2. To Verify and validate the user requirements by implementing testing strategies 3. To focus on accurate and reliable result by generating test cases 4. To provide information to take decision for next phase 5. To gain confidence of work by evaluating the capabilities of a system and system performance

SY- ETC SEM-III

1. Analog Circuits (BTEXC302)

Course Objectives:

1. To understand characteristics of IC and Op-Amp and identify the internal structure.
2. To introduce various manufacturing techniques.
3. To study various op-amp parameters and their significance for Op-Amp.
4. To learn frequency response, transient response and frequency compensation techniques for Op-Amp.
5. To analyze and identify linear and nonlinear applications of Op-Amp.
6. To understand functionalities of PLL.

Course Outcomes:

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

1. Understand the characteristics of IC and Op-Amp and identify the internal structure.
2. Understand and identify various manufacturing techniques.
3. Derive and determine various performances based parameters and their significance for Op-Amp.
4. Comply and verify parameters after exciting IC by any stated method.
5. Analyze and identify the closed loop stability considerations and I/O limitations.
6. Analyze and identify linear and nonlinear applications of Op-Amp.
7. Understand and verify results (levels of V & I) with hardware implementation.
8. Implement hardwired circuit to test performance and application for what it is being designed.

2. Electronic Devices & Circuits (BTEXC303)

Course Objectives:

1. To introduce semiconductor devices FET and MOSFET, their characteristics, operations, circuits and applications
2. To introduce concepts of both positive and negative feedback in electronic circuits
3. To analyze and interpret FET and MOSFET circuits for small signal at low and high frequencies
4. To simulate electronics circuits using computer simulation software and verify desired results
5. To study the different types of voltage regulators.

Course Outcomes:

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

1. Comply and verify parameters after exciting devices by any stated method.
2. Implement circuit and test the performance.
3. Analyze small signal model of FET and MOSFET.
4. Explain behavior of FET at low frequency.
5. Design an adjustable voltage regulator circuits.

3. Network Analysis (BTEXC304)

Course Objectives:

1. To learn about the basic laws of electric circuits as well as the key fundamentals of the communication channels, namely transmission lines.
2. To understand the need of simplification techniques of complicated circuits
3. To learn about the comprehensive insight into the principle techniques available for characterizing circuits, networks and their implementation in practice.
4. To learn about the use of mathematics, need of different transforms and usefulness of differential equations for analysis of networks.
5. To train the students for handling analog filter design through theory of NA along with practical, this is basic requirement of signal processing field.

Course Outcomes:

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

1. Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
2. Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters.
3. Identify issues related to transmission of signals, analyze different RLC networks.
4. Find technology recognition for the benefit of the society.

4. Digital Logic Design (BTEXC305)

Course Objectives:

1. To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
2. To lay the foundation for further studies in areas such as communication, VHDL, computer.

Course Outcomes:

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

1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
2. Design combinational and sequential circuits.
3. Design and implement hardware circuit to test performance and application.
4. Understand the architecture and use of VHDL for basic operations and Simulate using simulation software.

5. Basic Human Rights (BTHM3401)

Course Objectives:

1. To work for ensuring that basic human rights are respected everywhere.
2. To cooperate to avoid compromising on human rights for economic or political expediency
3. To recognize democratic institutions as a fundamental human right
4. To work towards the sovereignty and self-determination of entities with historical, cultural and ecological identity.
5. To actively engage with the Government of India and other countries to promote human rights education.
6. To bring diplomatic and commercial pressures on regimes that violates human rights, to ensure that they respect the basic rights of their citizens.
7. To keep the interests of disempowered communities foremost in all dealings with countries in which human rights violations occur
8. To develop a more distinctive and effective role for the International Court of Justice in the field of human rights
9. To promote a culture for educating the citizenry that cultivation and promotion of human rights culture is the sine qua non for the smooth functioning of the organs of a democratic State and for the kind of development that results into overall development of the society.
10. To train the young men and women for facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture
11. To study the effects of draconian laws and unlawful use of State's machinery and force by the enforcement agencies.

Course Outcomes:

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

1. Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights.
2. Strengthen the respect for human rights and fundamental freedoms.
3. Enable all persons to participate effectively in a free society.
4. Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights.
5. Learn about regional, national, state, and local law that reinforces international human rights law.
6. Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights

SY- ETC SEM-IV

1. Electrical Machines and Instruments (BTEXC401)

Course Objectives:

1. Model and Analyze the performance of different types of DC machines
2. Learn the applications of DC generators

3. Analyze the performance of different types of DC motors
4. Analyze the performance of different types of Sensors and Transducers
5. Familiarize with the applications of DC machines
6. To prepare students to perform the analysis of any electromechanical system.
7. To empower students to understand the working of electrical equipment used in everyday life.

Course Outcomes:

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

1. The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions.
2. The skill to analyze the response of any electrical machine.
3. The ability to troubleshoot the operation of an electrical machine.
4. The ability to select a suitable measuring instrument for a given application.
5. The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument.

2. Analog Communication Engineering (BTEXC402)

Course Objectives:

1. To introduce the concepts of analog communication systems.
2. To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
3. To understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase)

Course Outcomes:

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

1. Understand and identify the fundamental concepts and various components of analog communication systems.
2. Understand the concepts of modulation and demodulation techniques.
3. Design circuits to generate modulated and demodulated wave.
4. Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
5. Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase).
6. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
7. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

3. Microprocessor (BTEXC403)

Course Objectives:

1. Objective of this course is to introduce to the students the fundamentals of microprocessor.
2. After learning Microprocessor course, students will get advantage to pursue higher

studies in Embedded Systems or employment in core industries.

3. The learner can design microprocessor based systems and thus can become successful entrepreneur and meet needs of Indian and multinational industries.

4. The students can design and develop processor which can be used in Robotics, Automobiles, Space and many research areas.

5. The learners will acquaint optimization skills and undergo concepts design metrics for embedded systems.

6. The students will get acquainted with recent trends in microprocessor like pipelining, cache memory etc.

7. To understand the applications of Microprocessors.

8. To learn interfacing of real world input and output devices.

9. To study various hardware and software tools for developing applications.

Course Outcomes:

1. Learner gains ability to apply knowledge of engineering in designing different case studies.

2. Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications.

3. Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles.

4. Students can identify and formulate control and monitoring systems using microprocessors.

5. Students will design cost effective real time system to serve engineering solution for Global, social and economic context.

6. This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation.

7. Learn use of hardware and software tools.

8. Develop interfacing to real world devices.

4. Signals and Systems (BTEXC404)

Course Objectives:

1. To understand the mathematical description of continuous and discrete time signals and systems.

2. To classify signals into different categories.

3. To analyze Linear Time Invariant (LTI) systems in time and transform domains.

4. To build basics for understanding of courses such as signal processing, control system and communication.

5. To develop basis of probability and random variables.

Course Outcomes:

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

1. Understand mathematical description and representation of continuous and discrete time signals and systems.

2. Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.

3. Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.

4. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
5. Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

4. Product Design Engineering (BTID405)

Course Objectives:

- 1.To acquaint the students with the fundamental principles of product.
- 2.The students will be exposed to hardware details of different Product
- 3.The students will be exposed to hardware details of product with the related signals and their implications.
- 4.To lay the foundation for further studies in different areas.

Course Outcomes:

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

1. Create simple mechanical or other designs
2. Create design documents for knowledge sharing
3. Manage own work to meet design requirements
4. Work effectively with colleagues.

5. Numerical Methods and Computer Programming (BTBSC406)

Course Objectives:

1. To prepare students for successful career in industries, for Post Graduate programmes and to work in research institutes.
2. To understand different numerical techniques used for solving algebraic and transcendental equations.
3. To understand numerical methods to solve a system of linear equations.
4. To understand numerical integration and differentiation techniques.

Course Outcomes:

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

1. Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem.
2. Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques.
3. Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values.
4. Prepare them to write computer programs for the numerical computational techniques.
5. Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc.
6. Understand procedure-oriented and object oriented programming concepts.
7. Capable of writing C and C++ programs efficiently.

TY-ETC SEM-I

1. Electromagnetic Field Theory (BTEXC501)

Course Objectives:

1. Learners can be able to explore their knowledge in the area of EM Waves and its analysis.
2. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
3. To understand the boundary conditions for different materials /surfaces.
4. To get insight on finding solution for non-regular geometrical bodies using Finite Element Method, Method of Moments, Finite Difference Time Domain.
5. To get the basics of microwave, transmission lines and antenna parameters.
6. Students get acquainted with different physical laws and theorems and provide basic platform for upcoming communication technologies.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Use sections of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface
6. Analyze wave propagation on metallic waveguides in modal form
7. Understand principle of radiation and radiation characteristics of an antenna.

2. Control System Engineering (BTEXC502)

Course Objectives:

1. To introduce the elements of control system and their modeling using various
2. Techniques.
3. To introduce methods for analyzing the time response, the frequency response and the
4. stability of systems.
5. To introduce the concept of root locus, Bode plots, Nyquist plots.
6. To introduce the state variable analysis method.
7. To introduce concepts of PID controllers and digital and control systems.
8. To introduce concepts programmable logic controller.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the modeling of linear-time-invariant systems using transfer function and state-space representations.
2. Understand the concept of stability and its assessment for linear-time invariant systems.
3. Design simple feedback controllers

3. Computer Architecture (BTETC503)

Course Objectives:

1. To introduce basic concepts of computer organization and to illustrate the computer organization concepts by Assembly Language programming.
2. To understand operating systems and how they work with the computer and students will understand the relationship between hardware and software specifically how machine organization impacts the efficiency of applications written in a high-level language.
3. Students will be able to make use of the binary number system to translate values between the binary and decimal number systems, to perform basic arithmetic operations and to construct machine code instructions and students will be able to design and implement solutions for basic programs using assembly language.
4. Students will be able to design logical expressions and corresponding integrated logic circuits for a variety of problems including the basic components of a CPU such as adders, multiplexers, the ALU, a register file, and memory cells and to explain the fetch execute cycle performed by the CPU and how the various components of the data path are used in this process.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. learn how computers work
2. know basic principles of computer's working
3. analyze the performance of computers
4. know how computers are designed and built

4. Digital Signal Processing (BTEXC504)**Course Objectives:**

1. • To introduce students with transforms for analysis of discrete time signals and systems.
2. • To understand the digital signal processing, sampling and aliasing.
3. • To use and understand implementation of digital filters.
4. • To understand concept of sampling rate conversion and DSP processor architecture.

Course Outcomes:

After successfully completing the course students will be able to

1. Understand use of different transforms and analyze the discrete time signals and systems.
2. Realize the use of LTI filters for filtering different real world signals.
3. Capable of calibrating and resolving different frequencies existing in any signal.
4. Design and implement multistage sampling rate converter.
 5. Design of different types of digital filters for various applications.

5. Microcontroller and its Applications (BTEXC505)**Course Objectives:**

1. Objective of this course is to introduce to the students the fundamentals of microcontroller.

2. After learning Microprocessor course, students will get advantage to pursue higher studies in Embedded Systems or employment in core industries.
3. The learner can microcontroller design based systems and thus can become successful entrepreneur and meet needs of Indian and multinational industries.
4. The students can design and develop processor which can be used in Robotics, Automobiles, Space and many research areas.
5. The learners will acquaint optimization skills and undergo concepts design metrics for embedded systems.
6. The students will get acquainted with recent trends in microcontroller like pipelining, cache memory etc.
7. To understand the applications of Microcontrollers.
8. To understand need of microcontrollers in embedded system.
9. To understand architecture and features of typical Microcontroller.
10. To learn interfacing of real world input and output devices.
11. To study various hardware and software tools for developing applications.

Course Outcomes:

1. Learner gains ability to apply knowledge of engineering in designing different case studies.
2. Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications.
3. Graduates will be able to design real time controllers using microcontroller based system.

6. Probability Theory and Random Processes (BTEXPE506A)

Course Objectives:

1. To develop basic of probability and random variables.
2. The primary objective of this course is to provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in engineering and applied science.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand representation of random signals
2. Investigate characteristics of random processes
3. Make use of theorems related to random signals
4. To understand propagation of random signals in LTI systems.

7. Introduction to MEMS (BTEXPE506D)

Course Objectives:

1. The objective of this course is to make students to gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques.

2. This enables them to design, analysis, fabrication and testing the MEMS based components and to introduce the students various opportunities in the emerging field of MEMS.
3. This will enables student to study applications of micro-sensors and micro-actuators, various MEMS fabrication technologies, MEMS-specific design issues and constraints, Dynamics and modeling of microsystems, getting access to fabrication and testing in academia and industry.

Course Outcomes:

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

1. Appreciate the underlying working principles of MEMS and NEMS devices.
2. Design and model MEM devices.

TY-ETC SEM-II

1. Antennas and Wave Propagation (BTETC601)

Course Objectives:

1. To understand the applications of electromagnetic engineering.
2. To formulate and solve the Helmholtz wave equation and solve it for Uniform Plane Wave.
3. To analyze and understand the Uniform plane wave propagation in various media.
4. To solve the electric field and magnetic fields for a given wire antenna.

Course Outcomes:

After successfully completing the course students will be able to

1. Formulate the wave equation and solve it for uniform plane wave.
2. Analyze the given wire antenna and its radiation characteristics.
3. Identify the suitable antenna for a given communication system.

2. Computer Network & Cloud Computing (BTETC602)

Course Objectives:

1. To develop an understanding of modern network architectures from a design and performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3. To provide an opportunity to do network programming
4. To provide a WLAN measurement ideas.

Course Outcomes:

1. To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
2. To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks.

3. To be familiar with wireless networking concepts.
4. To be familiar with contemporary issues in networking technologies.
5. To be familiar with network tools and network programming.
6. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component.
7. For a given problem related TCP/IP protocol developed the network programming.
8. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

3. Digital Image Processing (BTETC603)

Course Objectives:

1. An ability to use current techniques, skills, and tools necessary for computing practice with an understanding of the limitations

Course Outcomes:

2. After completion of this course students will be able to
3. 1. Review the fundamental concepts of digital image processing system.
4. 2. Analyze images in the frequency domain using various transforms.
5. 3. Categories various compression techniques.
6. 4. Interpret image segmentation and representation techniques.

