

COURSE OUTCOMES

**DEPARTMENT OF ELECTRONICS AND
TELECOMMUNICATION ENGINEERING**



COLLEGE OF ENGINEERING ROORKEE
ACADEMIC YEAR – 2020-21

Preface

This document presents a compilation of the Course Outcomes (COs) for all subjects taught in a program leading to degree in **B. Tech(Electronics and Telecommunication Engineering)**. The COs outline a few (about 5) significant learning outcomes that a student is expected to learn while studying the subject. Besides, each Course Outcome is associated with one or more of the 5 Blooms Taxonomy Levels as listed below:

Bloom's Levels	Bloom's Taxonomy
1	Remember and Understand (Referred to as 'Understand' in all Course outcomes)
2	Apply
3	Analyze
4	Evaluate
5	Create

At the College of Engineering Roorkee (COER), the curriculum is prescribed by the affiliating University. Efforts are made to make the teaching learning process Outcome Based Education (OBE) oriented. Outcome-based education offers a powerful managing technical education to be effective in its goals.

The OBE process started at COER systems in 2018 and went through evolution phases. This document presents consolidated Course Outcomes (CO) of the all courses offered in the academic year 2020-21. For this purpose, Course Outcome (CO) committees were formed, which consisted Dean Academics, Head of the Department and a senior faculty members of the respective departments. They defined COs for each course by referring to contents of the respective syllabus. Bloom's Taxonomy levels were also assigned for each identified CO.

Teaching Scheme: B.Tech.(Electronics and Telecommunication Engineering)

Semester: 3rd

S. No	Subject's Title	Subject Code	L	T	P	Credits
1	Electronic Measurement & Instrumentation	BECT 302 BEC302	3	1	2	5
2	Digital Electronics	BECT 303 BEC303	3	1	2	5
3	Electronic Devices	BECT 304 BEC304	3	1	2	5

Semester: 4th

S. No	Subject's Title	Subject Code	L	T	P	Credits
1	Energy & Environmental Engineering	BAST 401	3	1	-	4
2	Signal & Systems	BECT 402 BEC402	3	1	-	4
3	Analog Communication	BECT 403 BEC403	3	1	2	5
4	Analog Circuits	BECT 405 BEC405	3	1	2	5

Semester: 5th

S. No	Subject's Title	Subject Code	L	T	P	Credits
1	Microprocessors & Interfacing	BECT501 BEC501	3	1	2	5
2	Electromagnetic Theory	BECT -502 BEC502	3	1	2	5
3	VLSI Technology and Design	BECT -503 BEC503	3	1	2	5
4	Data Communication and Networks	BECT -504	3	1	0	4

Semester: 6th

S. No	Subject's Title	Subject Code	L	T	P	Credits
1	Digital Signal Processing	BECT601 BECP-601	3	1	2	5
2	Antenna and Wave Propagation	BECT -602 BECP-602	3	1	2	5
3	Digital Communication	BECT -603 BECP-603	3	1	2	5
4	Departmental Elective: Biomedical Electronics	BOEC -605	3	1	0	4

Semester: 7th

S. No	Subject's Title	Subject Code	L	T	P	Credits
1	Optical Fibre Communication Systems	TEC-701	3	1	2	0
2	Wireless Communication Systems	TEC – 702	3	1	0	0
3	Satellite Communication	TEC – 703	3	1	0	0
4	ELECTIVE-I : Principles of Secure Communication	TEC-013	3	1	0	0

Semester: 8th

S. No	Subject's Title	Subject Code	L	T	P	Credits
1	Radar & Navigation	TEC - 801	3	1	0	0
2	Data Communication Networks	TEC-802	3	1	0	0
3	ELECTIVE-II : Digital Image Processing	TEC-024	3	1	0	0
4	ELECTIVE-III :Optical Network	TEC-032	3	1	0	0

Program Educational Objectives (PEOs)

PEO1 To equip the students with lifelong skills so that they can work and contribute to the infrastructural development projects of the public and private sectors

