# Course Outcomes (CO)- Engineering Mathematics –III ( BTINC301)

**Course Description:**

The course is intended to provide understanding of concepts of mathematics and its application to engineering. This course introduces the student to the second and higher order differential equations and their solution, function of a complex variable.This course is aimed study concept of

At the end of this course, students should be able to

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| **CO1** | Solve engineering problems using the principles of solution of differential equations. |
| **CO2** | Understand analytic function of a complex variable and able to apply Cauchy integral theorem and residue theorem to solve contour integrations. |
| **CO3** | Use Fourier transforms and its inverse in practical applications of electronics engineering. |
| **CO4** | Apply Laplace transform and its inverse to solve initial value and other related problems. |
| **CO5** | Know basic statistical techniques required for electronics engineering. |
| **CO6** | To Under Stand Functions of Complex Variables (Integral calculus) |

# Course Outcomes (CO)- Sensors and Transducers (BTINC302)

**Course Description:**

This course is aimed study concept of various unit operations in industry as well as understanding of different process and apply different instrumentation for control of this various processes to optimum level.

At the end of this course, students should be able to

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| **CO1** | To expose the students to various sensors and transducers for measuring mechanical quantities. |
| **CO2** | To understand the specifications of sensors and transducers. |
| **CO3** | To learn the basic conditioning circuits for various sensors and transducers. |
| **CO4** | To introduce advances in sensor technology. |
| **CO5** | Appreciate the characteristics of transducers |
| **CO6** | Identify different sensors and transducers required and able to apply them. |

## Course Outcomes (CO)- Network Analysis And Synthesis (BTINC303)

### Course Description:

This course is mainly for Undergraduate Second Year Instrumentation engineering students, which will introduce and explain the fundamental concepts in the field of Instrumentation engineering. Network analysis means find the currents and voltages in all parts of a given network which contains passive components and voltage/current sources

At the end of this course, students should be able to

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| **CO1** | Understand the concept of network topology and apply it for various formulations. |
| **CO2** | Apply basic circuital laws and simplify the network using reduction techniques and theorems. |
| **CO3** | Understand time domain analysis and evaluate transient response, Steady state response |
| **CO4** | Understand frequency domain analysis, use Fourier transform and Laplace transform for analysing circuits. |
| **CO5** | Define network functions and Synthesize networks using Foster and Cauer Forms. |
| **CO6** | Explain the concept of Laplace transform & can apply to solve D.E and integral equation. |

## Course Outcomes (CO)- Analog Electronics (BTINES304)

## Course Description:

This course provides knowledge about basic analog electronics components to familiarize students with construction, their working, operation, performance and applications.

At the end of this course, students should be able to

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| **CO1** | Analyze the characteristics, testing and controls and applications of transistors. |
| **CO2** | Design, analyze and test multi-stage amplifiers, feedback amplifiers. |
| **CO3** | Apply the analog electronics components for designing circuits. |
| **CO4** | Concept of negative and positive feedback applications. |
| **CO5** | The characteristics of operational amplifiers and apply it in various circuits. |
| **CO6** | Familiarize with construction and working principal of BJT and Field Effect Transistor and its applications. |

## Course Outcomes (CO) - Digital Electronics (BTINC401)

## Course Description:

This course provides knowledge about discrete time control system and components. It also provides the knowledge state space analysis, representation and useful transformations in state space analysis and design.

At the end of this course, students should be able to

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| **CO1** | To Work with a variety of number systems and numeric representations, including signed and unsigned binary, hexadecimal, 2'scomplement. |
| **CO2** | To introduce basic postulates of Boole an algebra and show the correlation between Boolean expression. |
| **CO3** | To introduce the methods for simplifying Boolean expressions. |
| **CO4** | To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits. |
| **CO5** | Design digital clock and frequency counter circuits. |
| **CO6** | Understand operation basics of flip-flops, registers, decoders, encoders, multiplexers and de-multiplexers. |

# Course Outcomes (CO)- Feedback Control System (BTINC402)

**Course Description:**

This course is aimed study concept of various unit operations in industry as well as understanding of different process and apply different instrumentation for control of this various processes to optimum level.

