Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Basic Electronics
Course Code	ECL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of modern physics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To become familiar with various types of semiconductors and basic electronic devices.**(BL1-Remember)** **CO2-** To understand the operation of various electronic devices.**(BL2-Understand)** **CO3-** To implement the concepts of semiconductors to various semiconductor devices. **(BL3-Apply)** **CO4-** To analyze the various electronic devices and their frequency response.**(BL4-Analyze)** **CO5-** To evaluate the performance of electronic devices such as diodes, transistors, function generators, and cathode ray oscilloscopes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Semiconductor Basics: Intrinsic and Extrinsic Semiconductors, Current Mechanisms in Semiconductors: Drift and Diffusion Current. PN Junction: Formation of PN Junction, Creation of Depletion Layer, Forward and Reverse Biasing, Diode Current Equation, Volt – Ampere characteristics of PN junction diode and effect of temperature on V-I characteristics, Diode resistances, Diode Capacitances, Diode Equivalent circuits: Piecewise Linear approximation Model, Simplified approximation Model, Ideal equivalent circuit.	Lecture Method/Video Clips	12
II	Diode Applications: Diode as Rectifier: Half Wave rectifier, Full Wave Rectifier, Calculation of Average, RMS loads voltages and currents, Rectification efficiency, PIV, Ripple factor. Break Down Diodes: Avalanche and Zener Breakdown. V-I characteristics of Zener Diode, Zener Diode Specifications, Zener Diode Equivalent Circuit. Zener Diode as Shunt Regulator: Analysis of Zener diode as shunt regulator under varying Load capacitance and Supply voltage.	Lecture Method/Video Clips/Simulation	10
III	Bipolar Junction Transistor: Formation of NPN and PNP Transistor, unbiased and biased transistor, Transistor currents, Symbol of NPN and PNP Transistors, Common Base, Common Emitter and Common Collector Configurations along with Input and Output Characteristics, Transistor Amplifying action. Transistor Biasing: Load Line, Operating Point, Need of Biasing, Different Biasing Techniques: Fixed Bias, Emitter Stabilized Bias, Voltage Divider Bias, DC Bias with Voltage Feedback	Lecture Method/Video Clips/Virtual Labs	10
IV	Field Effect Transistor: JFET: Construction of N channel and P channel JFET, Working of JFET along with Drain and Transfer Curves, JFET Parameters and symbol, JFET Biasing. MOSFET: Construction and working of N channel and P channel Depletion and Enhancement MOSFETs, Drain and Transfer curves, Symbols. Operational Amplifier: Basics of operation amplifier, op-amp parameters: Input offset voltage,	Lecture Method/Video Clips/Virtual Labs	12

	Output offset voltage, Slew rate, CMRR etc. Open and closed loop gain, Virtual Ground, Characteristic of ideal operational amplifier. Operational Amplifier Applications: Use of Ideal Op-amp to construct: Inverting amplifier, Non-inverting amplifier, Differentiator, Integrator, Adder, Subtractor etc.		
V	Electronic Instruments: Digital Voltmeter, Digital Multimeter, Cathode Ray Oscilloscope, Applications of CRO: Measurement of Voltage, Current, Time Period, Frequency, Use of Lissajous Pattern to Measure unknown frequency and phase difference, Function Generator.	Lecture Method/Video Clips/Virtual Labs/Simulation	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to Laboratory Equipment's: Cathode Ray Oscilloscope (CRO), Function Generator, Digital Multimeter.	Experiments	BL2-Understand	2
3	To study Full Wave Centre Tap Rectifier and calculate various parameters.	Experiments	BL4-Analyze	2
1	To study and plot the V-I characteristics of PN Junction Diode.	Experiments	BL4-Analyze	2
4	To study Full Wave Bridge Rectifier and calculate various parameters	Experiments	BL4-Analyze	2
3	To study and plot Input & Output Characteristics of BJT in Common Base Configuration	Experiments	BL5-Evaluate	2
4	To study and plot Input & Output Characteristics of BJT in Common Emitter Configuration	Experiments	BL4-Analyze	2
2	To Design Half-Wave rectifier by using basic electronic components	PBL	BL6-Create	10
4	**Construct a Simple Audio Amplifier** • **Objective:** Build a small audio amplifier for use with portable speakers. • **Focus Areas:** Operational amplifiers, transistors, capacitors, and speaker integration. • **Outcome:** A compact amplifier circuit that boosts audio signals for speaker output.	PBL	BL6-Create	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Boylestad & Nashelsky Electronics Devices and Circuit Theory Pearson Education India, 2009. Ramakant A. Gayakwad Op Amps and Linear Integrated Circuits Englewood Cliffs: Prentice-Hall, 2012.
Articles	Popović, Božidar, et al. "Remote control of laboratory equipment for basic electronics courses: A LabVIEW-based implementation." Computer Applications in Engineering Education 21.S1 (2013): E110-E120.
References Books	Malvino, L. Electronic principles The McGraw Hill Companies, 2016. Sedra and Smith, Microelectronics circuits, Fifth edition by Oxford University Press 2017 Graham Bell Electronic Devices and Circuits Prentice-Hall 2009
MOOC Courses	https://nptel.ac.in/courses/122106025
Videos	https://nptel.ac.in/courses/122106025

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	1
CO2	3	2	1	-	-	2	-	-	-	3	-	-	2	2	2
CO3	1	1	1	3	-	-	-	-	-	-	-	-	2	3	2
CO4	1	1	1	3	2	-	-	-	-	-	-	-	3	3	2
CO5	1	1	-	2	-	-	-	-	-	-	-	-	2	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Principles of Sensors & IoT
Course Code	ECL0102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Sensors, Smart Sensors, & IoT. **(BL1-Remember)** **CO2-** To understand the working principles, concepts, & circuit designs of various sensors. **(BL2-Understand)** **CO3-** To apply that how to make Sensors by using different electronic components, apply an integrated knowledge on the Sensors, work with and interpret the data obtained from various sensor applications**(BL3-Apply)** **CO4-** To analyse various parameters of sensors using simulation or performing experiments on kits.**(BL4-Analyze)** **CO5-** Evaluate performance of sensors & actuators for various applications.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Sensors: Sensors, Transducers, Difference between Sensor & Transducer, Different criteria to choose a sensor. Classification of Sensors: analog sensors, digital sensors, scalar sensors, vectored sensors. Need of Sensors. Temperature Sensors: Thermocouple-measuring principle and its applications, Resistive temperature detectors (RTD): used materials and construction and its applications. Thermistors: Principle and application. Comparison among Thermistor, Thermocouple, & RTD.	Audio, Video clip/Group discussion/Research/Field visit	12
2	Different types of Sensors: PIR sensor, Ultrasonic sensor, Gas Sensors, Proximity Sensor, Rain sensor, Touch Sensor, IR Sensor, Humidity Sensor, Semiconductor Sensors: working principle and its applications. Optical Sensors: Photodiodes, Photoresistor, PIN diode, Position Sensitive photo detectors, Pressure sensors. Chemical sensors: Electrochemical sensor, Amperometric and voltammetric sensors, potentiometric sensor, Bio sensors and applications	LectureAudio, Video clip/Group discussion/Research/Field visit	12
3	Smart Sensors and Actuators: Architecture of sensor node, Components of Sensor, Participatory Sensing, Wireless sensor motes and its applications: Mica2/MicaZ Motes, TelosB Motes, XM1000 wireless mote, Indriya, IRIS, iSense, Preon32, Wasp Mote, WiSense Mote, panStamp NRG Mote . Actuators: Principle, Types and Examples of Actuators, Sensor Data Communication Protocols.	Audio, Video clip/Group discussion/Research/Field visit	12
4	Internet of things (IoT): An Overview: Basics, definition and vision of IOT, IoT Conceptual Framework, IoT Architectural View, Physical Design of IoT, Logical Design of IoT, Applications of IoT. RFID: features, working principle, and applications.	Audio, Video clip/Group discussion/Research/Field visit	10
5	IoT Practical Applications: Definition & Essentials of IoT & IoT applications for: Home, Cities, Environment, Energy Systems, Retail, Logistics, Industry, Agriculture, Health & Lifestyle.	Audio, Video clip/Group discussion/Research/Field visit	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
4	IOT based Smart specs	PBL	BL6-Create	30
2	smart dustbin based on iot	PBL	BL6-Create	30
1	To familiarize with various sensors such as LM 35 Temperature Sensor, PIR Sensor, Soil Sensor, Thermistor Sensor.	Experiments	BL6-Create	2
1	To study characteristics of Platinum RTD (Resistance Temperature Detector) sensor	Experiments	BL6-Create	2
1	To study Characteristics of NTC Thermistor sensor.	Experiments	BL5-Evaluate	2
1	Study the Characteristics of K Type Thermocouple.	Experiments	BL6-Create	2
1	Study the characteristics of Pressure Transducer/ Sensor.	Experiments	BL6-Create	2
2	To make a touch sensor using 555 Timer IC on Breadboard	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015 2) Shantanu Bhattacharya, A K Agarwal, Environmental, Chemical and Medical Sensors, Springer Nature Singapore Pvt. Ltd. 2018
Articles	10.1088/978-0-7503-2707-7ch1
References Books	1) Donald Norris, The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black, McGraw Hill Publication Raj Kamal, Internet of Things, TMH, New Delhi.
MOOC Courses	https://courses.mooc.fi/org/uh-cs/courses/introduction-to-the-internet-of-things-mooc
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	1	1	2	2	1	2	3	1	-	3	3	3
CO3	-	1	3	2	1	2	2	2	-	1	-	3	3	3	2
CO4	1	2	2	3	2	-	-	2	-	-	2	1	3	2	2
CO5	-	-	-	-	1	2	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Electronics Workshop Practice
Course Code	ECP0101[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Use ESD accessories and safety systems for electronic equipment **(BL1-Remember)** **CO2-** Understand sensors and electronics device for various parameters,**(BL2-Understand)** **CO3-** Apply various electronic components using relevant equipment**(BL3-Apply)** **CO4-** Analyze various parts of SMPS, UPS, perform soldering and desoldering of SMD components**(BL4-Analyze)** **CO5-** Evaluate various types of Switches, Relays, Connectors, Cables, Network and Data cables**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, DSO etc.] [Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping.	Lecture Method/ Case Study/ Video/ Group Discussion	10
4	Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods,	Lecture Method/ Case Study/ Video/ Group Discussion	12
5	Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Familiarization of measuring instrument cro function genrator, digital multimeter, dc power, supply and breadboard	Experiments	BL5-Evaluate	2
1	Identification of various type of resistors and their measurement using multimeter	Experiments	BL5-Evaluate	2
1	Identification of various type of capacitor and their measurement using multimeter	Experiments	BL5-Evaluate	2
1	familiarization with various type of switches and their terminology	Experiments	BL5-Evaluate	2
1	identification of various type of diode , their terminology and application of diode as rectifier	Experiments	BL5-Evaluate	2
1	Identification of various type of transistor ,their terminology and dc rectification using diode	Experiments	BL5-Evaluate	2
1	introduction to integrated circuit their package and pin identification	Experiments	BL5-Evaluate	2
1	introduction to integrated circuit their packages and pin identification	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	R.S KHANDPUR,"TROUBLESHOOTING ELETRONICS EQUIPMENT Raghuwanshi B.S.,A Course in Workshop Technology,Dhanpat Rai & Sons, New Delhi, 2017 or latest edition
Articles	10.20525/ijrbs.v11i2.1462
References Books	Delton T.horn how to test almost everthing electronics
MOOC Courses	https://www.udemy.com/topic/electronics/
Videos	https://nptel.ac.in/courses/122106025