4. Power Electronics (BTETPE604C)

Course Objectives:

1. To introduce students to different power devices to study their construction, characteristics and turning on circuits.
2. To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.
3. To study the different motor drives, various power electronics applications like
4. UPS, SMPS, etc. and some protection circuits.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.

5. Digital System Design (BTETOE605A)

Course Objectives:

1. The concept and theory of digital Electronics are needed in almost all electronics and telecommunication engineering fields and in many other engineering and scientific disciplines as well.

2. The main objective of this course is to lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor etc. One of the most important reasons for the unprecedented growth of digital electronics is the advent of integrated circuit.
3. This course will explore the basic concepts of digital electronics.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation.

6. Employability & Skill Development (BTHM606)

Course Objectives:

1. To develop analytical abilities.
2. To develop communication skills.
3. To introduce the students to skills necessary for getting, keeping and being successful in a profession.
4. To expose the students to leadership and team-building skills.

Course Outcomes:

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

1. Have skills and preparedness for aptitude tests.
2. Be equipped with essential communication skills (writing, verbal and non-verbal)
3. Master the presentation skill and be ready for facing interviews.
4. Build team and lead it for problem solving.

7. Digital Communication (BTETC701)

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system.
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To understand concept of spread spectrum communication system.

Course Outcomes:

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.

2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Select the blocks in a design of digital communication system.
4. Analyze Performance of spread spectrum communication system.

BE-ETC (BAMU Structure) SEM-I

1. Digital Image Processing

Course Outcomes:

After learning the course the students should be able to:

1. Understand the basic image enhancement techniques in spatial & frequency domains.
2. Understand the various kind of noise present in the image and how to restore the noisy image.
3. Understand the basic multiresolution techniques and segmentation methods.
4. Apply different image processing concepts for image handling in various fields.
5. Apply various compression standards studied, reducing the image size for optimizing storage and transmission bandwidth in their image processing related projects.
6. Work as a team leader to work on complex projects in a project team environment

2. Very Large Scale Integration Design

Course Objectives

1. To learn basic CMOS Circuits.
2. To learn CMOS process technology.
3. To learn techniques of chip design using programmable devices.
4. To learn the concepts of designing VLSI Subsystems.
5. Understand the concepts of Physical Design Process such as partitioning, Floorplanning, Placement and Routing.
6. Discuss the concepts of design optimization algorithms and their application to physical design automation.
7. Understand the concepts of simulation and synthesis in VLSI Design Automation

Course Outcome

1. Identify the various IC fabrication methods.
2. Express the Layout of simple MOS circuit using Lambda based design rules.
3. Apply the Lambda based design rules for subsystem design
4. Differentiate various FPGA architectures.
5. Design an application using Verilog HDL.
6. Concepts of modeling a digital system using Hardware Description Language.
7. Students are able to know how to place the blocks and how to partition the blocks while for designing the layout for IC.

8. Students are able to solve the performance issues in circuit layout.
9. Students are able to analyze physical design problems and Employ appropriate automation algorithms for partitioning, floor planning, placement and routing
10. Students are able to decompose large mapping problem into pieces, including logic optimization with partitioning, placement and routing

3. Microwave & Radar Engineering

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain different types of waveguides and their respective modes of propagation.
2. Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations.
3. Design microwave matching networks using L section, single and double stub and quarter wave transformer.
4. Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc.
5. Describe and explain working of microwave tubes and solid state devices.
6. Perform measurements on microwave devices and networks using power meter and VNA.
7. Explain the operation of RADAR systems and recite their applications.

4. Advanced Embedded System

Course Outcomes

Upon successful completion of this course it is expected that student will be able to

1. Understand fundamentals of embedded systems, design paradigms, architectures, possibilities and challenges, both with respect to software and hardware.
2. Practically apply gained theoretical knowledge in order to design, analyze and implement embedded systems, e.g. integrating embedded systems and applications.
3. Analyze a system both as whole and in the included parts, to understand how these parts interact in the functionality and properties of the system.

5. EL-I Wireless Mobile Communication

Course Outcomes:

Upon successful completion of this course students are able to

1. Discuss the cellular system design and technical challenges.
2. Explain classification of mobile communication system.
3. Analyze the mobile radio propagation, diversity concepts, fading and channel modeling.
4. Develop ability to analyze improved data services in cellular communication.

BE-ETC (BAMU Structure) SEM-II

1. Computer Networks & Security

Course Outcomes:

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

1. Able to know basic concepts of computer, computer communication and use of it in networking.
2. Able to know basics of Networking with different switching techniques.
3. Study of Networking topologies: Mesh and Bus topology, Star topology & ring Topology.
4. Network Software : device driver for network interface card, LAN, MAN, WAN.
5. Overview of Network model: ISO-OSI and TCP/IP network reference Model.

2. EL-II (Fiber Optic Communication)

Course Objectives

1. To List the components optical fiber transmission link, block diagram .
2. To develop elements of an optical fiber transmission link, block diagram, advantages of optical fiber communication.
3. Understand and explain the Ray theory transmission, total internal reflection acceptance angle, numerical aperture and skew rays understanding optical fiber communication, applications and evolution of fiber optic systems,
4. Understand the Ray theory transmission
5. To Distinguish internal reflection acceptance angle, numerical aperture and skew rays specify their use
6. To List optical fiber communication, applications
7. To Explain Modes, electromagnetic mode theory and propagation I (U)
8. To Contrast and compare single mode and multimode fibers, linearly polarized modes

Course Outcome

After completion of the course, the student is able to

1. Distinguish Step Index, Graded index fibers and compute mode volume.
2. Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.
3. Classify the construction and characteristics of optical sources and detectors.

4. Discuss splicing techniques, passive optical components and explain noise in optical system.
5. Design short haul and long haul Analog/ Digital optical communication system and explain advanced optical transmission systems.

3. Antenna Theory

Course Objectives

Student will learn and understand

1. Fundamental antenna parameters and numerical methods to analyze and differentiate the antennas.
2. Concept of radiation mechanism of various antennas.
3. Mechanism and models for radio-wave propagation.

Course Outcomes

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

1. Identify basic antenna parameters.
2. Design and analyze antenna arrays.
3. Design and analyze wire and aperture antennas.
4. Identify the characteristics of radio-wave propagation.