At the end of this course, students should be able to

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| **CO1** | Understand control system concept, basic control configurations and types of control systems. |
| **CO2** | Review of Laplace transform and learn how to find mathematical model of system. |
| **CO3** | Perform Time domain analysis of control systems and able to get knowledge about stability of control systems. |
| **CO4** | Analyse frequency response analysis of control systems. |
| **CO5** | Apply and design compensators |
| **CO6** | Demonstrate proficiency in programming language related to basic control concepts. |

# Course Outcomes (CO)- Industrial Management and Economics (BTHM403 )

**Course Description:**

This course is aimed study concept of various unit operations in industry as well as understanding of different process and apply different instrumentation for control of this various processes to optimum level.

At the end of this course, students should be able to

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| **CO1** | To understand the basics of industrial management. |
| **CO2** | Learn principles of various elements of management. |
| **CO3** | Increase ability to learn the Economics of engineering. |
| **CO4** | Value added quality product for economical growth through technological development. |
| **CO5** | Appreciate the concepts in industrial management and safety |
| **CO6** | Understand the concepts of financial management and smart investment. |

# Course Outcomes (CO)- Elements of Electrical and Electronics Measurements (BTINBS404)

## Course Description:

This course provides knowledge about measuring instruments and standards. It also gives introduction to recorders, oscilloscopes, errors in measurements. It also covers the active and passive electronic components measuring circuits.

At the end of this course, students should be able to

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|---|---|
| **CO1** | understand the concept of measurement system. |
| **CO2** | apply and design analog measuring devices |
| **CO3** | identify, formulate and solve a problem of electrical and electronic measurement. |
| **CO4** | Familiarize with different measurement techniques. |
| **CO5** | Understand the operation of instruments in the electrical and electronic engineering applications |
| **CO6** | Gain proficiency in the use of common measuring instruments. |

## Course Outcomes (CO)- Signals and System (BTINPE405 )

## Course Description:

The course is designed to provide the fundamental concepts in signals and systems. It covers applications of these fundamentals for designing, filtering, sampling, communications and feedback systems analysis. It also focuses mathematical transformations used in signal analysis.

At the end of this course, students should be able to

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| **CO1** | Identify and represent the type of signals and systems and Perform elementary operations on signals |
| **CO2** | Classify systems based on their properties |
| **CO3** | Understand fundamental properties of LTI systems and be able to determine response of the system for given input |
| **CO4** | Interpret and analyze signal and report results. |
| **CO5** | Analyse and design of an LTI systems using Fourier transform and Laplace transform.. |
| **CO6** | Understand the concept of probability and statistical properties of signals. |

## Course Outcomes (CO)- Process Loop Components (BTINC501)

## Course Description:

The objective of the course is to provide students with a firm grasp of the essential principles of control system components

At the end of this course, students should be able to

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|---|---|
| **CO1** | Apply the knowledge of the control system components for controlling various Industrial parameters. |
| **CO2** | Able to identify, formulate and solve a problem using hydraulic, electrical & pneumatic system. |
| **CO3** | Analyse the process characteristics and apply suitable controller to that process. |
| **CO4** | Correctly select type and size of control valves for industrial use. |
| **CO5** | To introduce the PID Controllers and programmable logic controllers (PLC) |
| **CO6** | To introduce the Auxiliary components |

## Course Outcomes (CO)- Microprocessor and Microcontroller (BTINC502)

## Course Description:

To provide solid foundation on the fundamentals of microprocessors and applications, interfacing the external devices to the processor according to the user requirements thus, enabling to create novel products and solutions for real time problems. This course is an introduction to the basic principles and fundamental concepts of microprocessor system. The student will be able to integrate these concepts into their electronics designs for other courses where Control can be achieved via microprocessor.