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	1	3	-	-	-	-	-	-	-	-
CO2	3	3	3	2	-	2	3	-	-	-	-	-	-	-	-
CO3	2	2	2	2	1	2	3	-	-	-	-	-	-	-	-
CO4	2	-	-	3	-	2	3	-	-	-	-	-	-	-	-
CO5	2	2	2	3	2	2	3	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Communication Skills & Colloquium
Course Code	HUL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must have knowledge about Language proficiency.			**Co-Requisite/s**	1.Developed Communication skills. 2.Career Development workshop			
Course Outcomes & Bloom's Level	**CO1-** Comprehend and summarize characteristics & various structural principlesprerequisite to Technical Communication ((**BL1-Remember)** **CO2-** Classify and formulate the elementary intricacies of Scientific and Technical Writing using application grammar construct.**(BL2-Understand)** **CO3-** Create cohesive technical paragraphs & text.**(BL3-Apply)** **CO4-** Paraphrase text(s) and use appropriate referencing styles**(BL4-Analyze)** **CO5-** Evaluate the significance of Formal Writing**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module-1	Introduction to Communication Skills, Objectives, Significance of Communication, Flow of Communication, Principles Communication, Essential Features, Process of Communication, Verbal (Oral & Written) and Non-verbal Communication, Barriers to Effective Communication, Introduction to Technical Communication, Major Difference between Technical Communication and General Communication.	Audio/Video clips, group discussion, Lecture Method	6
Module-2	Introduction & Significance of Listening skills, Types of Listening, Barriers in Effective Listening, Basic Grammar - Parts of Speech, Active Passive and Articles.	Audio/Video clips, group discussion, Lecture Method	6
Module-3	Introduction to Formal Letter Writing, Elements of Letter Writing and Style of Writing, Layout & Structure of Formal Letter Writing, Introduction to the Types of Business Letters- Enquiry, Calling Quotations, Order,Complaint and Adiustment.Introduction to Employment Communication- Job Application, Writing Resume, Differences among Resume, Curriculum Vitae & Bio-data.	Audio/Video clips, group discussion, Lecture Method	6
Module-4	Introduction to Oral Presentations, Objectives, Significance and Approach, Preparation and Delivery of Oral Presentation (topics to be selected by the teachers). Introduction to Interview Skills. How to Develop Interview Skills. Dos and Don't of Interviews, Types of Interviews, Reviewing TV Program/Book/News Paper Articles etc.	Audio/Video clips, group discussion, Lecture Method	6
Module-5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports- Printed Format, Memo Format, Letter Format, Book/Letter Text Format. Layout and Structure of Reports, Components of Reports, Writing	Audio/Video clips, group discussion, Lecture Method	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit 1	Soft Skills	PBL	BL2-Understand	6
Unit 2	Basics of Communication	PBL	BL3-Apply	6
Unit 3	Letter Writing	PBL	BL3-Apply	6
Unit 4	Active Passive	PBL	BL4-Analyze	6
Unit 5	Rport Writing	PBL	BL5-Evaluate	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. Essentials of Business Communication with Student CD-ROM by Mary Ellen Gufley, Paperback: SII pages, Publisher: South-Western Educational 2. Business Communication: Building Critical Skills by Kitty O. Locker, Stephen Kyo Kazmarek, Hardcover: 637 pages, Publisher: Irvin/McGraw-Hill
Articles	https://www.jetir.org/papers/JETIR2108373.pdf https://open.lib.umn.edu/communication/chapter/1-2-the-communication-process/ https://www.iosrjournals.org/iosr-jbm/papers/Vol22-issue8/Series-2/E2208024254.pdf
References Books	1. Business Communication Today by Courtland L. Bovee, John V. Thill, Barbara E. Schatzman, Hardcover: 730 pages, Publisher: Prentice Hall. 2. Excellence In Business Communication (6th Edition) by John Thill, Courtland L. Bovee, Paperback: 656 pages, Publisher: Prentice Hall.
MOOC Courses	http://www.digimat.in/nptel/courses/video/109104031/L01.html
Videos	http://www.digimat.in/nptel/courses/video/109104031/L01.html

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Calculus For Engineers
Course Code	MAL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of Functions, Limit, Continuity and Differentiability			**Co-Requisite/s**	Basic knowledge of variables			
Course Outcomes & Bloom's Level	**CO1-** Knowledge about the derivative and use of derivative to expand the functions and evaluation of Maxima and Minima.**(BL1-Remember)** **CO2-** Knowledge about the vector valued function directional derivative, gradient, divergence and curl with their properties**(BL2-Understand)** **CO3-** Applying: Partial derivatives and its applications apply to evaluate the Maxima and Minima.**(BL3-Apply)** **CO4-** Find the area under a given curve, length of an arc through integration as application to Beta and Gamma Function.**(BL4-Analyze)** **CO5-** Evaluating: Find the area and volume by applying the techniques of double and triple integrals., **(BL5-Evaluate)** **CO6-** Applications of vector valued function in integration to find line , surface and volume. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Differentiation, Extremaon an Interval, Rolle's Theorem and the Mean Value Theorem, Increasing and Decreasing functions and First derivative test, Second derivative test, Maxima and Minima. Functions of two variables, partial derivatives, total differential, Jacobian and it Prosperities	Audio/Video clips, group discussion, lecture Method	8
Unit 2	Taylor's expansion for two variables, maxima and minima, constrained maxima and minima, Lagrange's multiplier method. Integration, Average function value, Area between curves, Volumes of solids of revolution, Beta and Gamma functions, interrelation.	Audio/Video clips, group discussion, lecture Method	8
Unit 3	Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, Evaluation of triple integrals, change of variables between Cartesian and cylindrical and spherical co-ordinates, evaluation of multiple integrals using gamma and beta functions.	Audio/Video clips, group discussion, lecture Method	8
Unit 4	Scalar and vector valued functions, gradient, tangent plane, directional derivative, divergence and curl, scalar and vector potentials, Statement of vector identities, Simple problems.	Audio/Video clips, group discussion, lecture Method	8
Unit 5	Line, surface and volume integrals, Statement of Green's, Stoke's and Gauss divergence Theorems, verification and evaluation of vector integrals using them.	Audio/Video clips, group discussion, lecture Method	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to MATLAB through matrices, and general Syntaxes.	Experiments	BL3-Apply	2
2	Plotting and visualizing curves and surfaces in MATLAB– Symbolic computations using MATLAB	Experiments	BL3-Apply	2
3	Evaluating Extremum of a single variable function	Experiments	BL3-Apply	2
4	Understanding integration as Area under the curve	Experiments	BL3-Apply	2
5	Evaluation of Volume by Integrals (Solids of Revolution)	Experiments	BL3-Apply	2
6	Evaluating Maxima and minima of functions of several variables	Experiments	BL3-Apply	2
7	Evaluating triple integrals	Experiments	BL3-Apply	2
8	Evaluating gradient, curl and divergence	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. Thomas' Calculus by George B. Thomas, D. Weirand J. Hass, 13th edition 2014, Pearson. 2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers. 3. B.V. Ramana, Higher Engineering Mathematics, Tata Mc Graw Hill.
Articles	
References Books	1. E. Kreyszig, Advanced Engineering Mathematics, 8th Ed., John Wiley and Sons, 1999. 2. Gorakhprasad, Integral Calculus, Pothishala Publication. 3. Gorakhprasad, Differential Calculus, Pothishala Publication.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ee09/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ph02/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO2	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO3	2	2	1	1	1	-	-	-	-	-	-	-	-	1	3
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO5	-	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Engineering Mechanics
Course Code	MEL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of basic sciences			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** CO1 Remember the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions**(BL1-Remember)** **CO2-** CO2 Understand the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions.**(BL2-Understand)** **CO3-** CO3 Apply system of forces in the belts drive systems as power transmission devices, shafts and beams.**(BL3-Apply)** **CO4-** CO4 Analyze the beams and trusses with centre of mass and moment of inertia.**(BL4-Analyze)** **CO5-** CO5 Evaluate shear force and bending moment in designing of shafts and beams and trusses.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction of Engineering Mechanics Basic concepts of system of forces- Coplanar Concurrent Forces - Components in Space – Resultant Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.	Lectures Method, Group discussion	9
Unit-2	Friction Types of friction, Limiting friction, Laws of Friction, static and Dynamic Friction. Motion of Bodies - Wedge, Ladder and Screw jack.	Lectures Method, Group discussion	7
Unit-3	Transmission of Power Belt Drivers - Open, Crossed and compound belt drives, length of belt, tensions- tight side and slack side, Power transmitted and condition for maximum power.	Lectures Method, Group discussion	7
Unit-4	Center of Gravity & Moment of Inertia: Centroids - Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures, Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia..	Lectures Method, Group discussion	8
Unit-5	Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts. Trusses- types, method of joints and method of moments.	Lectures Method, Group discussion	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	1. To verify the law of Triangle of forces and Lami's theorem.	Experiments	BL3-Apply	2
Experiment-2	2. To verify the law of parallelogram of forces	Experiments	BL3-Apply	2
Experiment-3	3. To verify law of polygon of forces	Experiments	BL3-Apply	2
Experiment-4	4. To find the support reactions of a given truss and verify analytically.	Experiments	BL3-Apply	2
Experiment-5	5. To determine support reaction and shear force at a given section of a simply supported beam and verify in analytically using parallel beam apparatus.	Experiments	BL3-Apply	2
Experiment-6	6. To verify bending moment at a given section of a simply supported beam.	Experiments	BL3-Apply	2
Experiment-7	7. To find coefficient of friction on horizontal and inclined planes.	Experiments	BL3-Apply	2
Experiment-8	8. To determine centre of gravity of different shapes.	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Engineering Mechanics by Dr. D.S. Kumar, S.K. Kataria & sons, latest edition. Engineering Mechanics by R. K. Rajput, S.Chand & Co. Engineering Mechanics: Statics & Dynamics by R.C. Hibbler
Articles	
References Books	• Engineering Mechanics- statics dynamics by Boresi & Schmidt, Thomson Books • Engineering Mechanics - Schaum's series - Mc.Grawhill Publications. • Engineering Mechanics by S. Timashenko, D.H. Young and J.V. Rao
MOOC Courses	https://archive.nptel.ac.in/courses/112/106/112106286/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	-	-	1	1	1	1	1	1
CO2	3	3	1	1	-	1	3	-	1	1	1	2	1	1	1
CO3	3	3	3	2	2	2	1	2	1	-	1	2	1	1	1
CO4	3	3	2	3	2	2	1	-	1	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Essentials of Information Technology
Course Code	CSL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Basics of Computer system, Storage Systems, Operating systems, Networking and Database.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)**(BL1-Remember)** **CO2-** Apply the various networking concepts, topologies and remove deadlocks. (Apply). **(BL2-Understand)** **CO3-** Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)**(BL3-Apply)** **CO4-** Design the concept of software, operating system for better utilization of external system (Design)**(BL4-Analyze)** **CO5-** Evaluating the various algorithm, its solution and other communication techniques. (Investigation).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Computer Basics: Basics of Computer Systems(T1,T2), Evolution of Computers, Computer Generations, Classification of Computers(T1,T3), Computer Applications, Interaction between User and Computer(T7). Hardware Components, Basic Computer Organization, Input and Output Devices(T1,T3), Central Processing Unit(T1), System Bus Architecture, Memory or Storage Unit	Lecture Method/ Video/ Group Discussion	6
2	Operating System: Introduction to Operating System, Function of Operating Systems(T1), Working Knowledge of GUI-Based Operating System (T3,T4), Working with latest version of Windows(T3,T4). Various Operating Systems, Evaluation of Operating System(T3,T4,T,7), Virtual Machine, Operating Systems for Mobile, Installation of Operating System(T1,T3,T4), Boot Process.	Lecture Method/Video Clips/Group Discussion	6
3	Computer Networks and World Wide Web: Introduction to Computer Networks (LAN, MAN, WAN, PAN)(T3,T4), Network Topologies, Ethical Issues related to Network Security(T2,T3). Internet and World Wide Web(T7,T8), Internet Evolution(T1), FTP, Electronic Mail, Search Engines(T1), Introduction to HTML, Static and Dynamic Web Pages	Lecture Method/Video Clips/Group Discussion	6
4	Computer Software: Introduction, System Software(T1,T3), Application Software, Firmware(T3), Software Installing and Uninstalling(T3,T4), Software Development Steps, Characteristics of good software(T1,T7), Usability of software, Introduction to Free and Open Source Software(T3,T4), Introduction to Database Management System	Lecture Method/Video Clips/Group Discussion	6
5	Subprograms and Blocks: Problem Solving: Flow Charts(T3,T4), Tracing Flow Chart, Algorithms. Fundamentals of sub-programs(T1,T3,T4), Scope of life time of variables, static and dynamic scope(T7), design issues of subprograms and operations, parameter passing methods(T3,T4), overloaded sub-programs, generic sub-programs(T1,T3), design issues	Lecture Method/Video Clips/Group Discussion	6

	for functions user defined overloaded operators		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Explain the Installation process of Operating system and its Memory Management.	Experiments	BL2-Understand	10
2-3	Design of a Web Page which describe your Biodata.	PBL	BL3-Apply	10
4-5	Describe Software development life cycle (SDLC) with all components.	PBL	BL5-Evaluate	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	0