4. Wireless Mobile Communication

Course Outcomes

1. Students will be able to discuss the cellular system design and technical challenges.
2. Students will be able to analyze the Mobile radio propagation, fading, diversity concepts and the channel modeling.
3. Students will be able to analyze the design parameters, link design, smart antenna, beam forming and MIMO systems.
4. Students will be able to analyze Multiuser Systems, CDMA, WCDMA network planning and OFDM Concepts.
5. Students will be able to summarize the principles and applications of wireless systems and standards

PES College of Engineering
Department of Electrical Engineering

Subject wise course Outcomes

Academic Year 2019-20

First Year

Course Name: Basic Electrical Engineering

	Students will be able
CO1	To study basics of electrical engineering
CO2	To study basics of DC and AC electrical circuits
CO3	To study electromagnetism
CO4	To study transformer

Second Year

Course Name: NETWORK ANALYSIS AND SYNTHESIS.

	Students will be able
CO1	To review basic components of electric network.
CO2	To design and develop network equations and their solutions.
CO3	To apply Laplace theorem for electric network analyses
CO4	To analyze AC circuit.

Course Name: FLUID MECHANICS AND THERMAL ENGINEERING.

	Students will be able
CO1	To introduce properties of fluid and hydraulic measurement
CO2	To understand dynamics of fluid flow
CO3	To understand basic concepts of IC engines
CO4	To understand concept of refrigeration and air conditioning

Course Name: MEASUREMENT AND INSTRUMENTATION

	Students will be able
CO1	To understand philosophy of measurement.
CO2	To understand different methods analog and digital measurement
CO3	To study principle of construction and operation of different transducer and dismay methods

Course Name: Basic Human Rights

	Students will be able
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CO1	To understand fundamental rights
CO2	To understand basic human rights

Course Name: ENGINEERING ECONOMICS

	Students will be able
CO1	To study concept of time value of money
CO2	To study about demand in detail
CO3	To understand Meaning of Production and factors of production,
CO4	To understand dif. Concept about market

Course Name: ELECTRICAL ENGINEERING MATERIALS.

	Students will be able
CO1	To study about crystal structure
CO2	To understand magnetic material structure
CO3	To study about conducting and superconducting materials
CO4	To study dielectric and nano materials.

Course Name: ELECTRICAL MACHINES – I

	Students will be able
CO1	To study diff. types, construction and operating principle of diff. types of electrical machines
CO2	To study the transformer and its applications
CO3	To study the performance of DC motors and its applicaitons
CO4	To study DC generator

Course Name: POWER SYSTEM-I

	Students will be able
CO1	To Understand basic operation of power system, power system components and their characteristics.
CO2	TO understand different power plants

Course Name: ELECTRICAL INSTALLATION AND ESTIMATION

	Students will be able
CO1	To prepare estimation and costing of electrical installations of power system,
CO2	To understand procedures of contracting and purchase.

Cou Course Name: NUMERICAL METHODS AND PROGRAMMING.

	Students will be able
CO1	To study and understand MATLAB programming.
CO2	To review mathematical concepts .
CO3	To develop computer program for linear and nonlinear equations.

Course Name: Product Design Engineering

	Students will be able to
CO1	Create simple mechanical or other designs
CO2	Create design documents for knowledge sharing
CO3	Manage own work to meet design requirements
CO4	Work effectively with colleagues

Course Name: SOLID STATE DEVICES.

	Students will be able
CO1	To study construction and characteristics of solid state devices.
CO2	To apply operational amplifier models in circuits employing negative feedback.
CO3	To design electronics circuit using Timer IC and voltage regulators.
CO4	To perform analysis of amplifiers using small signal models for the circuit elements.
CO5	To calculate the frequency response of circuits containing BJT, Op-Amp etc

Course Name: ANALOG AND DIGITAL ELECTRONICS

	Students will be able
CO1	To review basic number system.
CO2	To understand design and characteristics of digital logic gates.
CO3	To study different techniques in use of digital circuits.
CO4	To design

Course Name: INTRODUCTION TO NON-CONVENTIONAL ENERGY SOURCES,

	Students will be able
CO1	To understand basic concepts , construction and operational features of nonconventional energy sources
CO2	To review the energy scenario
CO3	To study the solar ,wind energy and its practical applicaitons

Third Year

Course Name: Electrical Machines -II

	Students will be able
CO1	To study different methods of speed control of AC and DC motor
CO2	To study importance and procedure of different performance test on AC and DC motor.
CO3	To determine different different operating characteristics of AC and DC machines

Course Name: POWER SYSTEM-II

	Students will be able
CO1	To study different parameters of power system operation and control
CO2	To study load flow and Diff. methods of reactive power control.
CO3	To understand different methods of fault analysis and stability study

Course Name: MICROPROCESSOR AND MICRO CONTROLLER

	Students will be able
CO1	To know the architecture of 8085 and 8051.
CO2	To understand interfacing and interrupt features of 8085 and 8051.
CO3	To develop program for basic applications.

Course Name: VALUE EDUCATION, HUMAN RIGHTS AND LEGISLATIVE PROCEDURES

	Students will be able
CO1	To understand value of education and self-development
CO2	To develop good values and character
CO3	To know Human right and legislative procedure

Course Name: ADVANCES IN RENEWABLE ENERGY SYSTEMS

	Students will be able
CO1	To know the principle of energy conversion technique from biomass, geothermal and
CO2	hybrid energy systems.
CO3	To understand effects of air pollution and ecosystems

Course Name: POWER PLANT ENGINEERING.

	Students will be able
CO1	To review basic components of power system, energy sources.
CO2	To understand principle of construction and operation of different conventional power plants.

Course Name: PRINCIPLES OF ELECTRICAL MACHINE DESIGN

	Students will be able
CO1	To understand principles of electric machine design.
CO2	To design different components of electric machine.
CO3	To design Transformer
CO4	To understand CAD and use it for transformer design

Course name: power electronics

	Students will be able
CO1	understand various basic Power Electronics devices.
CO2	understand application of Power Electronics devices in electrical power systems
CO3	understand control of Electrical Motors through DC-DC converters, AC Converters.
CO4	understand the use of Inductors and Capacitors in Choppers, Inverters and Converters

Course Name: INDUSTRIAL AUTOMATION AND CONTROL

	Students will be able
CO1	To understand construction and working principle of different industrial measurement systems
CO2	To understand new trends in industrial process control.

Course Name: SWITCH GEAR AND PROTECTION

	Students will be able
CO1	To understand principles of protective relaying.
CO2	To understand principle of construction, operation and selection of different circuit breaker used in power system
CO3	To understand different protection schemes used in power system operation

Course Name: . PROJECT MANAGEMENT

	Students will be able
CO1	To understand concepts of project management.
CO2	To develop a project plan.
CO3	To understand the project implementation strategy.
CO4	To analyze post project affects.

Course Name: Control System Engineering

	Students will be able
CO1	Student will be able to understand the role of control system in advanced society's acting as a catalyst for performing progress and development.
CO2	Student will be able to apply the knowledge of mathematics, basic operation of any system and mechanism.
CO3	The student will be able to optimize the control system design in economical and efficient design procedure
CO4	Student will be able to manipulate the selected data in such a way to that the given goal can be achieved optimally and efficiently.

CO5	Student will be able to analyze the time response and frequency response of the system for developing innovative and creative approaches to enhance the reliability and efficiency of electrical systems.
CO6	Student will be able to use their control system skills to plan, design and response to technical needs for industry, government and research.