PEO2 To provide research oriented education with knowledge of state-of-art analytical and experimental tools to enable students to pursue higher studies in institutions of repute in India and abroad

PEO3 To provide skill enriched education and training through internships to enable students to launch start-ups in their field of study

PEO4 To inculcate culture of professionalism, ethical conduct, team work with good communication skills to enable the students to be successful in their career



Program Specific Outcomes (PSOs)

PSO1 The students will acquire comprehensive understanding of concepts, analysis, operation and performance of all major aspects of electronics and telecommunication engineering such as electronic devices, circuit design, signal and system, signal processing, communication, electronic measurement and instrumentation and VLSI

PSO2 The students will have knowledge of analytical tools such as SCILAB, MATLAB for developing modelling and simulation of given problems

PSO3 The student will have rigorous training on experimental support to the theoretical concepts

PSO4 The students will have acquired ability to understand the scope of research work in major streams



Program Outcomes (POs)

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

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

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

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

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

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

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

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

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

PO-10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

environments.

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



Course Outcomes (COs)

Course Name: Electronic Measurement and Instrumentation

Course Code: BECT-302

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO 1	Understand different types of measuring instruments, their construction, operation and characteristics to measure various parameters.	Understand	BL-1
CO 2	Analyze suitable methods for measurement of resistance, inductance and capacitance.	Analyze	BL-3
CO 3	Understand different type of A/D, D/A convertor and Display devices	Understand	BL-1
CO 4	Understand and analyze the use of different type of CRO in lab and its calibration.	Understand Analyze	BL-1 BL-3
CO 5	Understand and Analyze generating signal and analyzing it.	Understand Analyze	BL-1 BL-3

Course Name: Digital Electronics

Course Code: BECT-303

The students will be able to

S.N.	COURSE OUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand numerical values in various number systems and perform conversions from one number system to another.	Understand	BL-1
CO2	Understand the operation of logic gates using IEEE/ANSI standard symbols.	Understand	BL-1
CO3	Apply and analyze various minimization techniques in order to reduce the number of gates required to design any logic.	Apply Analyze	BL-2 BL-3
CO4	Analyze the design of digital combinational circuits and sequential logic circuits.	Analyze	BL-3
CO5	Understand nomenclature and technology in memory devices and create state machine diagrams and design the digital system	Understand Create	BL-1 BL-5

Course Name: Electronic Devices

Course Code: BECT-304

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand the principles of semiconductor Physics.	Understand	BL-1
CO2	Understand the mathematical models of semiconductor junctions.	Understand	BL-1
CO3	Understand carrier transport in semiconductors.	Understand	BL-1
CO4	Analyze and evaluate the mathematical models of MOS transistors for circuits and systems.	Analyze Evaluate	BL-3 BL-3
CO5	Analyze and create application of special purpose diodes, and electronic circuits	Analyze Create	BL-3 BL-5

Course Name: Energy and Environment Engineering

Course Code: BAST 401

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Demonstrate and apply knowledge of new and renewable energy and their relationship with ecology and environment.	Understand Apply	BL-1 BL-2
CO2	Describe conventional and non-conventional energy scenario with respect to environment.	Apply	BL-2
CO3	Analyze Synergy between energy and environment, global environment issues.	Analyze	BL-3
CO4	Explain the Environmental Pollution and their effects on environment.	Understand	BL-1
CO5	Apply and evaluate awareness regarding environmental protection and application of renewable energy	Apply Evaluate	BL-2 BL-4

Course Name: Signals and Systems

Course Code: BECT 402

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand and Analyze the signals as Continuous time and Discrete time	Understand Analyze	BL-1 BL-3
CO2	Evaluate the spectral characteristics of signals using Fourier analysis.	Evaluate	BL-4
CO3	Understand and evaluate the systems based on their properties and determine the response of LTI system using convolution.	Understand Evaluate	BL-1 BL-4
CO4	Evaluate system properties based on impulse response and Fourier analysis	Evaluate	BL-4
CO5	Apply transform techniques to analyze continuous-time and discrete-time signals and systems.	Apply	BL-2