Part E

Books	P. K. Sinha, Priti Sinha; Computer Fundamentals; BPB Publication. V. Rajaraman; Fundamentals of Computers; Prentice Hall of India Publication. G. G. Wilkinson; Fundamentals of Information Technology; Wiley-Blackwell Publishing. Yashwant P. Kanetkar; Let Us C; BPB Publication.
Articles	
References Books	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1	2
CO2	1	2	-	-	-	-	-	-	-	-	-	-	3	3	2
CO3	-	-	1	-	-	-	-	-	-	-	-	-	3	2	2
CO4	-	-	-	2	-	-	-	-	-	-	-	-	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Programming Logics
Course Code	CSP0201[P]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Foundation core							
Pre-Requisite/s	Basic understanding of Windows/Linux operating system.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember: Recall the syntax and basic concepts of C programming.**(BL1-Remember)** **CO2-** Understand: Explain the meaning of C programming constructs and how they work together**(BL2-Understand)** **CO3-** Apply : Apply the various conditional and looping statement and functional programming.**(BL3-Apply)** **CO4-** Analyzing: Analyze and evaluate C programming code to identify errors and optimize performance.**(BL4-Analyze)** **CO5-** Evaluate : Evaluate the effectiveness of C programming solutions and propose improvements.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Character set, variables and identifiers, built-in data types, arithmetic operators and expressions, constants and literals, simple assignment statements, basic input/output statements, simple ‘C’ programs.	Demonstration throughPPT, Computer	10
2	Conditional Statements and Loops: Decision making within a program, conditions, relational operators, logical connectives, if statement, if-else statement; Loops: while loop, do-while loop, for loop; nested loops, infinite loops; switch statement, structured programming. Array: One Dimensional Arrays - array manipulation, searching, insertion and deletion in an array; Two Dimensional Arrays - addition/multiplication of two matrices, transpose of a square matrix; string	Demonstration throughPPT, Computer	10
3	Pointer: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, arrays and pointers, pointer arrays, dynamic memory allocation. Functions: Standard library functions, prototype of a function, return type, function calling, block structure, passing arguments to a function - call by reference and call by value; recursive functions, arrays as function arguments.	Demonstration throughPPT, Computer	10
4	Structure and Union: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays - arrays of structure, structures containing arrays, unions. Dynamic Memory Management: Use of malloc, calloc, realloc and free keywords	Demonstration throughPPT, Computer	10
5	File Management: Introduction, defining and opening a file, closing a file, input/output operations on files, error handling during i/o operations, random access to files, programs using files. Command Line Arguments: argv and argc arguments, programs using command line arguments. Preprocessor: Introduction, macro substitution, file inclusion, compiler control directives.	Demonstration throughPPT, Computer	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Life Insurance Premium Calculator	Experiments	BL3-Apply	10
2-3	Program to compare best life insurance plan using an array.	PBL	BL4-Analyze	10
4-5	Write a C program to read name and marks of n number of students from user and store them in a file. If the file previously exits, add the information of n students.	PBL	BL5-Evaluate	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	B. W. Kernighan, Dennis M. Ritchi; The C Programming Language; Prentice Hall.
Articles	
References Books	Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing.
MOOC Courses	https://www.my-mooc.com/ja/mooc/logic-and-computational-thinking/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	-	-	-	-	2	3	1
CO2	1	2	1	2	2	1	-	-	-	-	-	-	1	-	3
CO3	2	-	1	-	-	2	-	-	-	-	-	-	3	2	2
CO4	2	1	-	2	1	-	-	-	-	-	-	-	3	3	2
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Fundamentals of Arduino Programming
Course Code	ECL0261[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Specialization Elective Courses							
Pre-Requisite/s	Basic understanding of Sensors, Actuators, Interfacing of devices etc.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Arduino IDE, actuators, Sensors & IoT **(BL1-Remember)** **CO2-** To understand the working principles, concepts, & circuit designs of various Sensors & Actuators for IoT. **(BL2-Understand)** **CO3-** To apply that how to interface with and interpret the data obtained from various IoT applications **(BL3-Apply)** **CO4-** To analyse various smart systems using simulation or performing experiments on IoT builder kit**(BL4-Analyze)** **CO5-** Evaluate performance of various logics & designs of sensors with IoT systems for various applications. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	**Arduino an Overview:** • Introduction to Arduino • Features of Arduino • Pin configuration of Arduino UNO Board • Types of Arduino family Boards • Applications of Arduino for Robotics, prototypes, and Automation etc. • Installation of Arduino IDE	Lecture Method/Video	10
2	**Programming Arduino Boards:** • Overview of Programming setup of IDE with Different Boards • Installing Libraries • Arduino Programming concepts • Syntax • Program flow • serial monitors with Serial.begin • Arduino othre functions • data types and variables, Delay functions, • Arduino control statements	Lecture Method/Video	8
3	**Interfacing and Programming of Sensors and Actuators:** • Analog and Digital sensors examples with coding • Pulse Width Modulation • Heartbeat Detector • DHT Sensor • Actuators • Demo Fade Example • Buzzer • Making Sounds • Demo Music System • Push Buttons • LED Interfacing and Programming with different delays • IR Receiver and Transmitter .	Lecture Method/Video	10

4	**Communication Technologies behind IoT:** • Introduction and need of Communication Technologies for IoT • ZigBee, Z wave • RF links • Bluetooth, Bluetooth 4.0 LE • Wi-Fi, 6LoWPAN • Z-Wave and a comparison	Lecture Method/Video/Group Discussion	8
5	**Arduion Web Connecting:** • Arduino Shields • Ethernet Shields • Ethernet library • Ethernet client • Client Examples • Ethernet Server • WiFi Shield • WiFi Shield Demo • Arduino Libraries • EEPROM • I2C communication • Sending bits	Lecture Method/Video/Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study 37 in one sensors.	Experiments	BL2-Understand	2
3	To implement an Arduino program for Analog Read.	Experiments	BL3-Apply	2
3	To a interface and programming of Magnetic Reed switch	Experiments	BL4-Analyze	2
4	To compile an Arduino program for Digital and Analog Sensor interfacing.	Experiments	BL4-Analyze	2
3	To compile an Arduino program for interfacing and programming of Buzzer Module.	Experiments	BL4-Analyze	2
2	Line Follower Robot	PBL	BL6-Create	30
2	Obstacle Avoidance Robot	PBL	BL6-Create	30
3	Air Quality Monitoring System Using MQ-4 Sensor	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. Arshdeep Bahga and Vijay Madisetti "Internet of Things – A Hand-on Approach " Universities press, 2015 2. Donald Norris The Internet of Things: Do-It Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black McGraw Hill Publication. 3. Jeeva Jose Internet of Things Khanna publication, AICTE approved
Articles	1. Adeleke, O. J., & Ogbogbono, C. O. Smart Fan Control: A Comprehensive Study on Designing and Implementing an Arduino-Based Wireless Fan Speed Control System with Smartphone Integration. Available at SSRN 4735449. 2. Rodriguez-Sanchez, C., Orellana, R., Fernandez Barbosa, P. R., Borromeo, S., & Vaquero, J. (2024). Insights 4.0: Transformative learning in industrial engineering through problem-based learning and project-based learning. Computer Applications in Engineering Education, e22736.
References Books	Raj Kamal Internet of Things TMH, New Delhi.
MOOC Courses	https://onlinecourses.swayam2.ac.in/aic20_sp04/preview https://onlinecourses.nptel.ac.in/noc19_cs65/preview https://www.coursera.org/learn/interface-with-arduino#modules https://www.coursera.org/learn/interface-with-arduino#modules
Videos	http://www.iot-a.eu/public https://www.tinkercad.com/projects/Basics-of-Arduino-TINKERCAD Online Simulator

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	2	-	-	-	-	2	3	-	-	-	2	-
CO2	2	-	-	-	3	-	-	-	1	-	-	-	-	-	2
CO3	-	-	1	-	1	-	-	-	-	-	-	-	1	2	-
CO4	-	-	-	2	-	-	-	-	1	2	-	-	-	-	3
CO5	-	-	2	1	2	-	-	-	3	-	-	-	2	1	-
CO6	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Principles of Electrical Engineering
Course Code	EEL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Minor							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Predict the behavior of any electrical circuits, Formulate and solve complex DC circuits.**(BL1-Remember)** **CO2-** Predict the behavior of any electrical circuits, Formulate and solve complex single phase AC circuits.**(BL2-Understand)** **CO3-** Predict the behavior of any electrical circuits, Formulate and solve complex Three phase AC circuits.**(BL3-Apply)** **CO4-** Identify the type of electrical machine used for that particular application. Realize the requirement of transformers in transmission and distribution of electric power and other applications.**(BL4-Analyze)** **CO5-** Predict the behavior of various measuring instruments in electrical engineering**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	D.C. Circuit: - Combination of resistance in series & parallel, their solution ,Star –Delta combination, KCL and KVL. Voltage and current sources, dependent and independent sources, source conversion, DC circuit's analysis using mesh & nodal method, Superposition theorem.	Talks and presentations	12
2	Single Phase Circuit:- Generation of Alternating Voltage & Currents, Their Equation, Definition, R.M.S and Average values, Vector representation of alternating quantities, Phasor relations between voltage & current in each of resistance, inductance and capacitance, A.C series circuit power & power factor , Resonance in series circuit.	Talks and presentations	11
3	Electrical Measuring Instruments:- Introduction and classification of Electrical Instruments, Essentials of indicating instruments, Moving iron instruments, Types ofmoving iron instruments, Advantages and Disadvantages of moving iron instruments, Applications of moving iron equipment, Permanente Magnet type moving coil instruments, extension of range of ammeters and voltmeter, Dynamometer type instruments, Dynamometer type wattmeters	Talks and presentations	13
4	Poly-phase Circuits:-Generation of Poly-phase Voltages, 3phase system, Phase sequence, Inter connection of 3 phases, Voltage, Currents & Power relationships in balanced 3 phase circuits, Power Measurement in single phase & 3 phase circuits..	Talks and presentations	11
5	Transformer:- Construction & working principle of transformer, Emf equation, No load & Full load phasor diagram , Equivalent circuit, Losses & Efficiency, Voltage Regulation, Open circuit & Short Circuit Test on the Transformer	Talks and presentations	13

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To verify Kirchoff's current law and voltage law	Experiments	BL2-Understand	2
1	To verify superposition theorem	Experiments	BL3-Apply	2
2	Measurement Of Active & Reactive power in Single Phase AC circuit and three phase ac circuit	Experiments	BL2-Understand	2
2	Measurement of Impedance of R-L, R-C, R-L-C & study of resonance phenomena	Experiments	BL2-Understand	2
2	Measurement Of Power & Power factor in a Single Phase AC Circuit using Three Ammeter Method	Experiments	BL3-Apply	2
4	Measurement of line quantities and phase quantities in a three phase ac circuit	Experiments	BL4-Analyze	2
5	Study of transformer name plate rating and determination of its transformation ratio	Experiments		2
5	To perform load test on a single-phase transformer	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
Articles	
References Books	Basic Electrical Engg, Sunil S Gaikwad, Dream Tech/ Willey Publication.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	-	-	-	-	-	1	1	1	1	2
CO2	1	1	2	1	1	1	-	1	-	-	1	1	2	3	1
CO3	2	1	2	1	2	-	1	-	-	-	1	1	1	2	2
CO4	1	1	1	2	1	-	-	-	-	-	1	1	3	1	3
CO5	1	1	1	2	1	-	-	-	-	-	1	-	2	2	1
CO6	1	1	1	1	1	-	-	-	-	-	1	1	1	3	2

