



Dr. Bhimrao Ambedkar University, Agra

A State University of Uttar Pradesh (Paliwal Park, Agra -282004)

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A Documentary Support
for

Matric No. – 1.1.1

Programme Outcomes & Course Outcomes

*under the
Criteria – I*

(Curriculum Design and Development)

Key Indicator - 1.1

*in
Matric No. – 1.1.1*

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

2018


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Mapping:

 *Local Need*  *Regional*  *National*  *Global Need*

Value added Courses in ECE Department

- | | |
|---------------------------------------|------------------------------|
| 1. Human Values & Professional Ethics | ECE 3 rd semester |
| 2. Environment and Ecology | ECE 4 th Semester |
| 3. Occupational Health & Safety | ECE 6 th Semester |
| 4. Python Programming Lab | ECE 7 th Semester |


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18/11/23
Incharge
Electronics and Communication Engineering
Institute of Engineering & Technology
Dr. B.R.A. University
Khandari Campus, Agra


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Program outcomes suggested by the NBA for engineering programs

Program Outcomes (POs), are attributes acquired by the student at the time of graduation. The POs given in the Table below, ensure that the POs are aligned to the Graduate Attributes (GAs) specified by National Board of Accreditation (NBA). These attributes are measured at the time of Graduation, and hence computed every year for the outgoing Batch. The POs are addressed and attained through the Course Outcomes (COs) of various courses of the curriculum.

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

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

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

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

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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

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


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

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

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

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

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


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BCS-301 Mathematics III

Course Outcomes: Upon successful completion of this course, students will be able to:

1. Solve the Fourier Transform of function.
2. Compute poles & zeros.
3. Evaluate the real & complex integrals with the help of Cauchy's Residue Theorem.
4. Utilize curve fitting techniques for data representations and computation in engineering analysis.
5. Use Binomial, Poisson & Normal Distribution to solve statistical problems.

BEC 301 Digital Electronics

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand binary codes, binary arithmetic, minimization techniques and their relevance to digital logic design.
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder and sequential logic circuits.
3. Understand finite state machines and develop a digital logic to find out sustainable solution of a real life problem.
4. Understand and implement various digital integrated circuits using different logic families and simple systems composed of PLDs.

BEC 351 Digital Electronics Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Implement the basic digital theory concepts practically and will be able to verify various results derived in theory.
2. Design, analyze and troubleshoot broad range of combinational and sequential circuits for various practical problems using basic gates and flip flops I.C's.
3. Develop technical writing skills to communicate effectively and present one's own work.
4. Acquire teamwork skills for finding sustainable solution of a complex problem and working effectively in groups.

BEC 302 Electronic Devices & Circuits

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

1. Understand the working of switching devices and apply the same in designing complex circuits with fewer devices.
2. Design amplifier and other complex circuits with the help of special semiconductor devices which will further increase real time applications and reduce runaway situations.
3. Apply the mathematical modeling for the electronic devices and circuits in turn helps in improvement in design in terms of size, power requirement and ease of use.
4. Use variety of electronic devices for designing society friendly electronic gadgets used for security and other useful purposes.

BEC 352 Electronic Devices & Circuits Lab

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

1. Understand the characteristics of diodes, transistors, JFETs.
2. Understand the operation and characteristics of different configurations of BJT.
3. Design complex electronic circuits with fewer devices.
4. Able to understand the concept and applications of feedback mechanism in electronic circuits.

BEE 301 Network Analysis & Synthesis

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.



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BCS 301 Data structure

Course Outcomes: At the end of this course students will demonstrate the ability to

1. To review the concepts of fundamental data structures to be used in programming. To understand various searching algorithms.
2. To understand the various operations on different types of data structures such as stacks, queues and linked lists. To apply and analyze various data structures on different applications.
3. To understand, analyze and compare various sorting algorithms. To understand the concept of hashing and its techniques.
4. To understand the various types of tree structures and their implementation. To evaluate various tree structures. To be able to apply tree structures on various problems.
5. To understand and implement various types of graphs. To study and implement various shortest path algorithms on graphs.

BCS 352 Data Structures Lab

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

1. Analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. Implement search problem (Linear Search and Binary Search).
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity and will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

MC 302/MC 402 Human Values & Professional Ethics

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

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
4. Distinguish between ethical and unethical practices, and start working over the strategy to actualize a harmonious environment wherever they work.

BEC-401 Electromagnetic Theory

Course Outcomes: At the end of this course, student will have the ability to:

1. Understand the concepts of electromagnetic and magneto-statics
2. Understand and apply the time varying fields and Maxwell's equation to enhance various devices performance, hence upgrading its impact on society,
3. Analyse Uniform plane wave, Poynting vector and Flow of power to deign more efficient devices for improving communication capabilities in turn reduce impact of radiations.
4. Understand the basic concepts of transmission line and guided waves and apply them in designing better transmission line in terms of low power losses.