Course Name: Analog Communication

Course Code: BECT-403

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand the basic concepts of the analog communication systems.	Understand	BL-1
CO2	Evaluate modulation index, bandwidth and power requirements for various analog modulation schemes including AM,FM and PM	Apply	BL-4
CO3	Understand and Analyze various analog continuous wave modulation and demodulation techniques including AM, FM and PM.	Understand Analyze	BL-1 BL-3
CO4	Analyze various analog pulse modulation and demodulation techniques including AM, FM and PM	Analyze	BL-3
CO5	Understand the influence of noise over Analog Modulation schemes through random process and noise theory and applications of Analog communication techniques.	Understand Apply	BL-1 BL-2

Course Name:Analog Circuits

Course Code: BECT- 405

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand Current mirror and current steering circuit used for biasing of various stages in IC 741.	Understand	BL-1
CO2	Understand & Analyze of power output and efficiency for class A, B, AB, C Power amplifier, their efficiency and distortion.	Understand Analyze	BL-1 BL-3
CO3	Learn about DC and AC analysis of Operational amplifier IC741 and the basic functions of Op-Amp.	Understand	BL-1
CO4	Apply skills to construct active filters and their applications.	Apply	BL-2
CO5	Understand and create different types of Multivibrator and waveform generator using Op-Amp and IC-555.	Evaluate Create	BL-4 BL-5

CourseName:Microprocessors&Interfacing

CourseCode:BECT-501

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level(B. L)
CO1	Understand and solve basic binary math operations using the microprocessor and explain the microprocessor's and microcontroller's internal architecture and its operation within the area of manufacturing and performance.	Understand	BL-1
CO2	Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.	Apply	BL-2
CO3	Understand and analyze accepted standards and guidelines to select appropriate microprocessor (8085/8086) and microcontroller to meet specified performance requirements	Understand Analyze	BL-1 BL-3
CO4	Create and Analyze assembly language programs; select appropriate assembly into machine across assembler utility of a microprocessor and microcontroller.	Analyze Create	BL-3 BL-5
CO5	Create electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.	Create	BL5

Course Name:VLSI Technology and Design

Course Code: TEC 503

The students will be able to

	COURSE OUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand and Analyze the trends in semiconductor technology, and how it impacts scaling and its effect on device density, speed and power consumption.	Understand Analyze	BL-1 BL-3
CO2	Understand and Create learn Layout, Stick diagrams, Fabrication steps	Understand Create	BL-1 BL-5
CO3	Evaluate the various processes needed to fabricate the VLSI devices.	Evaluate	BL-4
CO4	Understand the static and dynamic behavior of MOSFETs (Metal Oxide Semiconductor Field Effect Transistors) and the secondary effects of the MOS transistor model	Understand	BL-1
CO5	Analyze the intricacies involved in VLSI circuit fabrication.	Analyze	BL-3

CourseName: DataCommunicationandNetwork

CourseCode:BECT-504

The students will be able to

	COURSEOUTCOME	Bloom'sTaxonomy	Bloom's Level(BL)
CO1	Understand and apply the knowledge to identify the different types of network topologies and protocols.	Understand Apply	BL-1 BL-2
CO2	Understand and analyze the layers of the OSI model and TCP/IP and Explain the function(s) of each.	Understand Analyze	BL-1 BL-3
CO3	Analyze the different internetworking devices and their functions and explain the role of protocol in networking.	Analyze	BL-3
CO4	Apply subnet masks and addresses to fulfill network requirements	Apply	BL-2
CO5	Understand the basic protocols of computer networks, and how they can be used to assist in network design and implementation.	Understand	BL-1