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Statistics for Engineers
Course Code	MAL0203[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	statistics for engineers typically include basic mathematics (algebra, calculus), understanding of probability theory, and familiarity with concepts in engineering disciplines. Additionally, knowledge of software tools like MATLAB or Python for data analysis is beneficial.			**Co-Requisite/s**	statistics for engineers may include introductory courses in engineering mechanics, computer programming, and experimental methods. Additionally, concurrent enrollment in courses covering linear algebra and differential equations could provide valuable mathematical background for understanding advanced statistical concepts and applications in engineering contexts.			
Course Outcomes & Bloom's Level	**CO1-** To remember basic concept of about the design data collection plans and basic tools of descriptive statistics.**(BL1-Remember)** **CO2-** To understand the identify relationship between two variables using scatter plot and Interpret a simple correlation. To understand the Knowledge about the different types of continuous distribution with their properties and applications.**(BL2-Understand)** **CO3-** To apply the test and make hypothesis by Student's t-test, F-test, chi-square test, Z test, goodness of fit.**(BL3-Apply)** **CO4-** To analyze the concept of sampling distribution of a statistic and its properties, difference between parameter and statistic.**(BL4-Analyze)** **CO5-** To evaluate and describe the properties of unbiasedness. Also identifying and provide an application the null hypothesis, alternative hypothesis and test statistic.**(BL5-Evaluate)**								
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	tInroduction to statistics and data analysis Measures of central tendency, Measures of variability, [Moments, Skewness, Kurtosis (Concepts only)]. Correlation and Regression, Partial and Multiple correlations, Multiple regressions.	Audio/Video clips, group discussion, lecture with ppt, quiz	10
2	Introduction, random variables, Probability mass Function, distribution and density functions, joint Probability distribution and joint density functions, Marginal, conditional distribution and density functions, Mathematical expectation, and its properties Covariance, moment generating function, characteristic function.	Audio/Video clips, group discussion, lecture with ppt, Review Analysis	10
3	Binomial and Poisson distributions, Normal distribution, Gamma distribution, Exponential distribution.	Audio/Video clips, group discussion, lecture with ppt, classroom presentations, Analysis	6
4	Testing of hypothesis, Introduction, Types of errors, critical region, procedure of testing hypothesis, Large sample tests, Z test for Single Proportion, Difference of Proportion, mean and difference of means.	Audio/Video clips, group discussion, lecture with ppt, quiz	8
5	Small sample tests, Student’s t-test, F-test, chi-square test, goodness of fit, independence of attributes, Design of Experiments, Analysis of variance, one and two way classifications, CRD, RBD, LSD.	Audio/Video clips, group discussion, lecture with ppt, quiz	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction: Understanding Data types; importing/exporting data.	Experiments	BL2-Understand	2
2	Computing Summary Statistics/plotting and visualizing data using Tabulation and Graphical Representations.	Experiments	BL3-Apply	2
3	Applying correlation and simple linear regression model to real dataset; Computing and interpreting the coefficient of determination	Experiments	BL3-Apply	2
4	Applying multiple linear regression model to real data set; computing and interpreting the multiple coefficient of determination	Experiments	BL3-Apply	2
5	Fitting the following probability distributions: Binomial distribution,	Experiments	BL3-Apply	2
6	Normal distribution Poisson distribution	Experiments	BL3-Apply	2
7	Testing of hypothesis for One sample mean and proportion from real, time problems	Experiments	BL3-Apply	2
8	Testing of hypothesis for Two sample mean and proportion from real, time problems	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	M. Ray, H.S. Sharma, Sanjay Chaudhary Mathematical Statistics Ram Prasad & Sons J.N. Sharma, J.K. Goyal Mathematical Statistics Krishna Prakash and Media (P) Ltd
Articles	
References Books	E.Kreyszig Advanced Engineering Mathematics 8 th Ed., John Wiley and Sons, 1999 B.V. Ramana Higher Engineering Mathematics Tata McGraw Hill B. S. Grewal Higher Engineering Mathematics Khanna Publishers
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ec03/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ec03/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Environmental Pollution & Global Issues/ Swayam
Course Code	MCL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Foundation core							
Pre-Requisite/s	Basic knowledge of natural resources, biodiversity, ecological succession, energy flow, environmental issues and problems.			**Co-Requisite/s**	A detailed understanding of the complexity of environment and its challenges and solutions to these problems and challenges.			
Course Outcomes & Bloom's Level	**CO1-** CO1. Develop environmental scientists and engineers and sensitize them towards environmental issues.**(BL2-Understand)** **CO2-** CO2. To acquire analytical skills in assessing environmental impacts through a multidisciplinary approach**(BL3-Apply)** **CO3-** CO3. Ability to distinguish between various methods of various pollution analysis**(BL4-Analyze)** **CO4-** CO4.Acquire expertise and skills needed for the Environmental Management Systems and techniques of monitoring, Environment audit, Environmental Impact Analysis, environment instrumentation and control systems and for the projects development, implementation, and maintenance.**(BL5-Evaluate)** **CO5-** CO5. Students acquire skills for to communicate, prepare, plan and implement the environmental management project**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG14(Life below water) SDG15(Life on land) SDG17(Partnerships for the goals)				

Part B

Modules	Contents	Pedagogy	Hours
Unit – 1 (Environment, Ecosystem and Environmental Education)	Environment – Definition and its segments, (Lithosphere, Hydrosphere, Atmosphere and Biosphere), Multidisciplinary nature of Environmental Science, Ecology and Ecosystem: Basic concepts, functions of ecosystem, Energy Flow, Food chain, food web, Ecological Pyramids, Ecological Successions. Environmental Education- Definition, scope, importance, Need for Public Awareness, Environmental Ethics. Environmental Impact Assessment: Screening, Scoping, Base line Analysis, Impact Mitigation, Documentation, Review, Public hearing, Post Project Monitoring.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, discussion (questions & answers section)	8
Unit – 2 (Natural Resources Management)	Natural Resources – Classification, Water Resources (availability, quality, water budget), Mineral Resources (distribution, availability and future perspectives), and Forest Resources. Energy Resources- Classification and alternatives of conventional energy resources- Solar, working of solar photovoltaic cells, Geothermal, Wind energy, Nuclear Energy, Biomass and Bio-gas	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
Unit – 3 (Water, Soil & Noise Pollution)	Water pollution – sources & effects, characteristics and treatment of waste water, engineered systems for water purification: Aeration, solid separation, settling operations, filtration and disinfection. Soil - formation of soil, elementary and mineral composition, types of soil in India, soil pollution, effects and abatements. Noise Hazards: Continuous and impulse noise, Effect of noise on man, Measurement and evaluation of Noise, noise isolation and absorption techniques, silencers, practical aspects of noise.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
Unit –4 (Atmospheric chemistry and Air Pollution)	Classification, sources and toxic effects of air pollutants, dispersal of air pollutants, engineered systems for air purification: Atmospheric cleansing process, approaches to contamination control. Air pollutants with emphasis on reactive intermediates in atmosphere like hydroxyl radical, ozone and nitrate radical, types of hydrocarbon in the troposphere, reaction of organic compounds in the atmosphere.(Green house gas effect, Global warming, Climate change).	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures,Audio/Video clips, Group discussion.	8