Final Year

Course Name: POWER SYSTEM OPERATION AND CONTROL

	Students will be able to
CO1	Explain the fundamental concept of power system.
CO2	Design the mathematical model of synchronous machine.
CO3	Design the mathematical model Excitation system and speed governing system.
CO4	Analyze the transient stability of power system using swing equation and equal area criteria
CO5	Analyze the economic operation of power system.
CO6	Explain the methods of Voltage control.

Course Name: High Voltage Engineering

	Students will be able to
CO1	Illustrate the concept of electric field stresses, applications of insulating materials and methods for Non-destructive testing of equipment like transformers, insulators, isolators, bushings, lightning arrestors, cables, circuit breakers and surge diverters.
CO2	Explain the breakdown process in solid, liquid, and gaseous materials
CO3	Analyze methods for generation and measurement of High Voltages and Currents (both ac and dc)
CO4	Describe the phenomenon of over-voltage and choose appropriate insulation co-ordination levels based on IS & IEC Standards

Course Name: Electrical Drives

	Students will be able to
CO1	Analyze the dynamics of Electrical Drives system.
CO2	Use various control techniques for controlling the speed of AC and DC motors.
CO3	Analyze the AC and DC drives.
CO4	To Select/recommend the appropriate Drive according to the particular applications.
CO5	State the recent technology of AC and DC drive

Course Name: Power system protection

	Students will be able to
CO1	Understand the different types of circuit breakers and relays
CO2	Understand the applications of relays in power system
CO3	Understand the protection of different components of power system

Course Name: Digital Signal Processing

	Students will be able to
CO1	Represent signals, systems and digital processing of analog signals.
CO2	Represent discrete time signals, systems and analysis of Discrete-Time Linear Time- Invariant Systems.
CO3	Apply digital signal processing techniques to analyze discrete time signals in time domain.
CO4	Apply digital signal processing techniques to analyze discrete time signals in frequency domain
CO5	Design different filter structure
CO6	Validate system functionality and evaluate results

Course Name: Flexible AC transmission

	Students will be able to
CO1	Understand the different types of converts
CO2	Understand the different controllers and regulators
CO3	Understand the compensators

Course Name: RENEWABLE ENERGY

	Students will be able
CO1	To know the principle of energy conversion technique from biomass, geothermal and
CO2	hybrid energy systems.
CO3	To understand effects of air pollution and ecosystems

P.E.S. College of Engineering

Nagsenvan, Aurangabad

Department of Civil Engineering

1.1. Course Outcomes (COs)

1) Course Name:- **BTCVC302Mechanics of Solids** Year of Study:- 2019-20

- 1) Perform the stress-strain analysis.
- 2) Draw force distribution diagrams for members and determinate beams.
- 3) Find deflections in determinant beams.
- 4) Visualize force deformation behavior of bodies.

2) Course Name:- **BTCVC303 Hydraulics I**

- 1: Calibrate the various flow measuring devices.
- 2: Determine the properties of fluid and pressure and their measurement.
- 3: Understand fundamentals of pipe flow, losses in pipe and analysis of pipe network.
- 4: Visualize fluid flow phenomena observed in Civil Engineering systems

3) Course Name:- **BTCVC304 Surveying – I**

- 1: Perform measurements in linear/angular methods.
- 2: Perform plane table surveying in general terrain.
- 3: Know the basics of leveling and theodolite survey in elevation and angular measurements.

4) Course Name:- **BTCVC305 Building Construction**

- 1: Understand types of masonry structures.
- 2: Understand composition of concrete and effect of various parameters affecting strength.
- 3: Comprehend components of building and their purposes.
- 4: Comprehend the precast and pre-engineered building construction techniques.

5) Course Name:- **BTCVC306Engineering Geology.**

- 1: Recognize the different land forms which are formed by various geological agents.
- 2: Identify the origin, texture and structure of various rocks and physical properties of mineral.
- 3: Emphasize distinct geological structures which have influence on the civil engineering structure.
- 4: Understand how the various geological conditions affect the design parameters of structures.

6) Course Name:- **BTCVC401Hydraulics II**

- 1: Design open channel sections in a most economical way.
- 2: Know about the non-uniform flows in open channel and the characteristics of hydraulic jump.
- 3: Understand application of momentum principle of impact of jets on plane.

7) Course Name:- **BTCVC402Surveying – II**

- 1: Understand basics different types of curves on roads and their preliminary survey.
- 2: Perform setting of curves, buildings, culverts and tunnels.
- 3: Comprehend different geodetic methods of survey such as triangulation, trigonometric leveling.
- 4: Comprehend modern advanced surveying techniques.

8) Course Name:- BTCVC403 Structural Mechanics – I.

- 1: Describe the concept of structural analysis, degree of indeterminacy.
- 2: Calculate slopes and deflection at various locations for different types of beams.
- 3: Identify determinate and indeterminate trusses and calculate forces in the members of trusses Perform the distribution of the moments the in continuous beam and frame.

9) Course Name:- BTCVE404A Numerical Methods in Engineering

- 1: Demonstrate the nuances of management functions.
- 2: Analyze the framework of a business organization.
- 3: Adopt an empirical approach toward business situations.
- 4: Apply various Management techniques.

10) Course Name:- BTCVC 501 Design of Steel Structures

- 1: Identify and compute the design loads and the stresses developed in the steel member.
- 2: Analyze and design the various connections and identify the potential failure modes.
- 3: Analyze and design various tension, compression and flexural members.
- 4: Understand provisions in relevant BIS Codes.

11) Course Name:- BTCVC 502 Structural Mechanics-II

- 1: Have a basic understanding of matrix method of analysis and will be able to analyze the determinant structure.
- 2: Have a basic understanding of the principles and concepts related to finite difference and finite element methods
- 3: Have a basic understanding of concept of influence line.

12) Course Name:- BTCVC 503 Soil Mechanics

- 1: Understand different soil properties and behavior
- 2: Understand stresses in soil and permeability and seepage aspects.
- 3: Develop ability to take up soil design of various foundations.

13) Course Name:- BTCVC 504 Environmental Engineering

- 1: Apply the water treatment concept and methods.
- 2: Prepare basic process designs of water and wastewater treatment plants.
- 3: Apply the wastewater treatment concept and methods.
- 4: Apply the solid waste management concepts.

14) Course Name:- BTCVC 505 Transportation Engineering.

1. Comprehend various types of transportation systems and their history of the development
2. Comprehend to various types of pavements
3. Design the pavements by considering various aspects associated with traffic safety measures.

15) Course Name:- BTCVE506A Materials, Testing &Evaluation

1. To develop skill among students to construct strong and durable structures by applying knowledge of material science.
2. To make the students aware of quality assurance and control in their real life as a professional.

16) Course Name:- BTCVE506C Development Engineering.

1. To develop multi scaled perspective about decisions in the built environment,
2. To expose the students to the analysis and evaluation of real world problems aiming to bring desired change in the society.