Course Name: Digital Signal Processing

Course Code: BECT 601

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand the characteristics and transformations of discrete time signals mathematically	Understand	BL-1
CO2	Understand and Apply techniques in time and transform domains to the analysis and design of discrete-time systems;	Understand Apply	BL-1 BL-2
CO3	Understand and analyze- DTFT, DFT, and FFT.	Understand Analyze	BL-1 BL-3
CO4	Create & Evaluate Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) Filters, and evaluate the performance to meet expected system specifications using MATLAB.	Create Evaluate	BL-5 BL-4
CO5	Understand the various realization techniques and learn the DSP programming tools and use them for applications.	Understand	BL-1

CourseName:AntennaandWavePropagation

Course Code: BECT 602

The students will be able to

	COURSEOUTCOME	Bloom'sTaxo nomy	Bloom's Level (BL)
CO1	Understand the far-field shading characteristics of a radiator and apply it to wire and loop antenna.	Understand	BL-1
CO2	Understand and analyze the electrical properties of an array antenna by controlling the elements of the array.	Understand Analyze	BL- 1 BL-3
CO3	Understand and analyze various types of antennas and its electrical and mechanical properties.	Understand Analyze	BL-1 BL-3
CO4	Analyze the various techniques involved in various antenna parameter measurements.	Analyze	BL-3
CO5	Understand various radio wave propagation mechanisms and its applications.	Understand	BL-1

Course Name: Digital Communication

Course Code: BECT-603

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand the basics of information theory, source coding techniques and calculate Entropy of source.	Understand	BL-1
CO2	Understand the generation and detection of Digital base band system. Evaluate and determine the performance of line codes and methods to mitigate inter symbol interference.	Understand Evaluate	BL-1 BL-4
CO3	Understand and analyze the generation, detection signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of different band pass modulation techniques.	Understand Analyze	BL-1 BL-3
CO4	Understand the generation and detection of advanced modulation techniques	Understand	BL-1
CO5	Evaluate the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel.	Evaluate	BL-4

Course Name: Biomedical Electronics

Course Code: BOEC-605

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (B.L)
CO1	Know the human body electro- physiological parameters recording of bio-potentials	Understand Analyze	BL-1 BL-3
CO2	Comprehend the electrical physiological parameters and their measurement – body ECG, EEG, EMG etc.	Analyze	BL-3
CO3	Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood flow meter etc.	Analyze Evaluate	BL-3 BL-4
CO4	Comprehend Medical Imaging techniques e.g. Ultrasound, X-Ray, CT SCAN, MRI etc.	Evaluate	BL-4
CO5	Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators.	Evaluate Create	BL-4 BL-5

Course Name:Optical Fiber Communication systems
Course Code: TEC-701

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand and characterize different components of an optical fiber communication system.	Understand	BL-1
CO2	Understand and analyze various propagation modes in optical fiber; explain attenuation, Signal Degradation and Pulse Broadening in optical fiber.	Understand Analyze	BL-1 BL-3
CO3	Define optical sources and detectors. Describe LED, laser diodes, PIN diodes and photo diodes.	Evaluate	BL-4
CO4	Understand optical transmitters and receivers, operating principle of LED and Laser diodes.	Understand	BL-1
CO5	Evaluate receiver sensitivity and power budget. Model optical receiver. Analyze various photodetectors. Explain WDM concept and principles, SONET/SDH networks.	Evaluate Analyze	BL-3 BL-4

CourseName:Wireless Communication systems

CourseCode: TEC-702

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand the transmission of voice and data through various networks.	Understand	BL-1
CO2	Understand and analyze cellular system design and technical challenges.	Understand Analyze	BL-1 BL-3
CO3	Analyze the Mobile radio propagation, fading, diversity concepts and the channel modeling.	Analyze	BL-3
CO4	Analyze the design parameters, link design, smart antenna, beam forming and MIMO systems.	Analyze	BL-3
CO5	Analyze and evaluate multiuser systems, CDMA, WCDMA network planning and OFDM Concepts.	Analyze Evaluate	BL-3 BL-4