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BEC 402 Microprocessors and its Applications

Course Outcomes: At the end of this course, the students will:

1. (i) Recall and apply a basic concept of digital fundamentals to microprocessor based personal computer system and Recall the memory types and understand the interfacing of memory with microprocessor. (ii) Understand the internal architecture and organization of 8085 & 8086.
2. (i) Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller. (ii) Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
3. Discuss how the different peripherals are interfaced with microprocessor like 8255, 8253/54, 8237, 8279, etc.
4. (i) To analyze the concepts of memory interfacing for faster execution of instructions and improves the speed of operations & hence performance of microprocessors. (ii) To understand the basic knowledge of advanced processor and Analyze the internal architecture of 80286, 80486 and Pentium processor.
5. (i) Analyze the internal architecture and real time control of 8051. (ii) Analyze the internal architecture of ARM Processors.

BEC 452 Microprocessor and its Applications Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Do basic assembly language programming of 8085.
2. Do advance assembly language programming of 8086.
3. Do basic assembly language programming of 8085 for interfacing of peripherals.
4. Do advance assembly language programming of 8086 for interfacing of peripherals.

BEC 403 Signals and Systems

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand and classify different types of signals and systems as per their properties.
2. Represent continuous and discrete time signals and systems in time and frequency domain using different transforms.
3. Understanding frequency concepts for analog and digital signals.
4. Get familiarized with the characteristics and applications of Linear Time Invariant Systems for practical applications.
5. Analyze LTI systems using Laplace/Z-Transform. Use of LTI systems for various applications.

BCS 404 JAVA

Course Outcomes: After completing this course the student must demonstrate the knowledge and ability to:

1. Able to understand the use of OOPs concepts.
2. Able to understand the use of abstraction, object, class.
3. Able to understand the concept of Inheritance and Polymorphism as well as packages and Interfaces
4. Able to design GUI based applications and develop applets for web applications.
5. Able to develop and understand exception handling, multithreaded applications with synchronization, use of collection and framework

BCS 454 JAVA Lab

Course outcomes: The student is expected to have hands on experience with the following:

1. Basics of Java programming, multi-threaded programs and Exception handling
2. The skills to apply OOP in Java programming in problem solving
3. Use of GUI components (Console and GUI based)


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BEC451 PCB Design Lab

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

1. Understand the basic concepts and principles to measure the different electrical signals.
2. Understand the operation and characteristics of different electrical instruments used around them
3. Understand and design the printed circuit boards.
4. Able to do the wiring with the meter in the main line efficiently

BHSM 501 Economics for Industry

Course outcome: At the end of the course, the students will be able to

1. Define the main concepts and describe the models and methods in economic analysis
2. Explain economic events in individual markets and the aggregate economy using basic theory and tools
3. Apply supply and demand analysis to relevant economic issues
4. Explain how individual decisions and actions as a member of society affect the economy locally, nationally and internationally
5. Distinguish between perfect competition and imperfect competition and explain the welfare loss in non-competitive markets

BEC 501 Antenna & Wave Propagation

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. define various antenna parameters.
2. understand the various special antennas with their applications.
3. understand the reflector antennas & types of reflector antennas.
4. understand the various antenna parameter measurements & antenna arrays.
5. discuss radio wave propagation.

BEC 502 Automatic Control Systems

Course Outcomes: After the successful completion of the course the students will be able to:

1. develop the mathematical model of the physical systems.
2. analyze the response of the closed and open loop systems.
3. analyze the stability of the closed and open loop systems.
4. Understanding the concept of gain margin and phase margin.
5. develop and analyze state space models

BEC 503 Electronic Measurement & Instrumentation

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. understand the fundamentals & characteristics of measurement & instrumentation.
2. analyze the different types with their applications of sensors and transducer.
3. apply the skills how to use electronic instruments & bridges with their applications.
4. apply the skills how to use display & special devices with their applications.
5. understand the operation, classification & application of telemetry & data acquisition system.

BEC 553 Electronic Measurement & Instrumentation Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. apply the skills how to select the correct sensors & transducers to find unknown values.
2. analyze the different types with their characteristics of sensors and transducer.
3. apply the skills how to use electronic instruments with their applications.
4. apply the skills how to use display devices with their applications.