Unit – 5 (Waste Management)	Solid waste: Generation and waste characterization. Collection, storage and transport. Waste disposal, waste processing techniques, reduction, reuse and recycling, resource recovery and utilization. Physical and chemical treatment methods and composting. Hazardous waste management and treatment.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion. Field visits. Industrial Visit (MSW/BMW/STP/ETP)	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Environmental Science by B. S. Chauhan; Firewall Media, 2008 • Environmental Science by Cuningham and Cuningham; McGraw-Hill Education; 13th edition (16 February 2014) • Environmental Engineering by S. K. Dhameja; S. K. Kataria & Sons, 2009 • Environmental Science by Richard T Wright; Benjamin-Cummings Pub Co.
Articles	
References Books	Environmental Engineering by Howards S Peavy, Donald R Rowe, T. George • Environmental Science & Engineering by Gilbert M. Master • Environmental Chemistry by Stanley
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Making of Modern India
Course Code	MCL0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Humanities, Social Sciences and Management							
Pre-Requisite/s	Basic knowledge of social sciences and political sciences.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** At the end of this course, students would be intellectually well equipped to have a sense of modern Indian history and culture.**(BL1-Remember)** **CO2-** The students will have an understanding of making of India as a nation and salient features of modern India**(BL2-Understand)** **CO3-** It will help students to develop their personality and thinking horizon for being a good and concerned Indian citizen**(BL3-Apply)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✓ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG5(Gender equality) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
I	Idea of India in historical perspective a) Indian culture, b) cultural commonness, c)cultural diversities, d)unity in diversity, e) cultural accommodations ,f) cultural conflicts, g)Idea of India and British Rule , h) Role of Indian Intelligentsia.	Lecture Method	6
II	Emergence and growth of Indian Nationalism a) Anti-colonial basis, b) Economic Nationalism, c) communalism and nationalism, d) revivalism and Indian nationalism, e)Enlightenment values, f)European Nationalism and Indian Nationalism.	Lecture Method	6
III	Social Reform Movements (a) British Rule and Indian introspection, (b) Raja Rammohan Roy, (c) social reform movements in 19th century, (d)Swami Vivekanand, (e)The women issue, (f)Caste system.	Lecture Method	6
IV	Indian National Movement (a) Early Revolts and 1857 Revolt, (b)Early Nationalists, (c) Bang Bhang Movement ,(d) Gandhi led Mass Movements, (e) Socialist and Left trends, (f) Princely States and their integration into nation, (h)Partition and Independence .	Lecture Method	6
V	India after independence a) Making of Indian Constitution, (b) Post Independent Nehru Era, (c) India facing Wars, (d) Indian economy- From Planning to LPG, (e) Achievements, (f) Challenges in 21st century India.	Lecture Method	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Bipan Chandra and others: India's Struggle For Independence , Penguine Publishers. 2. Bipan Chandra: History Of Modern India, Orient Blackswan publishers. 3. Sunil Khilnani: The Idea of India, Penguine publishers. 4. Shekhar Bandopadhyay: From Plastic to Partition and After, A History of Modern India, Orient Blackswan publishers. 5. Rakesh Batabyal: The Penguine Book of Modern Indian Speeches,1878 to Present, Penguine Publishers. 6. A R Desai:Social Background of Indian Nationalism, Popular Prakashan . 7. B R Nanda: Mahatma Gandhi ,A Biography,London.
Articles	
References Books	1. B.R.Nanda:Gandhi and His Critics, Oxford 2. Girja Shankar: Socialist Trends in Indian National Movement ,Meerut 3. Urmila Phadnis:Towards the integration of Indian States,1919-1947,Mumbai 4. Bimal Prasad: Gandhi,Nehru and JP,A Study in Leadership,New Delhi 5. Bipan Chandra and others:India Since Independence ,Penguine 6. Ramchandra Guha:Makers of Modern India, Penguine. 17. Austin Granville: The Indian Constitution, Oxford
MOOC Courses	https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/61
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	1	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Engineering Graphics
Course Code	MEL0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of geometrical construction, sketching, imagination etc.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of engineering graphics, geometrical construction and its applications.**(BL1-Remember)** **CO2-** To understand the basic concept of engineering graphics through real-life examples. **(BL2-Understand)** **CO3-** To implement the different engineering graphics concepts over appropriate drawing dataset. **(BL3-Apply)** **CO4-** To analyze the drawing performance of engineering graphics techniques.**(BL4-Analyze)** **CO5-** To evaluate the drawing performance of engineering graphics techniques on a corresponding object.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	1. Drafting tools, 2. Principles of Graphics, 3. Geometrical constructions 4. Scales: Plain, diagonal, 5. Curves used in engineering practice: such as ellipse, parabola, hyperbola by different methods. Cycloidal curves, Involutes and Spirals.	Lecture Method/Video	8
Unit-2	1. Types of projection, Orthographic projections, First angle and third angle projection. 2. Projections of points in different quadrants. Projections of lines, True inclination and true length of straight line, Traces.	Lecture Method	8
Unit-3	Projections of planes: Perpendicular plane, oblique plane and Auxiliary plane, projection of planes with inclined to one or both the reference planes and traces of planes.	Lecture Method	8
Unit-4	1. Projection of solids: Polyhedron and solids of revolution, projection of solids with inclined to one or both the reference planes. 2. Introduction to Section of solids and Development of surfaces.	Lecture Method	8
Unit-5	1. Isometric projection: Isometric scale, isometric projections from orthographic drawing. 2. Computer Aided Drafting (CAD): Introduction, benefit, software's, basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.	Lecture Method	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Drawing sheet of plane scale.	Experiments	BL3-Apply	2
Experiment -2	Drawing sheet of diagonal scale.	PBL	BL3-Apply	2
Experiment -3	Drawing sheet of ellipse.	PBL	BL3-Apply	2
Experiment -4	Drawing sheet parabola and hyperbola	PBL	BL3-Apply	2
Experiment -5	Drawing sheet of cycloidal curves.	PBL	BL3-Apply	2
Experiment -6	Drawing sheet of orthographic projection		BL3-Apply	2
Experiment -7	Drawing sheet of projection of line		BL3-Apply	2
Experiment -8	Drawing sheet of projection of plane.		BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. N.D.Bhatt Elementary of Enginnering Drawing Charotar Publication P.S. Gill Engineering Drawing Kataria Publication Agrawal and Agrawal Engineering Drawing TMH
Articles	
References Books	Venu Gopal K Engineering Drawing New age K.L. Narayana& P. Kannaiah Engineering Drawing SCITECH Pub.
MOOC Courses	https://nptel.ac.in/courses/112103019
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	2	2	1	2	-	-	3	3	-	-	3	2	2
CO3	-	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Evaluation of Industrial Training-I
Course Code	ECD0301[P]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Internships							
Pre-Requisite/s	Basic theoretical knowledge of electronics and communication.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Apply theoretical knowledge from coursework to solve real-world industry problems. (e.g., utilize marketing principles to develop a campaign for a local business) **(BL1-Remember)** **CO2-** Demonstrate proficiency in industry-standard tools and technologies relevant to the internship field. (e.g., use design software to create graphics for a company website) **(BL2-Understand)** **CO3-** Analyze and interpret data collected during the internship experience. (e.g., analyze customer feedback to improve product design).**(BL3-Apply)** **CO4-** Enhance critical thinking skills by analyzing and evaluating the outcomes of assigned projects or tasks.**(BL4-Analyze)** **CO5-** Compile a comprehensive report documenting the learning experiences, challenges, and achievements during the internship period.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Learning of how to do team work, collaboration with others and learning of insight regarding the internal working atmosphere of companies.	Internships	BL2-Understand	15
2	Learning of how to use the theoretical knowledge for solving the industry problem.	Internships	BL3-Apply	15
3	Development of communication skill, managerial skill and exposure to current work practices as opposed to possibly theoretical knowledge being taught at college.	Internships	BL4-Analyze	15
4	Adapting to evolving business cultures, new methods and technologies, services, technical interface.	Internships	BL4-Analyze	15
5	Learning of how to make industrial training reports and presentation of the reports.	Internships	BL5-Evaluate	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	3
CO2	1	2	1	2	1	-	-	-	-	2	-	-	-	-	3
CO3	1	2	2	2	2	-	-	-	-	-	-	-	-	-	2
CO4	1	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Semiconductor Devices
Course Code	ECL0303[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To become familiar with various types of diodes like the Schottky diode, tunnel diode, PIN diode. **(BL1-Remember)** **CO2-** To understand the operation of various electronic devices like BJT, JFET, and MOSFET. **(BL2-Understand)** **CO3-** To apply the concept of amplifiers to the various types of feedback amplifiers. **(BL3-Apply)** **CO4-** To analyze various electronics devices and their frequency response.**(BL4-Analyze)** **CO5-** To design various types of oscillators and feedback amplifiers. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, h-parameter model and small-signal operation, single stage BJT amplifier, BJT internal capacitances and high-frequency response, frequency response of CE amplifier.	Lecture Method/ Case Study/ Video/ Group Discussion	10
2	FET:Operation ofn-channel and p-channel JFET and MOSFET, comparison of BJT, JFET and MOSFET,MOSFET as Amplifier and switch, Biasing in MOS Amplifier circuits, small-signal operation, single stage MOS amplifier, MOSFET internal capacitances and high frequency response.	lecture method/Project based learning	10
3	Differential Amplifier: Four basic configurations of differential amplifiers, MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristics of the Differential amplifier (DA).	lecture method/Project based learning	10
4	Feedback: The general feedback structure properties of negative feedback, four basic feedback topologies, the series shunt feedback amplifier, the series –series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. Oscillator: Basic principles of sinusoidal Oscillators, op-amp RC Oscillator circuit, LC Oscillator, Hartley oscillator and Colpitt oscillator.	lecture method/Project based learning	11
5	Special Device: Use of PN junction diode as clipper, principle of operation of Light Emitting Diode, Schottky diode, advantages of Schottky diodes over conventional pn-junction diode, PIN diode	lecture method/Project based learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Design different types of Clippers using Diodes.	Experiments	BL4-Analyze	2
2	Electric field Detector	PBL	BL6-Create	2
1	To study and plot Input & Output Characteristics of BJT in Common Collector Configuration.	Experiments	BL4-Analyze	2
2	To study and plot Drain Characteristics of JFET in Common Source Configuration.	Experiments	BL4-Analyze	2
4	To study Hartley & Colpitts Oscillator and determine the frequency of oscillation.	Experiments	BL4-Analyze	2
4	To study Wien Bridge Oscillator and determine the frequency of oscillation.	Experiments	BL4-Analyze	2
5	To study and plot the characteristics of Silicon Controlled Rectifier.	Experiments	BL4-Analyze	2
5	mobile charger without Transformer	PBL	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Lestad, B., & Nashelsky. (2009). Electronics Devices and Circuit Theory, Pearson Education India
Articles	https://ieeexplore.ieee.org/document/4066811
References Books	1) Malvino, L., (2016). Electronic principles, Tata McGraw Hill 2) Sedra., & Smith., (2017). Microelectronics circuits, Oxford University Press 3) Bell, G., (2009). Electronic Devices and Circuits, Prentice-Hall 4) Jasprit Singh, Semiconductor Devices, ISBN 0-471-36245-X S. O. Kasap, Principles of electronic materials and devices, ISBN 0-07-295791-3
MOOC Courses	https://www.coursera.org/specializations/semiconductor-devices https://archive.nptel.ac.in/courses/108/108/108108122/
Videos	https://archive.nptel.ac.in/courses/108/108/108108112/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	2	2	-	-
CO4	2	2	-	2	-	-	-	-	-	-	-	2	2	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	2	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Architecturing of Smart IoT Devices
Course Code	ECL0304[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Sensors, Actuators, Interfacing of devices, Arduino IDE software and Hardware			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Architecture of IoT, IoT architecture standards, Networking Technologies, IoT Protocols. **(BL1-Remember)** **CO2-** To understand the basic concepts, & programming environment of various IoT Platforms. **(BL2-Understand)** **CO3-** To apply that how to these technologies work with and interpret the data obtained from various IoT applications.**(BL3-Apply)** **CO4-** To analyse various IoT architecture reference models using simulation or performing experiments on IoT builder kit.**(BL4-Analyze)** **CO5-** Evaluate performance of IoT systems for various applications.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	IoT Architecture Reference Model (ARM): IoT an Overview, Evolution of IoT, Need for ARM, IoT conceptual framework, IoT Architectural view: reference model definition, IoT reference model by CISCO, Oracle's IoT structure, Major components of IoT devices: Physical objects, Hardware, Communication Module, Software, IoT software components for device hardware. Development tools and Open-source Framework for IoT Implementation, Platforms and Integration tools	Lecture Method/Video	12
II	Python Introduction and Setting up the Environment, Basics of Python Tools, Sequence data types and associated operations**:** Strings, Lists, Arrays,Tuples, Dictionary, Sets, Range. NumPy: ndArray Pandas dataframe and dataframe related operations on Toyota Corolla dataset: Reading files, Exploratory data analysis, Data preparation and preprocessing	Lecture Method/Simulation	12
III	Data visualization on Toyoto Corolla dataset using matplotlib and seaborn libraries: Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot. Control structures using Toyota Corolla dataset: if-else family, for loop, for loop with if break, while loop. Functions, how to send data on cloud platforms like Thing speak, Blynk Platforms using NODEMCU device.	Lecture Method	10
IV	Programming Raspberry Pi: Introduction to Raspberry Pi, Basic Architecture, Pin Configuration, Installation, Interfacing of Sensors, Interfacing of Actuators & Display Devices with Raspberry Pi & Programming concepts.	Lecture Method/Research	10
V	IoT Architecture standards: ETSI standard for IoT Architecture: Standards for IoT for Home, Energy, People, motion, City. IoT Communication Architecture: IoT nodes, IoT Edge, 6LOWPAN, IPv4/IPv6, MQTT, SMQTT, CoAP, XMPP, AMQP protocols	Lecture Method/Case Study	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study IoT Builder kit & its sub system.	Experiments	BL2-Understand	2
1	To implement a GUI python program to control LED.	Experiments	BL4-Analyze	2
3	To implement a python program to interface DC Motor with IoT Development Kit.	Experiments	BL5-Evaluate	2
2	To write and implemetnt python program to control Stepper motor.	Experiments	BL3-Apply	2
3	To send & Visualize data on Thing speak cloud Platform using NODE MCU. for Dirrerent Applications such as Pulse Rate Monitoring	PBL	BL5-Evaluate	10
3	Smart Home Automation with NODEMCU Platform.	PBL	BL6-Create	10
5	Smart Healthcare Projects, Smart environment Projects, Agriculture sensors interfacing projects	PBL	BL6-Create	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015
Articles	IEEE Standards Association Working Group for an Architectural Framework for the Internet of Things (IoT) (P2413) - http://grouper.ieee.org/groups/2413/
References Books	Donald Norris The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black McGraw Hill Publication.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_cs53/preview https://www.coursera.org/learn/iot-architecture https://www.coursera.org/learn/raspberry-pi-interface https://onlinecourses.nptel.ac.in/noc24_cs68/course https://www.coursera.org/learn/raspberry-pi-platform https://www.coursera.org/learn/raspberry-pi-interface
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	1
CO2	3	2	1	-	-	2	-	-	-	3	-	-	2	-	2
CO3	1	2	1	3	2	-	-	-	-	-	-	-	2	2	2
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	1	2	-	2	-	-	-	-	-	-	-	-	2	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Digital Electronics
Course Code	ECL0306[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems **(BL1-Remember)** **CO2-** To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations **(BL2-Understand)** **CO3-** To Apply simple logical operations using combinational logic circuits [BL3]**(BL3-Apply)** **CO4-** To analysis of combinational logic circuits, sequential logic circuits [BL4] **(BL4-Analyze)** **CO5-** To Evaluate to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines [BL5]**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Digital Computer and Digital Systems, Number Systems & its Conversions, Complements, Binary codes, Binary Storage and Registers, Binary Logic, Integrated Circuits. Boolean Algebra–Definitions, Theorems, Properties & Function, Canonical and Standard Forms, Digital Logic Gates, Introduction to Digital Logic Families.	Audio video clip/Research/Field work/Group Discussion	12
2	The Map Method, Two and Three Variable Maps, Four Variable Maps, Five and Six Variable Maps, Product of Sums Simplification, NAND and NOR Implementation, Two Level Implementation, Don't–Care Conditions, Tabulation Method, Determination of Prime-Implicants, Selection of Prime- Implicants.	Audio video clip/Research/Field work/Group Discussion	12
3	Introduction, Design Procedure, Adders, Subtract or, Parity Generators, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-OR and Equivalence Functions, Magnitude Comparator, Decoder, Multiplexers, PLA.	Audio video clip/Research/Field work/Group Discussion	12
4	Introduction, Flip-Flops, Triggering of Flip-Flops–RS, J-K, T & D, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design with State Equations, Registers, Shift, Registers, Counters.	Audio video clip/Research/Field work/Group Discussion/lecture method	10
5	Memory Organization: Memory Hierarchy, Secondary Memory, Main Memory Organization: Random access Memory (RAM), Read Only memory (ROM), Building large memories using small RAM and ROM chips,	Audio video clip/Research/Field work/Group Discussion/field visit	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study various Logic Gates and verify their truth tables.	Experiments	BL4-Analyze	2
4	To Study D & T Flip Flop and verify their truth tables.	Experiments	BL4-Analyze	2
1	To Verify Demorgan's Theorem and observe the output	Experiments	BL4-Analyze	2
3	To Study Half Adder, Full Adder and Half Subtractor and verify their truth tables	Experiments	BL4-Analyze	2
1	To study BCD to Excess-3 code convertor and verify its truth table.	Experiments	BL4-Analyze	2
3	To study and verify the truth table of 4-to-1 Line Multiplexer.	Experiments	BL4-Analyze	2
3	To study and verify the Truth Table of 1-to-4 Line Demultiplexer.	Experiments	BL4-Analyze	2
4	LED panel using seven segment	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Digital Fundamentals by Morris and Mano, PHI Publication Fundamental of digital circuits by A.ANANDKUMAR,PHI Publication Digital Fundamaentals by FLOYD & JAIN, Pearsons Pub 2) Fundamentals of Logic Design by Charles H. Roth Thomson
Articles	https://www.researchgate.net/topic/Digital-Electronics
References Books	1) Leach and Malvino, Digital Principles and Applications, TMH 2) W.H. Gothman, Digital Electronics, PHI 3)Millman and Taub : Pulse, Digital and Switching Waveform, MGH
MOOC Courses	https://www.mooc-list.com/tags/digital-electronics
Videos	https://archive.nptel.ac.in/courses/108/105/108105132/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	2	-	2	-	-	-
CO2	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO3	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO4	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO5	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ITM UNIVERSITY
GWALIOR • MP • INDIA
CELEBRATING DREAMS