CourseName: SatelliteCommunication

Course Code: TEC-703

The students will be able to

	COURSEOUTCOME	Bloom'sTaxonomy	Bloom's Level (BL)
CO1	Understandingthe basicsof satellitecommunication	Understand	BL-1
CO2	Analyzelinebudgetofsatellitesignalforprop ercommunication.	Analyze	BL-3
CO3	Understand and analyzethe usageof systemfor the benefitof society	Understand Analyze	BL-1 BL-3
CO4	Understand the usage the different applications ofsatellitecommunication	Understand	BL-1
CO5	Evaluatesystempropertiesbasedlinkbudgetofsatell itesignal.	Evaluate	BL-4

CourseName:PrinciplesofSecureCommunication

CourseCode:TEC-013

The students will be able to

	COURSEOUTCOME	Bloom'sTaxonomy	Bloom's Level (BL)
CO1	Understand the benefits of SpreadSpectrum systems in CDMA applications for mobile communications.	Understand	BL-1
CO2	Understand and analyze the concepts underlying spread spectrum techniques, providing student with computer exercises to simulate, to process, and to analyze multicarrier communication techniques	Analyze	BL-1 BL-3
CO3	Understand and apply mathematical foundation required for various cryptographicalgorithms.	Understand Apply	BL-1 BL-2
CO4	Evaluate the basic concepts of cryptography and network security models by understanding various types of ciphers, DES, AES, message authentication, digital signature systems.	Evaluate	BL-4

Course Name: Television and Radar and Engineering
Course Code: TEC-801

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand knowledge about Radar and Radar equations.	Understand	BL-1
CO2	Understand and analyze using Detection of Signals in Noise and Radio Direction Finding.	Understand Analyze	BL-1 BL-3
CO3	Understand the detection fundamentals.	Understand	BL-1
CO4	Understand and analyze the operation of continuous wave Radar.	Understand Analyze	BL-1 BL-3
CO5	Apply knowledge to work using Instrument Landing System and Satellite Navigation System.	Apply	BL-2

CourseName:DataCommunication and Networks

CourseCode:TEC-802

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand and apply the knowledge to identify the different types of network topologies and protocols.	Understand Apply	BL-1 BL-2
CO2	Understand and analyze the layers of the OSI model and TCP/IP. Explain the function(s) of each.	Understand Analyze	BL-1 BL-3
CO3	Analyze the different internetworking devices and their functions and explain the role of protocol in networking.	Analyze	BL-3
CO4	Apply subnet masks and addresses to fulfill network requirements	Apply	BL-2
CO5	Understand the basic protocols of computer networks, and how they can be used to assist in network design and implementation.	Understand	BL-1

CourseName: DigitalImageProcessing

CourseCode:TEC-024

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	UnderstandtheoreticalaspectandmodelsinImageProcessing.	Understand	BL-1
CO2	Understand and Analyze signalsinfrequencydomainthroughimage transforms.	Understand Analyze	BL-1 BL-3
CO3	Apply quantitative models of image andvideo processing for various engineeringapplications.	Apply	BL-2
CO4	Create innovative design for practice allapplicationsin various fields.	Create	BL-5
CO5	Understand and evaluate different methods, models forvideoprocessingandmotionestimation.	Understand Evaluate	BL-1 BL-4

CourseName: OpticalNetworks

CourseCode:TEC-032

The students will be able to

	COURSEOUTCOME	Bloom's Taxonomy	Bloom's Level (BL)
CO1	Understand and apply knowledge of optical fibers in high speed data transmission medium applications.	Understand Apply	BL-1 BL-3
CO2	Understand and analyze the working of various components used in optical network design.	Understand Analyze	BL-1 BL-3
CO3	Analyze various network protection schemes.	Analyze	BL-3
CO4	Analyze and create Optical Link budget.	Analyze Create	BL-3 BL-5
CO5	Understand Frame structures used in SONET, IP and ATM networks	Understand	BL-1