DE-ECE 501 Electrical Engineering Materials

- Course Objectives:** At the end of the course, students will demonstrate the ability to
1. understand bonding in solids, crystal structure structural Imperfections and apply its role in materials behaviour that play a critical role in determining many physical properties.
 2. understand electrical and thermal conductivity in metals. Illustrate thermoelectric effect. Evaluate heat developed in current carrying conductors. Also Understand superconductivity and super conducting materials.
 3. know basics of magnetic materials and understand soft, hard and permanent magnetic materials.
 4. Compare between dielectric and insulator and illustrate effect of dielectric on the behaviour of a capacitor.
 5. know about basics of electrical components and understand effect of different electrical materials used in construction of different Electrical Components and classify according to their application.

OEC 503 Laser Systems and its Application

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand quantum physics needed for describing Laser operation
2. Describe Einstein's Coefficients and population inversion condition
3. Describe Components of Laser and explain its operating principles
4. Analyze Laser in different physical states
5. Appreciate numerous applications of Laser in Medical and Engineering field

BEC 601 Analog Communications

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Acquired knowledge about basic elements of a communication system.
2. design AM systems.
3. design Angle modulated systems.
4. design Pulse modulated systems.

BEC 651 Analog Communications Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to

1. Generate various AM signals
2. Generate FM signals
3. Evaluate the performances of AM and FM systems
4. Perform signal sampling by determining the sampling rates for baseband signals and reconstruct the signals

BEC 602 Digital Signal Processing

Course Outcomes: After studying this course, students will be able to:

1. Determine response of LTI systems using time domain and DFT techniques.
2. Compute DFT of real and complex discrete time signals.
3. Computation of DFT using FFT algorithms and linear filtering approach.
4. Solve problems on digital filter design and realize using digital computations.

BEC 652 Digital Signal Processing Lab

Course Outcomes: After studying this course, students will be able to:

1. Describe sampling theorem in MATLAB
2. Understand and verify different system properties
3. Find DFT and its Inverse DFT
4. Design FIR filter in MATLAB using window method
5. Design IIR filter in MATLAB.

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BEC 603 Linear Integrated Circuits

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. analyze and design analog circuits such as: differential amplifier, Op-amp and current mirror.
2. analyze and develop skill to design circuits such Op-amp circuit as comparator Schmitt trigger precision rectifier peak detector circuit, integrator circuit, difference circuit square wave and triangular wave generator etc.
3. understand the concept of filters & oscillators develop to design various filter and oscillator circuit.
4. know about various type of techniques to develop A/D and D/A converters.
5. understand the basics of timer IC 555 and phase locked loop, its working concept.

BEC 653 Linear Integrated Circuits Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. design and implement an inverting and non- inverting amplifier circuit.
2. design and implement a summing amplifier difference amplifier, a differentiator and an integrator circuit.
3. design and implement RC and LC oscillator.
4. know about and design square wave generator to operate at frequency $f_0=500\text{H}$.
5. know about timer-555 operation as monostable and astable multivibrator.

OHS 601 Occupational Health & Safety

Course Outcome: After learning the course the students should be able to:

1. Identify the diseases associated with occupation.
2. Manage safety in industries by suggesting safety measures.
3. Identify the accidental causes & apply the preventions.
4. Identify Fire Explosion & apply PPE.
5. Identify & apply Hazards & Risk identification, Assessment and control techniques

DE-ECE 601 Power Electronics

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. analyze different types of power semiconductor devices and their switching.
2. demonstrate the triggering circuit and snubber circuit and Classify the operation of choppers and basic topologies of DC-DC Switching regulators.
3. illustrate the operation of AC voltage controller and cyclo- converter and its application.
4. analyze operation, characteristics and performance parameter of controlled rectifiers.
5. analyze the operation of single phase and three phase inverters with and without PWM techniques and to understand harmonic reduction methods.

DE-ECE 605 Computer Networks

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model. To understand the fundamentals and basics of Physical layer, and to apply them in real time applications.
2. Study and evaluate medium access layer protocols. To learn data link layer concepts, design issues, and protocols and demonstrate knowledge of various error detection, correction and flow control techniques in data link layer.
3. Classify the routing protocols, analyze how to assign the IP addresses for the given network and to evaluate different congestion control methods.
4. Understand, analyze and evaluate a number of Transport layer and presentation layer services, and protocols.
5. Understand the functions of Application layer Paradigms and Protocols.


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OEC 603 Robotics

Course Outcomes: After the completion of this course, the students will be able to:

- 1- Understand the basics of robotic systems and different types of robots.
- 2- Perform kinematic and dynamic analyses with simulation.
- 3- Know about different types of sensors and robotic eye: geometry of image formation.
- 4- Know different types of actuators and grippers in robotics.
- 5- Select a robotic system for given industrial application.