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Network Analysis & Synthesis
Course Code	ECL0307[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Concepts of DC circuits, AC circuits, Laplace transform and Differential equation.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of basic electric circuits.**(BL1-Remember)** **CO2-** To understand & gain the knowledge on basic network elements**(BL2-Understand)** **CO3-** To implement the concept of TPN, RLC, RL, LC, RC circuits in other electronics devices. **(BL3-Apply)** **CO4-** To analyze the various electrical and electronics hardware circuit and Gain the knowledge about network Synthesis.**(BL4-Analyze)** **CO5-** To Evaluation of various electrical parameters (current, voltage, power etc.) of RLC circuits. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	**Introduction**: Electrical elements description (resistor, capacitor, inductor), Electrical circuit & network, Linear & nonlinear elements, Unilateral and bilateral elements, Active and passive elements, Sources (dependent and independent voltage and current source), Kirchhoff's Laws (KVL and KCL), Network solution methods (Mesh analysis, Node analysis and Branch current analysis), series and parallel connection of resistors, inductors and capacitors, Source transforms theorem.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	**Networks Theorems for AC and DC circuits:** Thevenin's, Norton's, Superposition, Reciprocity, Maximum power transfer and millmn's theorems problems with dependent and independent sources. Star to delta and delta to star conversion.	Lecture Method/ Case Study/ Video/ Group Discussion	10
3	**Two Port Parameters**: Short circuit parameters, Open circuit parameters, Transmission parameters, hybrid parameters, relation between parameters sets, parallel connection and cascade connection of two port network, reciprocity and symmetry in all parameters.	Lecture Method/ Video/ Group Discussion	10
4	**The Laplace Transform & its Application on Network Circuits** – RL, LC, CR, RLC & Initial condition (series & parallel combinations), initial and final value theorem. **Transient analysis:** Transients in RL, RC and RLC circuits, initial conditions, time constants, networks driven by constant driving sources and their solutions, Steady state analysis of RL, RC and RLC circuits, Laplace transform solution of Integral-differential equations	Lecture Method / Video/ Group Discussion	10
5	**Introduction to Network Synthesis**: PRF & its properties, Basic synthesis procedure, Methods of synthesis, Driving point synthesis of one networks with two type of elements, Synthesis of RLC driving point functions.	Lecture Method / Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To verify Kirchhoff’s Current Law (KCL) and Kirchhoff’s Voltage Law (KVL).	Experiments	BL5-Evaluate	2
5	Determination of the Z- Parameters of a Two-Port Network.tion of network theorems	Experiments	BL5-Evaluate	2
3	Determination of the Y -Parameters of a Two-Port Network.	Experiments	BL5-Evaluate	2
4	Determination of the A, B, C, D Parameters of a Two-Port Network.	Experiments	BL5-Evaluate	2
4	Determination of the h- Parameters of a Two-Port Network.	Experiments	BL5-Evaluate	2
2	To verify the Superposition Theorem.	Experiments	BL5-Evaluate	2
2	Design of RLC filters	PBL	BL6-Create	30
2	Verification of networks theorems	PBL	BL5-Evaluate	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	(1) Van Valkenburg M.E, Network Analysis, Prentice Hall India (2) Chakrabarti, A, Circuit Theory Analysis and Synthesis, Dhanpat Rai & Co., Seventh - Revised edition (3) Ravish R. Singh, Network Analysis and Synthesis, McGraw-Hill Education
Articles	(1) J. G. Gottling, "Node and mesh analysis by inspection," in IEEE Transactions on Education, vol. 38, no. 4, pp. 312-316, Nov. 1995, doi: 10.1109/13.473148. keywords: {Inspection;Linear circuits;Differential equations;Vectors;Circuit analysis;Impedance;Operational amplifiers;Coupling circuits;Mutual coupling;Coils}, (2) Gluskin, Emanuel. "Two Mathematical Comments on the Thevenin Theorem: An “Algebraic Ideal” and the “Affine Nonlinearity”." Mathematical Problems in Engineering 2015 (2015).
References Books	(1) D. Roy Chaudhary, Network Theory, Newage Asian (2) Kuo, F, Network Analysis and Synthesis, John Wiley (3) William D Stanley, Network Analysis with Applications, Pearson Education
MOOC Courses	https://archive.nptel.ac.in/courses/108/105/108105159/
Videos	(1) https://www.youtube.com/watch?v=0pFF1oAYgQI (2) https://www.youtube.com/watch?v=O2GoxZqhlzA (3) https://www.youtube.com/watch?v=GRoHyB8obfM

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	3	2	1	-	-	2	-	-	-	3	-	-	2	-	2
CO3	1	1	1	3	-	-	-	-	-	-	-	-	2	2	2
CO4	1	2	1	2	2	-	-	-	-	-	-	-	3	3	3
CO5	1	2	-	2	-	-	-	-	-	-	-	-	2	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Engineering Mathematics
Course Code	MAL0306[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of equations			**Co-Requisite/s**	Basic knowledge of roots			
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to numerical computing, Approximation and error in numerical computations, Numerical solution of algebraic and Transcendental equations. Regula-Falsi method, Newton-Raphson method, Graffes-Root squaring method, Iterative method. Solution of simultaneous linear equation, Gauss-Elimination method, Jacobi's method Gauss- Seidel method Iterative method. Numerical differentiation and integration(Trapezoidal rule Simpson's 1/3rd rule , Simpson's 3/8rule)	lecture with Board , Quiz, Seminar,	8
Unit 2	Difference operators, Interpolation: Newton's forward and backward method, Lagrange method, Central difference interpolation, Numerical solution of ordinary differential equations: Picard's method, Euler method, Modified Euler method and Runge- Kutta Method, Numerical solution of partial differential equation: Elliptic (Laplace Equation), Parabolic (Heat conduction equation)	lecture with Board , Quiz, Seminar,	8
Unit 3	Laplace Transform: Laplace Transform of elementary functions, Laplace Transform of derivatives, integrals and multiplication by t^n and division by t, Inverse Laplace Transform., convolution Theorem (application only), application to solution of differential equations.	lecture with Board , Quiz, Seminar,	8
Unit 4	Fourier transform, Fourier complex transform Fourier integral theorem, Fourier sine and cosine transform of simple function of derivatives, Finite Fourier sine & cosine transform, inverse of Fourier transform, Application to differential equation, solution of one dimensional heat and wave equations through Fourier transform.	lecture with Board , Quiz, Seminar,	8
Unit 5	Transform: Definition of Z -transform, Z-transform of simple sequences. Properties of Z -transform. Initial and final value theorem, Inverse Z -transform, partial fraction method, convolution theorem, residue method, Application to finite difference equation.	lecture with Board , Quiz, Seminar,	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill 2. B.S.Grewal, Higher Engineering Mathematics ,Khanna Publishers 3. H.K.Das and R. Verma, Higher Engineering Mathematics, S.Chand and Company Pvt.Ltd.
Articles	
References Books	1. E.Kreyszig, Advanced Engineering Mathematics ,John Wiley and Sons, 1999 2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers. 3. T. Veerajan and T. Ramachandran, Theory and Problems in Numerical Methods, Tata McGraw Hill
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma36/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma36/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	-	-	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	-	-	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	-	-	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	-	-	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Data Structure and Application
Course Code	CSL0457[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of basic Data structure and C Programming			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various syntax of C programming **(BL1-Remember)** **CO2-** To understand the Basic concept of Data structure, application areas and tools for data science **(BL2-Understand)** **CO3-** Applying coding for handling logic data and algorithm for handling data from data files **(BL3-Apply)** **CO4-** Analyzing the hash function concepts of collision and its resolution methods **(BL4-Analyze)** **CO5-** To evaluate and summarize the data structure using statistical & visualization tools**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Linear Array, Operations on Linear Array, Multidimensional Array, Sparse Matrices Strings; Linked List: Operations on Linked List, Garbage Collection, Header Linked List, Two-Way Linked List, Circular Linked List	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Stacks: Implementation of Stacks using Arrays and Linked Lists, Polish Notations, Conversion from Infix to Postfix, Evaluation of Postfix Expressions Queues: Representation of Queues, Implementation of Queues using Arrays and Linked Lists, Circular Queue, De-Queue, Priority Queues, Recursion	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Trees: Definition, Terminology; Binary Trees: Representation in Memory, Traversing Binary Tree, Extended Binary Tree, Threaded Binary Trees, Operations on Binary Trees; Search Trees: Operations on Search Trees.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Graphs: Terminology, Representation of Graphs, Directed Graphs, Directed Acyclic Graph, Shortest Path Algorithms Graph Traversal; Minimum Cost Spanning Tree: Kruskal's Algorithm, Prim's Algorithm.	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	File Structures, Random Access Files, Indexed Sequential Files, Hash Tables, Hashing Functions, B Trees and B+ Trees; Sorting: Bubble Sort, Heap Sort, Quick Sort; Searching: Linear Search, Binary Search	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	implement array and traverse all the elements of the array	Experiments	BL4-Analyze	2
3	Write a program in C to delete an element from the array with given item of information	Experiments	BL4-Analyze	2
4	Write a program in C to implement the bubble sort algorithm.	Experiments	BL4-Analyze	2
5	Write a program in C to implement the linear search algorithm.	Experiments	BL4-Analyze	2
6	Write a program in C to implement the binary search algorithm	Experiments	BL4-Analyze	2
7	Write a program in C to create and traverse the elements of the two- dimensional array.	Experiments	BL4-Analyze	2
8	Write a program in C to create and traverse the elements of the multidimensional array.	Experiments	BL4-Analyze	2
9	create and display the element of the linked list	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Books	1) Gilberg and Forouzan: “Data Structure- A Pseudo code approach with C” by Thomson publication
Articles	https://arxiv.org/ftp/arxiv/papers/1602/1602.07799.pdf
References Books	1) Fundamentals of data structure in C” Horowitz, Sahani & Freed, Computer Science Press.
MOOC Courses	https://www.udemy.com/course/master-the-coding-interview-data-structures-algorithms/? utm_source=adwords&utm_medium=udemyads&utm_campaign=DataStructures_v.PROF_la.EN_cc.INDIA&campaigntype=Search&portfolio=India&l 870865452613_._li_1007796_._pd__._&matchtype=b&gad_source=1&gclid=CjwKCAjwrvyxBhAbEiwAEg_KgvbvKoF-XCo7SBArYky8ApNQqBQ3kaF
Videos	https://nptel.ac.in/courses/106102064

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	1	2	-	-	-	3	-	-	-	-	1
CO2	1	3	1	-	1	2	-	-	-	3	-	-	-	-	3
CO3	3	2	1	2	-	-	-	-	-	-	-	-	-	-	3
CO4	3	3	1	2	-	-	-	-	-	-	-	-	-	-	3
CO5	2	3	-	1	-	-	-	-	-	-	-	-	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Electronics Circuits & Linear ICs Applications
Course Code	ECL0408[T]