At the end of this course, students should be able to

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|---|---|
| **CO1** | Review the latest technology regarding design of integrated circuits. |
| **CO2** | Review the fundamental concepts of a microprocessor and microcontroller. |
| **CO3** | Design and debug programming of microprocessors and microcontrollers. |
| **CO4** | Identify and select an appropriate microcontroller as well as development tools for given applications |
| **CO5** | Understand the basic architecture, interfacing and interrupts of 8085. |
| **CO6** | Understand the basic architecture, peripheral functions of 8085. |

## Course Outcomes (CO) - Digital Signal Processing (BTINC503)

## Course Description:

This course is aimed at introducing the fundamentals of Digital Signal, Digital Filters and Application of Digital signal processing to undergraduate students. The objective of the course is to use the knowledge of Digital signal Processing in real Instrumentation applications.

At the end of this course, students should be able to

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| **CO1** | Ability to apply the various programming techniques on DSPs |
| **CO2** | Ability to determine the frequency, steady state and transient response of LTI systems. |
| **CO3** | Ability to apply the DFT and FFT methods for various signals |
| **CO4** | Solve a given problem for analyze Signals in the frequency domain using various transforms. |
| **CO5** | Ability to design FIR and IIR filters using different techniques. |
| **CO6** | Ability to study of real application of DSP in Instrumentation area. |

## Course Outcomes (CO) - Linear Technique (BTINPE 504 B)

## Course Description:

The objective of the course is to provide students with a firm grasp of the essential principles of Operational Amplifiers and its applications as well as signal sources and signal analysis.

At the end of this course, students should be able to

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|---|---|
| **CO1** | Apply basic Knowledge of science and engineering subject to understand the concept, working and application of Operational Amplifier. |
| **CO2** | Understand concept of negative and positive feedback applications using Operational Amplifiers. |
| **CO3** | Understand the characteristics of operational amplifiers. |
| **CO4** | Understand fundamentals and design of different signal sources and voltage regulators |
| **CO5** | Understand the block diagram and applications astable, Monostable multivibrater |
| **CO6** | Understand Voltage regulators and Active filters |

## Course Outcomes (CO)- Control System (BTINOE505 A)

## Course Description:

This course is aimed at introducing the fundamentals of Digital Control System, Z plane Analysis and Design of Discrete Time Control System by conventional methods to undergraduate students. The objective of the course is to use the knowledge of DCS, State Space Analysis of Discrete Time Control System and Pole Placement and Observer Design

At the end of this course, students should be able to

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| **CO1** | Study and Analysis of Non-linear Control Systems |
| **CO2** | Ability to study of Proportional (P), Integral (I) & Derivative (D)controller, |
| **CO3** | Ability to study of Concept of state & state variable |
| **CO4** | Design and investigate State Space Analysis of Control Systems. |
| **CO5** | Find Controllability & observability of linear system by using Kalman's test. |
| **CO6** | Introduction to control system design, Compensation technique-Cascade & Feedback, Compensation network |

## Course Outcomes (CO) - Digital Control System (BTINC601)

### Course Description:

This course provides knowledge about discrete time control system and components. It also provides the knowledge state space analysis, representation and useful transformations in state space analysis and design.

At the end of this course, students should be able to

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|---|---|
| **CO1** | Study and Analysis of Digital Control Systems |
| **CO2** | Ability to study of Z plane Analysis of Discrete-time Control Systems |
| **CO3** | Plot response and stability analysis of the Discrete Time Control System for different standard signals. |
| **CO4** | Design and investigate State Space Analysis of Control Systems. |
| **CO5** | design discrete time control system by conventional methods. |
| **CO6** | Estimate, analyze, and improve the stability of control systems. |

## Course Outcomes (CO)- Programmable logic controller and Distributed Control System (BTINC602)

## Course Description:

To provide the Fundamentals of PLC, PLC programming concepts, PLC applications To provide in-depth understanding of DCS, SCADA, and Computer Controlled Systems which are used in automation of various machines, processes and systems in industries