BEC 701 Digital Communications

Course Outcomes: After the completion of the course the student will be able to:

1. Model a digital communication system and Identify source coding and channel coding schemes for Digital communication link
2. Understand the wave form coding techniques and evaluate the performance of PCM, DPCM and DM in a digital communication system
3. Comparison of various digital modulation techniques.
4. Design encoder and decoder schemes for error control.

BEC 751 Digital Communications Lab

Course Outcomes: After the completion of the course the student will be able to:

1. Perform signal sampling for baseband signals and reconstruct the signals.
2. Generate digital modulation signals for ASK, PSK and FSK and perform their detection.
3. Understand and generate QPSK signal.
4. Single bit error detection and correction.

BEC 702 Wireless & Mobile Communication

Course Outcomes: After the completion of the course the student will be able to:

1. Demonstrate their understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards.
2. Compare different technologies used for wireless communication systems.
3. Explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks.
4. Demonstrate an ability explain multiple access techniques for Wireless Communication
5. Demonstrate an ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

BEC 752 Wireless & Mobile Communication Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Describe the evolution of mobile communication system.
2. Describe the various concept of cellular system.
3. Illustrate the various models of propagation in mobile communication.
4. Express the equalization & channel coding for various system.
5. Compare the different wireless networks & standards.
6. Set up experiments for wireless mobile communication.


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DE-ECE 701 VLSI

Course Outcomes: After the successful completion of the course the students will be able to:

1. Students are able to know how to place the blocks and how to partition the blocks while for designing the layout for IC.
2. Students are able to solve the performance issues in circuit layout.
3. Students are able to analyze CMOS & NMOS process technology.
4. Students are able to understand the Sequential MOS logic circuit.
5. Students are able to analyze circuits using both analytical and CAD tools.

OEC 711 Machine learning and Python Programming

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Do programming with Python
2. Apply Statistics to machine learning and know how it is different than descriptive statistics
3. Build features that meet analysis needs and understand different approaches for creating predictive models
4. Create and evaluate data clusters
5. Apply Python for NLP

BEC 801 Optical Communications

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. familiarize with basic concepts and theory of optical fiber communication system.
2. learn transmission characteristics of optical fiber in optical fiber communication system.
3. understand the various optical sources used in optical fiber communication system.
4. understand the various optical receivers used in optical fiber communication system.
5. understand optical link design in optical fiber communication system.

BEC 851 Optical Communications Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. understand and measure the basic properties of the propagation of light in optical fiber communication system
2. understand the differences between types of light sources utilized in optical fiber communication system
3. understand the differences between types of light receivers utilized in optical fiber communication system
4. understand the different types of modulation techniques used in optical fiber communication system

BEC 802 Satellite Communication

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. define orbital mechanics and satellite launch methodology.
2. describe satellite sub systems
3. design link power budget for satellite
4. explain different satellite access
5. describe DTH and Compression standard.

DE-ECE 805 Fuzzy Logic and Neural Network

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

1. Apply operations on Fuzzy sets
2. Develop Fuzzy logic controllers.
3. Apply Fuzzy relations to applications.
4. Understand the basic concepts of Neural Network.
5. Apply neural network techniques to applications.

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OEC 803 Advance Sensors and Transducers

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Apply the mathematical knowledge and science & engineering fundamentals gained to solve problems pertaining to measurement applications.
2. Analyze the problems related to sensors & transducers.
3. Select the appropriate sensor/transducer for a given application.
4. Determine the static and dynamic characteristics of transducers using software packages.
5. Understand fiber optic sensor and applications. Ability to understand smart traducer and its standard.


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Electrical Engineering Department

VISION

- To produce competent Electrical Engineers by imparting quality education and make them industry ready to serve the society

MISSION

- To nurture a conducive academic environment to offer quality Education in Electrical Engineering
- To develop and maintain appropriate facilities for promoting research and innovation for sustainable development
- To develop overall personality of students by instilling in them social responsibility and leadership qualities

Programme Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) for the **Electrical Engineering** program describe accomplishments that graduates are expected to attain within five to seven years after graduation

PEO – 1: To provide students with strong fundamentals concepts and also advanced tools and techniques to enable the graduates build solutions or systems of varying complexity.

PEO – 2: To enable graduates to pursue research, have a successful career in academia or industries associated with Electrical Engineering

PEO – 3: To prepare students as entrepreneurs capable of delivering ethical, innovative and sustainable solutions to the problems identified.

Programme Specific Outcome (PSOs)

After the successful completion of B.E programme in Electrical Engineering, the graduates will be able to

PSO – 1: Analyze and design electrical machines and power converters.

PSO – 2: Implement and maintain computerized solutions in Power and Energy sectors.