17) Course Name:- BTCVC601Design of Concrete Structures – I

1. Comprehend to the various design philosophies used for design of reinforced concrete.
2. Analyze and design the reinforced concrete slab using limit state and working state method.
3. Analyze and design the reinforced concrete beam using limit state and working state method.
4. Analyze and design the reinforced concrete column using limit state and working state method.

18) Course Name:- BTCVC602Foundation Engineering

1. To predict soil behavior under the application of loads and come up with appropriate solutions to foundation design queries.
2. Analyze the stability of slope by theoretical and graphical methods.
3. Analyze the results of in-situ tests and transform measurements and associated uncertainties into relevant design parameters.
4. Synthesize the concepts of allowable stress design, appropriate factors of safety, margin of safety, and reliability.

19) Course Name:- BTCVC603Concrete Technology

- 1: Understand the various types and properties of ingredients of concrete.
- 2: Understand effect of admixtures on the behavior of the fresh and hardened concrete.
- 3: Formulate concrete design mix for various grades of concrete.

20) Course Name:- BTCVC604Project Management

1. Understand various steps in project Management, different types of charts.
2. Construct network by using CPM and PERT method.
3. Determine the optimum duration of project with the help of various time estimates.
4. Know the concept of engineering economics, economic comparisons, and linear break even analysis problems.
5. Understand the concept of total quality Management including Juran and Deming's philosophy.

21) Course Name:- BTCVC606Building Planning and Design

1. To plan buildings considering various principles of planning and bye laws of governing body.
2. Comprehend various utility requirements in buildings.
3. Understand various techniques for good acoustics.

22) Course Name:- BTCVE605AWaste Water Treatments

1. Determine the sewage characteristics and design various sewage treatment plants.
2. Understand municipal water and wastewater treatment system design and operation.
3. Apply environmental treatment technologies and design processes for treatment of industrial waste water.
4. Understand the rural sanitation schemes.

23) Course Name:- BTCVE605DAdvanced Engineering Geology

- 1) Understand geological time scale and physiographic division of India and their geological characteristics and different geological formation in India.
- 2) Perform sub surface exploration and interpret core log.
- 3) Solve numerical problem based on core drilling and seismic data.
- 4) Familiar with origin of earthquake, seismic wave and landslide in Deccan trap.

24) Course Name:- BTCVE 605E Advanced Soil Mechanics.

- 1: Behavior of soil based on its particle size and mineral content
- 2: Ability to understand the Earth work equipment
- 3: Ability to understand the necessity of ground improvement and potential of a ground for improvement
- 4: Understand the soil reinforcement mechanisms
- 5: Understand the grouting and injection methods.

25) Course Name:- BTCVC 701 Design of Concrete Structures II

1. Able to identify the behavior, analyze and design of the beam sections subjected to torsion.
2. Able to analyze and design of axially and eccentrically loaded column and construct the interaction diagram for them.
3. Understand various concepts, systems and losses in pre-stressing.
4. Able to analyze and design the rectangular and symmetrical I-section pre-stressed beam/girders.

26) Course Name:- BTCVC 702Infrastructure Engineering

1. Know about the basics and design of various components of railway engineering
2. Understand the types and functions of tracks, junctions and railway stations.
3. Know about the aircraft characteristics, planning and components of airport
4. Understand the types and components of docks and harbors.

27) Course Name:- BTCVC 703Water Resources Engineering

- 1: Understand need of Irrigation in India and water requirement as per farming practice in India.
- 2: Understand various irrigation structures and schemes.
- 3: Develop basis for design of irrigation schemes.

28) Course Name:- BTCVC 704 Professional Practices

1. Understand the importance of preparing the types of estimates under different conditions for various structures.
2. Know about the rate analysis and bill preparations and to study about the specification writing.
3. Know the various types of contract, accounts in PWD, methods for initiating the works in PWD and tendering.
4. Understand the valuation of land and buildings, various methods and factors affecting valuation.

29) Course Name:- BTCVE705A Plastic Analysis and Design

1. Understand modes of structural collapse.
2. Perform the plastic analysis and design of various determinant and in-determinant structures.

30) Course Name:- BTCVC 801Introduction to Earthquake Engineering

1. Capture complexities in earthquake resistant design of structures
2. Grasp Nature of earthquake vibration and associated forces on structures
3. Understand importance of designing the building to targeted seismic performance.

31) Course Name:- BTCVE802BConstruction Techniques.

1. Understand the planning of new project with site accessibility and services required.
2. Comprehend the various civil construction equipment's.
3. Familiar with layout of RMC plant, production, capacity and operation process.
4. Recognize various aspect of road construction, construction of diaphragm walls, railway track construction etc.

32) Course Name:- BTCVE803A Bridge Engineering

1. Understand components of bridges and its various types.
2. Understand site selection criteria and comprehend various forces acting on bridges.
3. Analyze bridge structures using different analysis techniques.
4. Understand the importance of different types of bridge bearings.

33) Course Name:- BTCVE803B Structural Audit

1. Gain the knowledge of Bye laws, procedure of Structural audit and study the typical problems in structures.
2. Aware of causes and types of deterioration in structures.
3. Develop skills for use of various Nondestructive tests required during auditing of structures.
4. Strength evaluation of existing structures.
5. Acquire knowledge of legal procedure to conduct structural audits.
6. Prepare a Structural audit report.

34) Course Name:- BTCVE804A Rock Mechanics

- 1: Understand the mechanism of rock under various conditions.
- 2: Able to determine the engineering properties of rocks and sub-surface conditions
- 3: Identify various cause of slope failure and suggest some preventive measures for them.

35) Course Name:- BTCVE804D Finite Element Method

1. Understand the different energy methods in structural analysis and basic concepts of finite element method.
2. Analyze 1-D problems related to structural analysis like Bars, Trusses, Beams and Frames using finite element approach.
3. Find solution to problems using direct approach methods like Rayleigh – Ritz or Galerkin' s Method.
4. Solve 2-D problems using knowledge of theory of elasticity.
5. Students will be able to implement the knowledge of numerical methods in FEM to find the solution to the various problems in statics and dynamics.
6. Analyze 1D, 2D, and 3D structures using different software packages based on FEM.

36) Course Name:- BTCVE804E Repair & Rehabilitation of Structures.

1. Understand factors of Serviceability and Durability of Structures.
2. Determine crack width, effect of crack on materials, effect of moisture on structures.
3. Understand methods for protection of steel structures and masonry structures.
4. Understand various materials and methodologies used for repairing of structures.
5. Understand and implement techniques used for repairing and maintenance of structure.
6. Understand procedure to strengthen the existing structures and structural elements.