At the end of this course, students should be able to

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|---|---|
| **CO1** | To provide the Fundamentals of PLC. |
| **CO2** | PLC programming concepts. |
| **CO3** | PLC applications To provide in-depth understanding of DCS. |
| **CO4** | PLC applications To provide in-depth understanding of systems in industries SCADA. |
| **CO5** | Computer Controlled Systems which are used in automation of various machines. |
| **CO6** | Computer Controlled Systems which are used in automation of various processes. |

## Course Outcomes (CO)- Power Electronics and Drives (BTINC603)

## Course Description:

The objective of the course is to provide students with a firm grasp of the essential principles of power electronics circuits and their classifications. The course aimed at acquiring an understanding of basic principles, operation, performance and applications of power electronics circuits. The subject is helpful in the study of technological aspects such as utilization semiconductor devices and technology in power systems, industrial drives, automation and control.

At the end of this course, students should be able to

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|---|---|
| **CO1** | To review principle of construction, operation and characteristics of basic semiconductor devices. |
| **CO2** | To understand and analyze performance of controlled and uncontrolled converters. |
| **CO3** | To understand and analyze performance of DC to DC converters. DC to AC converters. |
| **CO4** | To understand and analyze performance of AC voltage controllers. |
| **CO5** | To understand Various methods and their circuit diagrams and working. |
| **CO6** | Industrial Applications of Thyristor controller |

## Course Outcomes (CO)- Instrumentation in Unit Operations( BTINPE604 A)

### Course Description:

This course is aimed study concept of various unit operations in industry as well as understanding of different process and apply different instrumentation for control of this various processes to optimum level.

At the end of this course, students should be able to

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| **CO1** | List chemical processes, units, and the corresponding equipments. |
| **CO2** | Make material balances and energy balance on unit operations and processes. |
| **CO3** | Understanding of the degrees of freedom analysis and its significance. |
| **CO4** | Get knowledge of basic principles of fluid mechanics |
| **CO5** | Analyze fluid flow problems with the application of the momentum and energy equations |
| **CO6** | Select suitable size reduction equipment, separation equipment and proper conveying medium. |

## Course Outcomes (CO)- Fiber Optics Laser Instrumentation (BTINOE 605 B)

## Course Description:

Basic concepts of optical fibers and their properties. Fiber Optic based measurement Systems. Lasers and their uses in different industrial purposes

At the end of this course, students should be able to

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| **CO1** | Obtain the knowledge needed to perform fiber-optic communication system engineering calculation. |
| **CO2** | Apply knowledge to modern fiber-optic systems. |
| **CO3** | Evaluate real time systems |
| **CO4** | Understand the most recent literature in the field of fiber-optic communications. |
| **CO5** | Understand Types of laser Instruments |
| **CO6** | Understand application of laser Instruments in real life of instrumentation system |

## Course Outcomes (CO)- Process Instrumentation and Control (BTIEC701)

### Course Description:

This course is aimed study concept of various unit operations in industry as well as understanding of different process and apply different instrumentation for control of this various processes to optimum level.

At the end of this course, students should be able to

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| **CO1** | Summarize and classify characteristics of various control loops |
| **CO2** | Design and apply appropriate control for different control loops. |
| **CO3** | Familiarize with the advances in process instrumentation. |
| **CO4** | Apply the principles and practices for Process control |
| **CO5** | Apply various control techniques to processes |
| **CO6** | Design multivariable control scheme. |

# Course Outcomes (CO)- Instrumentation System Design (BTIEC702)

**Course Description:**

This course is aimed study concept of Control Valve Sizing concepts and its usual terms for applications like liquid, gas, vapour and flashing fluids, Control room and Control Panel details and The process of Electronic product design

At the end of this course, students should be able to

| | |
|---|---|
| **CO1** | Design and Analyse CV Sizing |
| **CO2** | Identify various Control panels and Control Room details |
| **CO3** | Design of Electronic product. |
| **CO4** | Understand Signal Conditioning for Transducers. |
| **CO5** | Understand and Design of signal conditioning circuits |
| **CO6** | Understand to Printed circuit board design guidelines, general components layout scheme |

## Course Outcomes (CO)- Industrial Project Planning and Estimation

## ( BTIEC703)

## Course Description:

The objective of the course is to provide students with a firm grasp of the essential principles of project, planning, controlling, estimation and economics.