PSO – 3: Implement AI and Automation to solve problems Industry and Society

PSO – 4: Design and develop Renewable Energy Solutions and Electrified Automobiles


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III Semester

BCS-301 Mathematics III

Course Outcomes: Upon successful completion of this course, students will be able to:

1. Solve the Fourier Transform of function.
2. Compute poles & zeros.
3. Evaluate the real & complex integrals with the help of Cauchy's Residue Theorem.
4. Utilize curve fitting techniques for data representations and computation in engineering analysis.
5. Use Binomial, Poisson & Normal Distribution to solve statistical problems.

BEE 301 Network Analysis & Synthesis

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.

BEE 302 Electrical Machines I

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand the principle of Electromechanical Conversion of Energy in electrical machines
2. Understand how the DC Generators and DC Motors operate and also their characteristics and applications
3. Apply mathematical models of the machines to design, test and analyze the performance of DC Machines
4. Understand the starting methods and apply their knowledge to control speed of DC Machines and
5. Analyze the performance of single phase and three phase transformers

BEE 303 Solid State Devices & Circuits

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

1. Understand the working of switching devices and apply the same in designing complex circuits with fewer devices.
2. Design amplifier and other complex circuits with the help of special semiconductor devices which will further increase real time applications and reduce runaway situations.
3. Apply the mathematical modeling for the electronic devices and circuits in turn helps in improvement in design in terms of size, power requirement and ease of use.
4. Use variety of electronic devices for designing society friendly electronic gadgets used for security and other useful purposes.

BEC 301 Digital Electronics

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand binary codes, binary arithmetic, minimization techniques and their relevance to digital logic design.
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder and sequential logic circuits.
3. Understand finite state machines and develop a digital logic to find out sustainable solution of a real life


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4. Understand and implement various digital integrated circuits using different logic families and simple systems composed of PLDs.

MC 302/MC 402 Human Values & Professional Ethics

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

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
4. Distinguish between ethical and unethical practices, and start working over the strategy to actualize a harmonious environment wherever they work.

BEC 351 Digital Electronics Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Implement the basic digital theory concepts practically and will be able to verify various results derived in theory.
2. Design, analyze and troubleshoot broad range of combinational and sequential circuits for various practical problems using basic gates and flip flops I.C's.
3. Develop technical writing skills to communication effectively and present one's own work.
4. Acquire teamwork skills for finding sustainable solution of a complex problem and working effectively in groups.

BEE 352 Electrical Machines Lab – I

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

- CO1 To experiment with the shunt and compound D.C. Generators and obtain their performance characteristics
- CO2 To perform load tests on D.C. Motors and analyze their performance characteristics
- CO3 To conduct tests on single phase transformers and predict and analyze their performance

BEE 352 Solid State Devices & Circuits Lab

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

1. Understand the characteristics of diodes, transistors, JFETs..
2. Understand the operation and characteristics of different configurations of BJT.
3. Design complex electronic circuits with fewer devices.
4. Able to understand the concept and applications of feedback mechanism in electronic circuits.


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IV Semester

BEE 401 Electrical Measurements and Instruments

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. understand the fundamentals & characteristics of measurement & instrumentation.
2. analyze the different types with their applications of sensors and transducer.
3. apply the skills how to use electronic instruments & bridges with their applications.
4. apply the skills how to use display & special devices with their applications.
5. understand the operation, classification & application of telemetry & data acquisition system.

BEC 402 Linear Integrated Circuits

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. analyze and design analog circuits such as: differential amplifier, Op-amp and current mirror.
2. analyze and develop skill to design circuits such Op-amp circuit as comparator Schmitt trigger precision rectifier peak detector circuit, integrator circuit, difference circuit square wave and triangular wave generator etc.
3. understand the concept of filters & oscillators develop to design various filter and oscillator circuit.
4. know about various type of techniques to develop A/D and D/A convertors.
5. understand the basics of timer IC 555 and phase locked loop, its working concept.

BEE 402 Electrical Machines – II

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand the principle of Synchronous Generators and Motors and their characteristics and applications
2. Apply mathematical models of the Synchronous machines to design, test and analyze their performance
3. Understand the operation of three phase Induction motors and analyze their performance.
4. Apply mathematical models of the Single phase induction Motors to test and analyze their performance
5. Aware of the working principle of special AC and DC motors and their applications.

BEE-403 Electromagnetic Theory

Course Outcomes: At the end of this course, student will have the ability to:

1. Understand the concepts of electromagnetic and magneto-statics
2. Understand and apply the time varying fields and Maxwell's equation to enhance various devices performance, hence upgrading its impact on society,
3. Analyse Uniform plane wave, Poynting vector and Flow of power to design more efficient devices for improving communication capabilities in turn reduce impact of radiations.
4. Understand the basic concepts of transmission line and guided waves and apply them in designing better transmission line in terms of low power losses.