P.E.S College of Engineering
Department of Mechanical Engineering

Course Structure& CO

Course Structure for Semester III [Second Year] w.e.f. 2018-2019

BTMEC302 Materials Science and Metallurgy
BTMEC303 Fluid Mechanics
BTMEC304 Machine Drawing and CAD
BTMEC305 Thermodynamics
BTHM3401 Basic Human Rights

Course Structure for Semester IV [Second Year] w.e.f. 2018-2019

BTMEC401 Manufacturing Processes - I
BTMEC402 Theory of Machines-I
BTMEC403 Strength of Materials
BTID405 Product Design Engineering – I
BTHM3402 Interpersonal Communication Skill& Self Development

Course Structure for Semester V [Third Year] w.e.f. 2019-2020

BTMEC501 Heat Transfer
BTMEC502 Applied Thermodynamics – I
BTMEC503 Machine Design – I
BTMEC504 Theory of Machines- II
BTMEC505 Metrology and Quality Control

Course Structure for Semester VI [Third Year] w.e.f. 2019-2020

BTMEC601 Manufacturing Processes- II
BTMEC602 Machine Design-II
BTMEC603 Applied Thermodynamics- II
BTMEC604B IC Engines

Course Structure for Semester VII [Third Year] w.e.f. 2019-2020

BTMEC701 Mechatronics
BTMEC702 CAD/CAM
BTMEC703 Manufacturing Processes - III

BTMEC302 **Material Science and Metallurgy**

Course Outcomes:

CO1	Study various crystal structures of materials
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CO2	Understand mechanical properties of materials and calculations of same using appropriate equations
CO3	Evaluate phase diagrams of various materials
CO4	Suggest appropriate heat treatment process for a given application
CO5	Prepare samples of different materials for metallography
CO6	Recommend appropriate NDT technique for a given application

BTMEC303 Fluid Mechanics

Course Outcomes:

CO1	Define fluid, define and calculate various properties of fluid
CO2	Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies
CO3	Explain various types of flow. Calculate acceleration of fluid particles
CO4	Apply Bernoulli's equation and Navier-Stokes equation to simple problems in fluid mechanics
CO5	Explain laminar and turbulent flows on flat plates and through pipes
CO6	Explain and use dimensional analysis to simple problems in fluid mechanics
CO7	Understand boundary layer, drag and lift

BTMEC304 Machine Drawing and Computer Aided Drafting

Course Outcomes:

CO1	Interpret the object with the help of given sectional and orthographic views.
CO2	Construct the curve of intersection of two solids
CO3	Draw machine element using keys, cotter, knuckle, bolted and welded joint
CO4	Assemble details of any given part. i. e. valve, pump, machine tool part etc.
CO5	Represent tolerances and level of surface finish on production drawings
CO6	Understand various creating and editing commands in Auto Cad

BTMEC305 Thermodynamics

Course Outcomes:

CO1	Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics.
CO2	Study different laws of thermodynamics and apply these to simple thermal systems like balloon, piston-cylinder arrangement, compressor, pump, refrigerator, heat exchanger, etc. to study energy balance.
CO3	Study various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes.
CO4	Apply availability concept to non-flow and steady flow type systems.

CO5	Represent phase diagram of pure substance (steam) on different thermodynamic planes like p-v, T-s, h-s, etc. Show various constant property lines on them.
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BTHM3401 Basic Human Rights

Course Outcomes:

CO1	Understand the history of human rights.
CO2	Learn to respect others caste, religion, region and culture.
CO3	Be aware of their rights as Indian citizen.
CO4	Understand the importance of groups and communities in the society.
CO5	Realize the philosophical and cultural basis and historical perspectives of human rights.
CO6	Make them aware of their responsibilities towards the nation.

BTMEC401 Manufacturing Processes-I

Course Outcomes:

CO1	Identify castings processes, working principles and applications and list various defects in metal casting
CO2	Understand the various metal forming processes, working principles and applications
CO3	Classify the basic joining processes and demonstrate principles of welding, brazing and soldering.
CO4	Study center lathe and its operations including plain, taper turning, work holding devices and cutting tool.
CO5	Understand milling machines and operations, cutters and indexing for gear cutting.
CO6	Study shaping, planing and drilling, their types and related tooling's

BTMEC402 Theory of Machines- I

Course Outcomes:

CO1	Define basic terminology of kinematics of mechanisms
CO2	Classify planar mechanisms and calculate its degree of freedom
CO3	Perform kinematic analysis of a given mechanism using ICR and RV methods
CO4	Perform kinematic analysis of a given mechanism analytically using vector or complex algebra method
CO5	Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach

BTMEC403 Strength of Materials

Course Outcomes:

CO1	State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ , etc.
CO2	Recognize the stress state (tension, compression, bending, shear, etc.) and calculate the value of stress developed in the component in axial/eccentric static and impact load cases.
CO3	Distinguish between uniaxial and multiaxial stress situation and calculate principal stresses, max. shear stress, their planes and max. normal and shear stresses on a given plane.
CO4	Analyze given beam for calculations of SF and BM
CO5	Calculate slope and deflection at a point on cantilever / simply supported beam using double integration, Macaulay's, Area-moment and superposition methods
CO6	Differentiate between beam and column and calculate critical load for a column using Euler's and Rankine's formulae

BTID405 Product Design Engineering - I

Course Outcomes:

CO1	Create simple mechanical designs
CO2	Create design documents for knowledge sharing
CO3	Manage own work to meet design requirements
CO4	Work effectively with colleagues

Semester -V

BTMEC501 Heat Transfer

Course Outcomes:

CO1	Explain the laws of heat transfer and deduce the general heat conduction equation and to explain it for 1-D steady state heat transfer in regular shape bodies
CO2	Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer
CO3	Interpret the extended surfaces
CO4	Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions
CO5	Describe the Boiling heat transfer, mass transfer and Evaluate the heat exchanger

	and examine the LMTD and NTU methods applied to engineering problems
CO6	Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields

BTMEC502 Applied Thermodynamics - I

Course Outcomes:

CO1	Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air, equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel.
CO2	Study and Analyze gas power cycles and vapour power cycles like Otto, Diesel, dual, Joule and Rankine cycles and derive expressions for the performance parameters like thermal efficiency, P_m
CO3	Classify various types of boiler, nozzle, steam turbine and condenser used in steam power plant.
CO4	Classify various types of IC engines. Sketch the cut section of typical diesel engine and label its components. Define the terms like TDC, BDC, r_c , etc.
CO5	Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors.

BTMEC503 Machine Design - I

Course Outcomes:

CO1	Formulate the problem by identifying customer need and convert into design specification
CO2	Understand component behavior subjected to loads and identify failure criteria
CO3	Analyze the stresses and strain induced in the component
CO4	Design of machine component using theories of failures
CO5	Design of component for finite life and infinite life when subjected to fluctuating load
CO6	Design of components like shaft, key, coupling, screw and spring

BTMEC504 Theory of Machines - II

Course Outcomes:

CO1	Identify and select type of belt and rope drive for a particular application
CO2	Evaluate gear tooth geometry and select appropriate gears, gear trains
CO3	Define governor and select/suggest an appropriate governor
CO4	Characterize flywheels as per engine requirement
CO5	Understand gyroscopic effects in ships, aeroplanes, and road vehicles.
CO6	Understand free and forced vibrations of single degree freedom systems

BTMEC505 Metrology and Quality Control

Course Outcomes:

CO1	Identify techniques to minimize the errors in measurement
CO2	Identify methods and devices for measurement of length, angle, and gear and thread parameters, surface roughness and geometric features of parts.
CO3	Choose limits for plug and ring gauges.
CO4	Explain methods of measurement in modern machineries
CO5	Select quality control techniques and its applications
CO6	Plot quality control charts and suggest measures to improve the quality of product and reduce cost using Statistical tools.