At the end of this course, students should be able to

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| **CO1** | Apply the knowledge of the documentation for project execution. |
| **CO2** | Able to do the documentation for procurement of instruments/equipment. |
| **CO3** | Apply the knowledge for project, planning, controlling, estimation and economics. |
| **CO4** | Do higher studies in field of project, planning, controlling, estimation and economic developments. |
| **CO5** | To understand importance, characteristics, principles and levels of management |
| **CO6** | To understand Cost Management, PERT and CPM |

## Course Outcomes (CO)- Image Processing ( BTIEPE704A )

### Course Description:

The fundamentals of digital image processing and algorithms that are used. Useful skill base that would allow them to carry out further study should they be interested and to work in the field. The students are expected to develop a foundation that can be used as the basis for further study and research in this field. The syllabus gives great emphasis on basic principles as well as more advanced techniques for image enhancement, segmentation, morphological operations etc.

At the end of this course, students should be able to

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| **CO1** | Review the fundamental concepts of a digital image processing system. |
| **CO2** | Analyze images in the frequency domain using various transforms. |
| **CO3** | Evaluate the techniques for image enhancement and image restoration. |
| **CO4** | Interpret Image compression standards |
| **CO5** | Interpret image segmentation and representation techniques |
| **CO6** | Ability to study of real application of DIP in Instrumentation area. |

## Course Outcomes (CO)- Analytical Instrumentation (BTIEOE705A)

## Course Description:

It is the course which provides the knowledge of different analytical methods used in chemical analysis and role of instrumentation in it.

At the end of this course, students should be able to

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| **CO1** | Understand the capabilities and limitations of analytical instruments. |
| **CO2** | Select and apply an analytical instrument in the physical, chemical and biological world and appreciate the role of instrumentation. |
| **CO3** | Learn the advances in analytical instrumentation. |
| **CO4** | To understand principles of instrumental analysis |
| **CO5** | To study the theory and design of analytical instruments |
| **CO6** | To develop problem-solving skills applicable to real-world problems |

## Course Outcomes (CO)- Control Engineering ( BTIEPE801A)

## Course Description:

This course shall introduce the fundamentals of modeling and control of linear time invariant systems; primarily from the classical viewpoint of Laplace transforms and a brief emphasis on the At the end of this course, students should be able to

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| **CO1** | To understand Mathematical Modelling of Systems |
| **CO2** | To understand Block diagram reduction, Time response characteristics. |
| **CO3** | To understand Introduction to stability, Routh Hurwitz stability criterion. |
| **CO4** | To understand Basics of control design, the proportional, derivative and integral actions. |
| **CO5** | To understand State space analysis and Design using State space |
| **CO6** | To understand Laplace Transforms, transfer functions, block diagram representation. |

## Course Outcomes (CO)- Sensors and Actuators ( BTIEPE802B)

## Course Description:

This course is designed with an aim of educating students in micro technology and its use to fabricate sensors and systems. The students will have an exposure to sensors and its importance in the real world. The students will also able to understand how to fabricate some of those sensors. Students will have an exposure towards how to fabricate the sensors and its application in real world. The students will provide an understanding on modern day micro sensors and micro actuators.At the end of this course, students should be able to

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| **CO1** | To understand Basics of Energy Transformation such as Transducers, Sensors and Actuators |
| **CO2** | Understanding of thin film physics: Application in MOSFET and its variants |
| **CO3** | Basic understanding of Photolithography for pattering layer. Detailed overview of Etching methods |
| **CO4** | Understanding of Sensor Interfacing with Microprocessor to build electronic system |
| **CO5** | Understanding various gas sensors: Optical gas sensor, Metal oxide semiconductor gas sensor, Field effect transistor gas sensor, Piezoelectric gas sensor, Polymer gas sensor, Nano-structured based gas sensors |
| **CO6** | Understanding basics of micro fluidics to assist Photo mask design using Clew in Software, pattern transfer techniques, device bonding techniques. |