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">4th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>1</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Foundation core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- To get familiarized with basic integrated circuit components, its designing & packaging.(BL1-Remember)
CO2- Understanding various operating modes of Op-amp and its linear/non-linear applications(BL2-Understand)
CO3- apply the concepts of transistors to understand the working of power amplifiers(BL3-Apply)
CO4- To analyze various operational amplifier circuits.(BL4-Analyze)
CO5- To evaluate the performance of various types of active filters and their design(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG1(No poverty)
SDG2(Zero hunger)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Integrated Circuits: Analog and Digital Integrated Circuits, Characteristics, Advantages and disadvantages of Analog and digital Integrated Circuits. Current Mirrors: Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Operational amplifier (IC741), specifications, ideal and practical characteristics, frequency response, unity gain bandwidth, Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp, Current to Voltage Converter, Voltage to Current Converter, Instrumentation Amplifier.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Non-Linear applications of IC Op-amps: Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Sample and Hold Circuits, Analog Multipliers and their applications, Op-amp as a comparator, Zero crossing detectors, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Filters: Active and Passive Filters, First and second order Low Pass, High Pass, Band Pass, Band Reject and All pass active filters. Integrated Circuit Timer: The 555 Circuit, implementing a Mono stable Multi vibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC.	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	Phase Locked Loop: VCO, Block diagram of PLL, Working of PLL and its applications. Power amplifier: Introduction, types, Class A, Class B, Class-AB, Class C, Class D amplifiers.	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
4	mouse tracker circuit using 555 timer	PBL	BL6-Create	30
1	To study different applications of Operational Amplifier: Voltage follower, Integrator and differentiator	Experiments	BL5-Evaluate	2
1	To study Op-Amp. as Comparator and Zero Crossing Detector.	Experiments	BL5-Evaluate	2
1	To study and design Schmitt Trigger using an Op-Amp.	Experiments	BL5-Evaluate	2
1	To study and measure the Input Offset Voltage, Input Bias Currents, Input Offset Current, and Slew Rate of an Op-Amp.	Experiments	BL5-Evaluate	2
4	To study Mono stable Multi vibrator using IC 555.	Experiments	BL5-Evaluate	2
4	To study Astable Multi vibrator using IC 555.	Experiments	BL5-Evaluate	2
4	To study and design second order Low Pass Butterworth Filter.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Ramakant A. Gayakwad, Op Amps and Linear Integrated Circuits, Prentice Hall Publications 2)Integrated Electronics: Analog and Digital Circuits & Systems by Chetan D. Parikh, Christos C. Halkias, and Jacob Millman
Articles	https://ieeexplore.ieee.org/document/1082512
References Books	1) Sedra and Smith, Microelectronics circuits, Fifth edition by Oxford University Press.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ee73/preview
Videos	https://archive.nptel.ac.in/courses/108/108/108108111/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	-	-	-	-	-	3	-	-	-	-	3
CO2	-	2	-	2	-	-	-	-	-	3	-	-	-	-	3
CO3	-	2	-	3	-	-	-	-	-	1	1	1	-	-	3
CO4	-	1	-	1	-	-	-	-	-	-	1	1	-	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Digital System Design
Course Code	ECL0409[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various concept of Digital system design **(BL1-Remember)** **CO2-** Understand the digital systems as an activity in a larger systems design context**(BL2-Understand)** **CO3-** Apply the concept of digital system design**(BL3-Apply)** **CO4-** Analyze the concept of digital system design**(BL4-Analyze)** **CO5-** Evaluate Programmable logic devices (PLDs) and networks of arithmetic operations.B**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
1	**Introduction of Sequential Circuits:** Flip Flops, Flip Flops Characteristics Equations, Flip Flop Excitation Tables, Conversion of Flip Flops, Specification of Sequential Circuits, Designing of Sequential Circuits, Introduction of Mealy and Moore Models.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	**Synthesis and Analysis of Synchronous Sequential Circuits:** Introduction, Characterizing Equation and Description of Synchronous Sequential Machine, Realization of Flow Table from Verbal Description, Moore & Mealy Machines, Machines State Table and Transition Diagram, Designing of Synchronous Sequential Machines, Minimization of Flow Table of Completely and Incompletely Specifies Sequential Machines..	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	**Synthesis and Analysis of Asynchronous Sequential Circuits:** Introduction, Structure and Classification, Equivalence & Minimization, Analysis Procedure, Circuits and Latches, Design Procedure, Reduction of State and Flow Tables, Race-Free State Assignments, Hazards, Information Loss Less Machine.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	**Algorithmic State Machine:** Introduction, Fundamental Concept of Hardware / Firmware Algorithms, ASM Chart, Timing Considerations, Control Implementation, Design with Multiplexers, PLA Control.	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	**Fault Detection in Combinational Circuit:** Types of Faults, Fault Detection using Boolean Difference and Path Sensitization Method **Programmable Devices**: Concept of PROM, PLAs, PALs, PLE, GAL, PEEL, CPLDs and FPGA, PALASM Software Applications, Design Implementation using CPLDs and FPGAs.	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	1. To implement RS Flip Flop using NAND gates and verify their truth tables.	Experiments	BL5-Evaluate	2
1	2. To implement JK Flip Flop using NAND gates and verify their truth tables	Experiments	BL5-Evaluate	2
1	3. To implement D and T Flip Flop using NAND gates and verify their truth tables	Experiments	BL5-Evaluate	2
1	4. To implement Master Slave JK Flip-Flop and verify its truth table	Experiments	BL5-Evaluate	2
1	5. Design and verify the Asynchronous Counter (Ripple Counter)	Experiments	BL5-Evaluate	2
1	6. To implement a Ring Counter using Flip-Flops	Experiments	BL5-Evaluate	2
1	7. To implement a Johnson Ring Counter using Flip-Flops	Experiments	BL5-Evaluate	2
1	Visitor counter using arduino	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) R.P. Jain, Modern Digital Electronics, Tata Mc Graw Hill Company Limited.
Articles	1) Comparative study of Moore and Mealy machine models adaptation in black soap production 10.4314/njt.v36i2.36
References Books	1) Morries Mano,, Digital Logic Design, PHL
MOOC Courses	https://www.coursera.org/learn/electronica-digital-bit-a-bit-disenando-circuitos-complejos
Videos	https://onlinecourses.nptel.ac.in/noc21_ee39/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-2	1	-	-	-	-	-	1	-	3	2	1	-
CO2	3	3	3	1	-	-	-	-	-	1	-	-3	3	1	-
CO3	3	3	2	1	-	-	-	-	-	1	-	3	2	1	-
CO4	3	3	2	1	-	-	-	-	-	1	-	3	3	1	-
CO5	3	3	2	1	2	-	-	-	-	1	-	3	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Analog Communication
Course Code	ECL0411[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	A basic idea regarding the initial concepts of communication is enough to go through this subject.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** :To remember the properties of signals & concepts of communication**(BL1-Remember)** **CO2-** To Understand basic characteristics of signal, Modulation & demodulation techniques of AM, DSB, SSB &VSB**(BL2-Understand)** **CO3-** Analyzing spectrum of AM, FM signal, noise characteristics in the channel communications and the percentage of modulation in FM and AM systems**(BL3-Apply)** **CO4-** To evaluation of various communication parameters (Power, Energy, Modulation index etc.)**(BL4-Analyze)** **CO5-** To Design low power AM and FM transmitters and receivers. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to the signal: Definition, types of signals and their representations: continuous time/ discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, unit impulse, unit step, unit ramp (and their inter relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals	Lecture Method/ Video/ Group Discussion / Case study / Simulation	12
II	System: Classification, Linearity and Non linearity, Time invariance and Causality, impulse response, unit step response, ramp response, LTI system. Fourier Transform: Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse Fourier transform	Lecture Method/ Video/ Group Discussion / Simulation	10
III	Introduction to communication system: Elements of communication system, Types of modulation continuous and phase, modulation benefits and applications, limitation in communication, baseband communication, carrier communication, radio frequency spectrum. Noise: Classification of noise, External, Atmospheric Noise, Solar & Cosmic Noise, Industrial noise, Internal Noise, Shot noise, partition noise, Flicker Noise, Transit lime noise, thermal noise, signal to noise ratio, noise figure and its Calculation.	Lecture Method / Video/ Group Discussion	10
IV	Amplitude modulation: Amplitude modulation, time domain representation of AM Wave, frequency spectrum of AM wave, single tone sinusoidal modulation, multi tone sinusoidal modulation, power content of side bands, current calculation in AM wave, generation of AM wave, demodulation of AM wave, Suppressed carrier modulation, DSB-SC modulation generation of DSB-SC signal, SSB modulation, generation of SSB waves, detection of SSB waves, VSB modulation, generation and detection of VSB signals, comparison of various AM systems.	Lecture Method / Video/ Group Discussion	10
V	Angle Modulation: FM and PM waveforms, phase deviation, frequency deviation, modulation index, phase and frequency modulators and demodulators, frequency spectrum of angle modulated waves, bandwidth requirement for angle modulated waves, Average power of angle modulated waves, direct and indirect FM transmitters, FM Receivers, Angle Vs Amplitude modulation, FM vs PM	Lecture Method / Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the operation of a DSB AM Modulator.	Experiments	BL5-Evaluate	2
2	A). To generate Amplitude Modulated wave and determine the percentage modulation. B). To Demodulate the modulated wave using Envelope Detector.	Experiments	BL5-Evaluate	2
3	To study the Modulation and Demodulation of a Double Side Band Suppressed Carrier Signal.	Experiments	BL5-Evaluate	2
3	To study the Modulation and Demodulation of a Single Side Band Suppressed Carrier Signal.	Experiments	BL5-Evaluate	2
3	A) To generate Frequency Modulated Signal and determine the Modulation Index and Bandwidth for various values of Amplitude and Frequency of modulating signal. B) To demodulate a Frequency Modulated Signal using FM Detector and study the Modulation and Demodulation of a Frequency Modulated Signal.	Experiments	BL5-Evaluate	2
4	To study the Modulation and Demodulation of a Phase Modulated Signal.	Experiments	BL5-Evaluate	2
5	Soil Nutrient Analysis and Automated Targeted Fertilizer Application	PBL	BL6-Create	30
5	Robotic Hand Design and Implementation	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	(1) B.P. Lathi Modem Digital and Analog communication Systems 4th Edition' Oxford Press (2) V Oppenheim, A.S Willsky , and S. Hamid Nawab Signals & system Pearson Education,2nd Ed
Articles	(1) Houtgast, T. "Frequency selectivity in amplitude-modulation detection." The Journal of the Acoustical Society of America 85.4 (1989): 1676-1680. (2) Moore, Brian CJ, and Aleksander Sek. "Effects of carrier frequency, modulation rate, and modulation waveform on the detection of modulation and the discrimination of modulation type (amplitude modulation versus frequency modulation)." The Journal of the Acoustical Society of America 97.4 (1995): 2468-2478.
References Books	(1) Kennedy & Devis Electronic Communication System Tata McGraw Hill (2) Simon Haykins Communication systems 4thEdition (3) Singh and Sapre Communication Systems Tata McGraw Hill
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_ee74/preview
Videos	https://www.youtube.com/watch?v=iZM2zgxnEOc&t=46s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	3	2	1	-	-	2	-	-	-	3	-	-	-	-	2
CO3	1	1	1	3	2	-	-	-	-	-	-	-	-	-	3
CO4	1	2	1	3	-	-	-	-	-	-	-	-	-	-	3
CO5	1	1	-	2	-	-	-	-	-	-	-	-	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Wireless Sensor Networks & IoT
Course Code	ECL0460[T]