BTMEC506A Automobile Engineering

Course Outcomes:

CO1	Identify the different parts of the automobile.
CO2	Explain the working of various parts like engine, transmission, clutch, brakes etc.,
CO3	Demonstrate various types of drive systems.
CO4	Apply vehicle troubleshooting and maintenance procedures.
CO5	Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications.
CO6	Evaluate future developments in the automobile technology.

BTMEC506C Energy Conservation and Management

Course Outcomes:

CO1	Understand energy problem and need of energy management
CO2	Carry out energy audit of simple units
CO3	Study various financial appraisal methods
CO4	Analyse cogeneration and waste heat recovery systems
CO5	Do simple calculations regarding thermal insulation and electrical energy conservation

BTMEL509 Machine Design Practice - I

Course Outcomes:

CO1	Apply design process to an open ended problem
CO2	Determine suitable material and size for structural component of machine/system
CO3	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing
CO4	Choose logically and defend selection of design factors
CO5	Design of components for given part/system i.e. shaft, keys, coupling, links, screws, springs etc.

CO6	Work effectively as a part of design group/team
CO7	Have good communication skill, orally, graphically as well as in writing

Semester - VI

BTMEC601 Manufacturing Processes - II

Course Outcomes:

CO1	Understand the process of powder metallurgy and its applications
CO2	Calculate the cutting forces in orthogonal and oblique cutting
CO3	Evaluate the machinability of materials
CO4	Understand the abrasive processes
CO5	Explain the different precision machining processes
CO6	Design jigs and fixtures for given application

BTMEC602 Machine Design - II

Course Outcomes:

CO1	Define function of bearing and classify bearings.
CO2	Understanding failure of bearing and their influence on its selection.
CO3	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter.
CO4	Select materials and configuration for machine element like gears, belts and chain
CO5	Design of elements like gears, belts and chain for given power rating
CO6	Design thickness of pressure vessel using thick and thin criteria

BTMEC603 Applied Thermodynamics – II

Course Outcomes:

CO1	Apply first law of thermodynamics for closed systems and flow process. Produce TDS relations from Maxwell's relations.
CO2	Calculate thermal efficiencies of heat engine.
CO3	Calculate work done and heat transfer for flow and non-flow process.
CO4	Calculate properties of air vapor mixture using mathematical knowledge and psychrometric chart.

BTMEC604B IC Engines

Course Outcomes:

CO1	Explain fuel injection systems in SI engine, types of combustion chamber and combustion process.
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CO2	Explain different types of fuel injection system and combustion chambers of CI engine.
CO3	Explain the mechanism of pollution formation and the evolution of emission norms.
CO4	Describe the properties of various alternative fuels, engine modification required and emission characteristic of alternative fuels
CO5	Discuss various ignition methods used in I.C engine and electronic engine management system.

Final Year
Semester - VII

MED401-INTERNAL COMBUSTION (I. C.) ENGINES AND GAS TURBINES

Course Outcomes:

CO1	Explain fuel injection systems in SI engine, types of combustion chamber and combustion process.
CO2	Explain different types of fuel injection system and combustion chambers of CI engine.
CO3	Explain the mechanism of pollution formation and the evolution of emission norms.
CO4	Describe the properties of various alternative fuels, engine modification required and emission characteristic of alternative fuels
CO5	Discuss various ignition methods used in I.C engine and electronic engine management system.

MED402- AUTOMATIC CONTROL SYSTEM

Course Outcomes:

CO1	Understand basic control concepts and control actions.
CO2	Understand simple mathematical modeling and the concept of block diagram and signal flow graph.
CO3	Study of system in time & frequency domain and understand concept of stability.

MED403-METROLOGY & QUALITY CONTROL

Course Outcomes:

CO1	Understand the principles, construction, use, techniques of handling and maintenance of various measuring instruments.
CO2	Plot and use of quality control charts and Suggest measures to improve the quality of product and reduce cost.
CO3	Students are expected to understand the fundamentals of quality & to apply different statistical process control tools for managerial decisions.
CO4	Understand the various types of sensors and their applications

CO5	Design a pneumatic circuit for a given application
CO6	Design a hydraulic circuit for a given application

MED404-ENERGY CONSERVATION AND MANAGEMENT

Course Outcomes:

CO1	Conceptual knowledge of the technology, economics and regulation related issues associated with energy conservation and energy auditing
CO2	Ability to analyse the viability of energy conservation projects
CO3	Capability to integrate various options and assess the business and policy environment regarding energy conservation and energy auditing
CO4	Advocacy of strategic and policy recommendations on energy conservation and energy auditing

MED405-: MECHATRONICS

Course Outcomes:

CO1	Define sensor, transducer and understand the applications of different sensors and transducers
CO2	Explain the signal conditioning and data representation techniques
CO3	Design pneumatic and hydraulic circuits for a given application
CO4	Write a PLC program using Ladder logic for a given application
CO5	Understand applications of microprocessor and micro controller
CO6	Analyse PI, PD and PID controllers for a given application
CO1	Define sensor, transducer and understand the applications of different sensors and transducers

Semester - VIII

MED451-AUTOMOBILE ENGINEERING

Course Outcomes:

CO1	Students understand the fundamentals of Automobile Engineering
CO2	Identify the different parts of the automobile.
CO3	Explain the working of various parts like engine, transmission, clutch, brakes.
CO4	Describe how the steering and the suspension systems operate.
CO5	Understand the environmental implications of automobile emissions

MED 452-PROJECT MANAGEMENT AND OPERATIONS RESEARCH

Course Outcomes:

CO1	To create awareness about optimization in utilization of resources.
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CO2	To make them understand the concepts of Project Management for planning to execution of projects
CO3	To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
CO4	To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
CO5	Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

MED453-REFRIGERATION AND AIR CONDITIONING

Course Outcomes:

CO1	Introduce students to HVAC technology, engineering, research, systems, system designs, energy impacts, and overall goals
CO2	Introduce students to HVAC technology, engineering, research, systems, system designs, energy impacts, and overall goals.
CO3	Students will demonstrate an understanding thermal comfort conditions with respect to temperature and humidity and human clothing and activities and its impact on human comfort, productivity, and health.
CO4	Students will demonstrate an understanding of the needs and requirements for ventilation and its impact on design and energy and its impact on human comfort, productivity, and health.
CO5	Students will demonstrate an understanding of psychrometrics and its application in HVAC engineering and design and will practice or observe psychrometric measurements.

MED 454 :FINITE ELEMENT ANALYSIS

Course Outcomes:

CO1	To familiarize students with the displacement-based finite element method for displacement and stress analysis.
CO2	To study approximate nature of the finite element method and convergence of results are examined.
CO3	It provides some experience with a commercial FEM code and some practical modeling exercises.