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BCS 402 Data structures and Algorithms

Course Outcomes: At the end of this course students will demonstrate the ability to

1. To review the concepts of fundamental data structures to be used in programming. To understand various searching algorithms.
2. To understand the various operations on different types of data structures such as stacks, queues and linked lists. To apply and analyze various data structures on different applications.
3. To understand, analyze and compare various sorting algorithms. To understand the concept of hashing and its techniques.
4. To understand the various types of tree structures and their implementation. To evaluate various tree structures. To be able to apply tree structures on various problems.
5. To understand and implement various types of graphs. To study and implement various shortest path algorithms on graphs.

MC 401 Environment and Ecology

Same as CSE and ECE

BEE 451 Electrical Measurements & Instrumentation Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. apply the skills how to select the correct sensors & transducers to find unknown values.
2. analyze the different types with their characteristics of sensors and transducer.
3. apply the skills how to use electronic instruments with their applications.
4. apply the skills how to use display devices with their applications.

BEC 452 Linear Integrated Circuits Lab


Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. design and implement an inverting and non- inverting amplifier circuit.
2. design and implement a summing amplifier difference amplifier, a differentiator and an integrator circuit.
3. design and implement RC and LC oscillator.
4. know about and design square wave generator to operate at frequency $f_0=500\text{H}$.
5. know about timer-555 operation as monostable and astable multivibrator.

BEE 452 Electrical Machines Lab II

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

- CO1 To demonstrate some methods of starting and speed control of an Induction Motor
- CO2 To operate a synchronous motor and demonstrate the effect of excitation on its performance
- CO3 To conduct various tests on an Alternator and analyze the performance
- CO4 To conduct various tests on a single phase Induction motor and analyze its performance


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BCS 452 Data Structures and Algorithm Lab

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

1. Analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. Implement search problem (Linear Search and Binary Search).
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity and will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

V Semester

BEE-501	Power Systems – I	L-T-P-C: 3-0-0-3
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Understand the concepts of power systems	
CO2	Distinguish between various components of power system	
CO3	To analyse different types of faults, Estimate fault currents, over-voltages and insulation coordination	
CO4	Comprehend basic protection schemes	
CO5	Understand concepts of HVDC power transmission and renewable energy generation	

BEE-502	Signals and Systems	L-T-P-C: 2-0-0-2
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Analyse different types of signals	
CO2	Represent continuous and discrete systems in time and frequency domain using different transforms	
CO3	Investigate whether the system is stable	
CO4	Do Sampling and reconstruction of a signal	

BEE-503	Microprocessors and Microcontrollers	L-T-P-C: 3-0-0-3
CO1	1. Recall and apply a basic concept of digital fundamentals to microprocessor based personal computer system and Recall the memory types and understand the interfacing of memory with microprocessor. 2. Understand the internal architecture and organization of 8085 & 8086.	
CO2	1. Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller. 2. Analyse assembly language programs; select appropriate assemble into	


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	machine a cross assembler utility of a microprocessor and microcontroller.
CO3	Discuss how the different peripherals are interfaced with microprocessor like 8255,8253/54,8237,8279 etc.
CO4	1. To analyse the concepts of memory interfacing for faster execution of instructions and improves the speed of operations & hence performance of microprocessors. 2.To Understand the basic knowledge of advanced processor and analyse the internal architecture of 80286,80486 and Pentium processor.
CO5	1. Analyse the internal architecture and real time control of 8051. 2. Analyse the internal architecture of ARM Processors.

HSMC-501 Economics for Industry L-T-P-C: 3-0-0-3 Common to all

Same as ECE/CSE

DEEE 502 Introduction to Power Plant Engineering

Course Outcomes: At the end of this course, the students will:

- (i) Recall and apply a basic concept of digital fundamentals to microprocessor based personal computer system and Recall the memory types and understand the interfacing of memory with microprocessor. (ii) Understand the internal architecture and organization of 8085 & 8086.
- (i) Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller. (ii) Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
- Discuss how the different peripherals are interfaced with microprocessor like 8255, 8253/54,8237,8279,etc.
- (i)To analyze the concepts of memory interfacing for faster execution of instructions and improves the speed of operations & hence performance of microprocessors. (ii) To understand the basic knowledge of advanced processor and Analyze the internal architecture of 80286, 80486 and Pentium processor.
- (i) Analyze the internal architecture and real time control of 8051. (ii) Analyze the internal architecture of ARM Processors.

OEEE 501 VLSI Circuits

OEEE-501	VLSI Circuits	L-T-P-C: 3-0-0-3
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Comprehend IC Fabrication Techniques	
CO2	Analyse and design MOSFET logic circuits	
CO3	Analyse and design CMOS logic circuits	
CO4	Design Read Only Memory, Random Access Memory	
CO5	Design Adders, multipliers	


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BEE 551 Power Systems I Lab

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Calculate the various parameters of transmission lines using MATLAB.
2. Analyze the design of various components of distribution system.

BEE 552 Electronic Design Lab

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Study using MATLAB various **Electrical circuits for combinations of R, L, C, and AC or DC sources.**
2. Study using MATLAB various **Electronic circuits using diode, transistors and OPAMP.**

BEE 553 Microprocessor and Microcontrollers Lab

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Do basic assembly language programming of 8085.
2. Do advance assembly language programming of 8086.
3. Do basic assembly language programming of 8085 for interfacing of peripherals.
4. Do advance assembly language programming of 8086 for interfacing of peripherals

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VI SEMESTER

BEE601 Power Systems II

BEE-601	Power Systems – II	L-T-P-C: 3-1-0-4
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Apply numerical methods to analyse a power system in steady state	
CO2	Comprehend stability constraints in a synchronous grid	
CO3	Understand methods to control the voltage, frequency and power flow	
CO4	Comprehend the monitoring and control of a power system	
CO5	Appreciate the basics of power system economics	

BEE602 Automatic Control Systems

BEE-602	Automatic Control System	L-T-P-C: 3-1-0-4
CO1	Understand concepts of Time Domain and Frequency Domain Analysis	
CO2	Model linear-time-invariant systems using transfer function	
CO3	Model linear-time-invariant systems using state-space representations	
CO4	Apply the concept of stability in linear-time invariant systems	
CO5	Design simple feedback controllers	

BEE603 Power Electronics

BEE-603	Power Electronics	L-T-P-C: 3-1-0-4
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Ability to analyse different types of power semiconductor devices and their switching.	
CO2	Demonstrate the triggering circuit and snubber circuit, operation of choppers and basic topologies of DC-DC Switching regulators	
CO3	Ability to analyse operation, characteristics and performance parameter of controlled rectifiers	
CO4	Illustrate the operation of AC voltage controller and cyclo- converter and its application.	
CO5	Analyse the operation of single phase and three phase inverters with and without PWM techniques and to understand harmonic reduction methods.	

MC601 Occupational Health and Safety

Same as ECE, CSE

DEEE601 Soft Computing

DEEE-601	Soft Computing	L-T-P-C: 3-1-0-4
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Artificial Intelligence, Various types of production systems, characteristics of production systems	
CO2	Neural Networks, architecture, functions and various algorithms involved	
CO3	Fuzzy Logic, Various fuzzy systems and their functions	
CO4	Genetic algorithms, its applications and advances	
CO5	The unified and exact mathematical basis as well as the general principles of various soft -computing techniques.	



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DEEE 701 1 Electrical and Hybrid Vehicles

OEEE-601	Electrical and Hybrid Vehicles	L-T-P-C: 3-0-0-3
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Understand the models used to describe hybrid vehicles and their performance.	
CO2	To comprehend electric and hybrid drive train topologies	
CO3	To realize different possible ways of energy storage	
CO4	Understand the different strategies of energy management	

VI SEMESTER**BEE651 Power Electronics and Drives Lab****Course Outcomes:** At the end of this course students will demonstrate the ability to

3. Correlate theoretical and practical analysis of AC-AC, DC-AC converters and also converter fed to AC&DC drives.
4. Analyze the characteristics of MOSFET, SCR and SCR firing circuits

BEE652 Automatic Control Systems Lab**Course Outcomes:** At the end of this course students will demonstrate the ability to

1. Demonstrate and analysis various controllers like, PID, Servomotor, synchro transmitter receiver.
2. Study using MATLAB of 1st, 2nd order system, laplace transform, inverse laplace transform, PID, various plots such as Root locus, Nyquist plot, Bode Plot.

BEE653 Power Systems II lab**Course Outcomes:** At the end of this course students will demonstrate the ability to

1. Analyze the performance of transmission line and relays.
2. Analyze different types of short circuit faults which occurs in power system.

VII SEMESTER**BEE 701 Digital Signal Processing**

BEE-701	Digital Signal Processing	L-T-P-C: 3-0-0-3
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Represent signals mathematically in continuous and discrete-time, and in the frequency domain.	
CO2	Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms	
CO3	Realize Digital filter structures	
CO4	Design digital filters for various applications	
CO5	Apply multi-rate digital signal processing for the analysis of real-life signals including image	

BEE 702 Advanced Electrical Drives

BEE-702	Advanced Electrical Drives	L-T-P-C: 2-0-0-2
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	To comprehend the fundamentals of Electric Drives	
CO2	To understand the dynamics of Electric Drive	
CO3	To comprehend the dynamics of starting and braking of DC, Three phase Induction and Synchronous motors	

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CO4	Understand the power electronic converters used for dc motor speed control
CO5	Understand the power electronic converters used for induction motor speed control

BEE 703 Power System Operation and Control

BEE-703	Power System Operation and Control	L-T-P-C: 3-0-0-3
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Comprehend structure of Power System	
CO2	Understand the economic operation of power system	
CO3	Describe Load Frequency Control methods	
CO4	Explain Automatic Voltage Control methods	
CO5	Understand State Estimation	

DEEE 704 Energy Audit

DEEE-704	Energy Audit	L-T-P-C: 3-1-0-4
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Understand the Power distribution system planning, operation and maintenance	
CO2	Describe the types of Energy auditing and energy audit instruments.	
CO3	Explain the short and long term measures to reduce loss and improve energy efficiency	
CO4	Understand Demand Side Management	

OEEE 701 Machine Learning and Python Programming

Course Outcomes: At the end of this course students will demonstrate the ability to

CO1. Describe what Data Science is and the skill sets needed to be a data scientist. • Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.

CO2. Use R to carry out basic statistical modeling and analysis.

CO3. Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.

CO4. Describe the Data Science Process and how its components interact

CO5 Use APIs and other tools to scrap the Web and collect data. And Apply EDA and the Data Science process in a case study.

BEE 751 Digital Signal Processing Lab

Course Outcomes: After performing the experiments of DSP lab, students will be able to,

1. Understand the use of MATLAB as software tool for the implementation of DSP concepts.
2. Visualize the conceptual similarity between the theory and practical implementation.
3. Understand the concepts of basic signal processing concepts such as convolution, correlation,


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filtering etc.

4. Design the various filters to do various processing on signals.

BEE 752 Internship Assessment
Industrial exposure to students for a period of 30 to 45 days

PROJEE1 Project Stage I

Course Outcomes: At the end of this course students will demonstrate the ability to **Hands on experience in deciding on a project work, collecting literature, finding relevant social / industrial needs and use technological interventions to give appropriate solutions, formulating methodology, working out the solution, analyzing the results and concluding on future prospects**

VIII SEMESTER

BEE 801 Industrial Electrical Systems

BEE-801	Industrial Electrical Systems	L-T-P-C: 2-0-0-2
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Understand various components of industrial electrical systems	
CO2	Understand the electrical wiring systems for residential representing the systems with standard symbols and drawings	
CO3	Analyse and choose the appropriate ratings of various electrical system components.	
CO4	Understand the electrical wiring systems of commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD	
CO5	To understand concepts of Automation and PLC SCADA	


DEEE 803 Analog and Digital Communication

DEEE-603	Analog and Digital Communication	L-T-P-C: 3-1-0-4
Course Outcomes: At the end of this course students will demonstrate the ability to		
CO1	Exhibit knowledge of Elements of communication system	
CO2	Understand Phase modulation Techniques	
CO3	Understand Pulse modulation systems	
CO4	Analyse digital modulation Techniques	
CO5	Analyse information coding techniques	

OEEC 803 Advance Sensors and Transducers

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Apply the mathematical knowledge and science & engineering fundamentals gained to solve problems pertaining to measurement applications.
2. Analyze the problems related to sensors & transducers.
3. Select the appropriate sensor/transducer for a given application.


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4. Determine the static and dynamic characteristics of transducers using software packages.
5. Understand fiber optic sensor and applications. Ability to understand smart traducer and its standard.

BHSM 804 Principles of Management		L-T-P-C: 3-0-0-3
BHSM-804	Principles of Management	
CO1	Remembering the concept of Management, human relation and skills of management	
CO2	Understand the meaning of planning , strategic management	
CO3	Understand the steps of Decision Making and Technique	
CO4	Remembering of the nature of organisation, motivational technique, leaderships etc.	
CO5	Performs and evaluate of budgetary and no budgetary control technique	


BEE 851 Electrical CAD and Fabrication Lab

Course Outcomes: After completion of this lab, students will be able to,

1. get hands on experience of building some small circuits.
2. get familiar with design process of electronic circuits.
3. understand the use of circuit simulation software required for circuit design.

BEE 852 PROJEE 2 Project Stage II

Course Outcomes: At the end of this course students will demonstrate the ability to **Hands on experience in deciding on a project work, collecting literature, finding relevant social / industrial needs and use technological interventions to give appropriate solutions, formulating methodology, working out the solution, analyzing the results and concluding on future prospects**


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