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">4th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>1</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Bridge Course</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Knowledge of Architecture of IoT and Communication and Networking Technologies.</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- To remember the basic terminologies of networking, sensor node architecture etc.(BL1-Remember)
CO2- To understand the important functions, concepts, algorithms &types of WSNs, Protocols. (BL2-Understand)
CO3- To apply the knowledge of programming to achieve a specific task/challenge. Gain knowledge about Power Management of WSNs(BL3-Apply)
CO4- To analyse the results by using computer-based tools/kits for engineering applications. Use computer programming tools to process and visualize results(BL4-Analyze)
CO5- To evaluate the applications of WSN in various fields such as research and industries(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG1(No poverty)
SDG2(Zero hunger)
SDG4(Quality education)
SDG11(Sustainable cities and economies)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Motivation for a Network of Wireless Sensor Nodes: Definitions and Background - Challenges and Constraints: Energy, Self-Management, Wireless Networking, Decentralized Management, Design Constraints, Security - Applications : Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining	Lecture Method/Video/Virtual Lab	10
2	Node Architecture: The Sensing Subsystem, The Processor Subsystem, Communication Interfaces, Prototypes Medium Access Control: Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols.	Lecture Method/Video/Virtual Lab	10
3	Network Layer: Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols.	Lecture Method/Video/Virtual LabWhiteboard/PPT	8
4	IoT with Raspberry pi: Senor motes programming with python on Raspberry pi, Interfacing concepts with python Programming and data cloud concepts with raspberry pi. Remote access of Raspberry pi with Python, Interfacing of sensors & Actuators with Raspberry Pi. Localization: Ranging Techniques, Range-Based Localization, Range-Free Localization, Event-Driven Localization	Lecture Method/Video/Virtual Lab	8
5	Integration of WSN to IoT: Integration approaches – stack-based approaches, topology-based approaches - SCADA network architecture - Security Challenges, Introduction to Simulation Tools of WSN like: NETSIM Simulation, COOJA Simulator, NS2 Simulator. Security: Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, Security Protocols for Sensor Networks	Lecture Method/Research/Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To Study Sensor Node Configuration & Different Sensors with pin details.	Experiments	BL2-Understand	2
2	To write a Python Program for test Air Quality Sensor (SS151) with interfacing	Experiments	BL4-Analyze	2
2	Interfacing with Python Program for test Soil Moisture Sensor (SS152).	Experiments	BL5-Evaluate	2
3	Interfacing of Soil / Water Temperature Sensor (SS154). on IoT builder kit	Experiments	BL4-Analyze	2
3	WSN Virtual lab	Virtual Labs	BL4-Analyze	2
4	Netsim Tool simulation	Simulation	BL4-Analyze	10
3	IoT based system design and implementation	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. Dr Xuemin (Sherman) Shen Dr Yi Pan Fundamentals of Wireless Sensor Networks, Theory & Practices Wiley Series on Wireless Communications and Mobile Computing 2. Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015
Articles	Karan Bajaj, Bhisham Sharma, and Raman Singh Integration of WSN with IoT Applications: A Vision, Architecture, and Future Challenges Springer Nature Switzerland AG 2020 Integration of WSN with IoT Applications: A Vision, Architecture, and Future Challenges Springer Nature Switzerland AG 2020 Akyildiz, I.F.; Su, W.; Sankarasubramaniam, Y.; Cayirci, E. Wireless Sensor Networks: A Survey. Comput. Netw. 2002, 38, 399–422.
References Books	
MOOC Courses	https://www.coursera.org/learn/iot-wireless-cloud-computing https://archive.nptel.ac.in/courses/106/105/106105160/
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	3	2	1	-	-	2	-	-	-	3	-	1	2	2	2
CO3	1	1	1	3	2	-	-	-	-	-	-	-	2	3	2
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	1	1	-	2	-	-	-	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Evaluation of Industrial Training-II
Course Code	ECD0502[P]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Internships							
Pre-Requisite/s	Basic theoretical knowledge of electronics and communication.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Apply theoretical knowledge from coursework to solve real-world industry problems. (e.g., utilize marketing principles to develop a campaign for a local business) **(BL1-Remember)** **CO2-** Demonstrate proficiency in industry-standard tools and technologies relevant to the internship field. (e.g., use design software to create graphics for a company website) **(BL2-Understand)** **CO3-** Analyze and interpret data collected during the internship experience. (e.g., analyze customer feedback to improve product design)**(BL3-Apply)** **CO4-** Enhance critical thinking skills by analyzing and evaluating the outcomes of assigned projects or tasks.**(BL4-Analyze)** **CO5-** Compile a comprehensive report documenting the learning experiences, challenges, and achievements during the internship period.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Learning of how to do team work, collaboration with others and learning of insight regarding the internal working atmosphere of companies.	Internships	BL2-Understand	15
2	Learning of how to use the theoretical knowledge for solving the industry problem.	Internships	BL3-Apply	15
3	Development of communication skill, managerial skill and exposure to current work practices as opposed to possibly theoretical knowledge being taught at college.	Internships	BL4-Analyze	15
4	Adapting to evolving business cultures, new methods and technologies, services, technical interface.	Internships	BL4-Analyze	15
5	Learning of how to make industrial training reports and presentation of the reports and training.	Internships	BL5-Evaluate	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	2
CO2	1	2	1	2	-	-	-	-	-	2	-	-	-	-	3
CO3	1	2	2	2	-	-	-	-	-	-	-	-	-	-	3
CO4	1	2	2	3	-	-	-	-	-	-	-	-	-	-	2
CO5	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Electromagnetic Theory
Course Code	ECL0512[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get familiarized with various coordinate systems**(BL2-Understand)** **CO2-** To understand the various laws and theorems related to electromagnetics**(BL1-Remember)** **CO3-** To apply various laws and theorems to derive Maxwell's equations**(BL3-Apply)** **CO4-** To analyse various types of transmission mediums**(BL4-Analyze)** **CO5-** To evaluate the performance of transmission lines**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Prerequisite: Knowledge of vector algebra. Coordinate Systems and Transformation: Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates. Vector Calculus: Differential Length, Area and Volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	white board, ppt	14
2	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses Law-Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields, boundary condition, Poisons and Laplace equations.	white board, ppt	12
3	3 Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential, magnetic boundary conditions. Lectures with whiteboard/PPT, Recorded video/interactive videos,	white board, ppt	10
4	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, equation of continuity, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence, wave polarization.	white board, ppt	12
5	Introduction of Wave Propagation in Bounded Medium, Transmission Lines: Transmission line parameters, Transmission line equations, Lossless lines, Distortion less line, Input impedance, Standing Wave Ratio and Power, The Smith chart, Some applications of transmission lines.	white board, ppt	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Elements of Electromagnetic, Mathew N.O Sadiku, Oxford Engineering Electromagnetic, William H. Hayt, TMH
Articles	
References Books	Electromagnetics, John D. Kraus,Tata McGraw Hill Electromagnetic wave and Radiating System, Jordan Balman, PHI Element of Engineering Electromagnetic, N.N. Rao, Pearson Education
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	-	1	1	-	-	-	1	1	2	1	2
CO2	1	1	1	1	1	1	-	-	-	-	1	1	3	2	2
CO3	1	1	1	1	1	-	1	-	-	-	1	-	2	2	3
CO4	1	1	-	1	-	1	1	-	-	-	1	1	2	2	2
CO5	1	-	1	1	1	1	-	-	-	-	1	1	2	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Digital Communication
Course Code	ECL0513[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various concept of Digital communication **(BL1-Remember)** **CO2-** Understanding practical implementation issues, such as non-ideal filters, non-ideal sampling pulses, aliasing, and intersymbol-interference (ISI)[BL2].**(BL2-Understand)** **CO3-** Apply error control coding techniques for efficient communication [BL3]**(BL3-Apply)** **CO4-** To analyze digital pulse modulation techniques [BL4]**(BL4-Analyze)** **CO5-** Evaluate fundamental communication system parameters, such as bandwidth, power and signal to quantization noise ratio and data rate**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Prerequisite: Knowledge of vector algebra. Coordinate Systems and Transformation: Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates. Vector Calculus: Differential Length, Area and Volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Sampling, sampling theorem for low pass and band pass signal Types of Sampling, Instantaneous, Natural and Flat Top, Aperture Effect, Pulse Amplitude Modulation (PAM), Channel Bandwidth for PAM, Pulse Position and Pulse Duration Modulation and Demodulation Channel Bandwidth for PAM, PWM, PPM, Compression of PAM,PWM,PPM, Time Division Multiplexing (TDM), Frequency division multiplexing	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Quantization, Quantization Error, Pulse Code Modulation (PCM), Signal to- Noise Ratio in PCM, Data Rate and Bandwidth of Multiplexed PCM Signal, Inter-symbol Interference, Commanding, Differential PCM (DPCM), Delta Modulation (DM), Adaptive Delta Modulation (ADM), Compression of pulse Digital modulation technique, Frequency Division Multiplexing, TDMA, Compression between FDMA AND TDMA	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Analysis' Generation and Detection, ASK, BPSK,BFSK, Spectrum and bandwidth analysis of ASK,BPSK,BFSK, Differential phase shift eying (DPSK), Quadrature phase shift keying (QPSK),M-ary PSK, Quadrature, M-ary Frequency shift keying ,Minimum shift keying, Quadrature amplitude modulation(QAM)	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	Information Theory, Information, entropies (Marginal and Conditional), Model of a communication system, Binary symmetric channel (BSC), Binary error channel (BEC), Shannon Fano and Huffman coding methods and their efficiency	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1		Experiments	BL4-Analyze	2
4	Generation and Detection of a Quadrature Phase Shift Keying (QPSK) signal	Experiments	BL5-Evaluate	2
3	PBL based on delta modulation circuit	PBL	BL6-Create	25
2	Generation and Detection of a Pulse Position Modulated (PPM) signal.	Experiments	BL4-Analyze	2
4	Generation and Detection of a Time Division Multiplexed (TDM) signal	Experiments	BL4-Analyze	2
4	Generation and Detection of a Pulse Code Modulated (PCM) signal.	Experiments	BL4-Analyze	2
4	Generation and Detection of an Amplitude Shift Keying (ASK) signal	Experiments	BL4-Analyze	2
1	Generation and Detection of a Frequency Shift Keying (FSK) signal	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Books	1) H, P. HSU & D Mitra,Analog and Digital Communications,, 2nd Edition' Tata McGraw-Hill Publishing .
Articles	https://www.researchgate.net/publication/371531206_Digital_Communication
References Books	1) B.P. Lathi, Modem Digital and Analog communication Systems",2nd Edition' Tata McGraw-Hill Publishing Company Ltd 2)Singh and Sapre, Communication Systems. 3) Simon Haykin, Communication System,TMH
MOOC Courses	https://www.udemy.com/course/digital-communication-information-theory/? utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.EN_cc.INDIA&campaigntype=Search&portfolio=India&language= 393783612853_._li_1007795_._pd__._&matchtype=&gad_source=1&gclid=Cj0KCQjw6PGxBhCVARIsAIumnWYxPKj0B9Wj0ROnVdPVCHIKAMEAa
Videos	https://nptel.ac.in/courses/117101051

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-	2	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Advanced Microprocessors and Interfacing
Course Code	ECL0515[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Basic knowledge of Digital System Design Course			**Co-Requisite/s**	Understanding the prerequisites of digital system design			
Course Outcomes & Bloom's Level	**CO1-** Assess 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.**(BL1-Remember)** **CO2-** Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller**(BL3-Apply)** **CO3-** Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.**(BL4-Analyze)** **CO4-** Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.**(BL5-Evaluate)** **CO5-** Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements**(BL5-Evaluate)** **CO6-** To train their practical knowledge through laboratory experiments.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Prerequisite: Basic understanding of Digital electronics, number system and conversion. Introduction to microprocessor, Evolution of Microprocessors' Overview of 8 bit microprocessor (8085): Pin configuration and Internal architecture' Registers, ALU. Interrupts. Assembly language programming'	lecture method/Group Discussion	8
2	l6 bit Microprocessor (8086) - Register organization, Architecture of 8086- BIU and EU, Memory Segmentation, Pin description' Memory Addressing,' Maximum and Minimum Modes of operation along with timing diagram' Clock generator 8284.	lecture method/Project-based Learning	10
3	Addressing Modes, Instruction set of 8086, Assembly Language Programming, Assembler Directives and operators, Procedures, Macros, Interrupts, 8086 Based Multiprocessor Systems- Coprocessors (8087 NDP).	lecture method/Project-based Learning	10
4	Peripheral Interfacing: 8255 Programmable peripheral interface, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, DMA Controller.	lecture method/Project-based Learning	12
5	80186 Architecture, Enhancements of 80186-80286,Architecture-Real and Virtual addressing modes-80386 Architecture special Registers-Memory Management Memory Paging Mechanism 80486 Architecture Enhancements Cache Memory Techniques Exception Handling, Brief comparative overview of Pentium and Core I version of processors	lecture method/Project-based Learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Write 8085 Assembly Language Program for Addition of two 8-bit numbers and Sum is 8 bit	Experiments	BL3-Apply	2
10	Digital Energy Meter LCD display	PBL	BL6-Create	2
3	Write 8085 Assembly Language Program for Decimal Addition of two 8-bit numbers and Sum is 8 bit.	Experiments	BL3-Apply	2
4	Write 8085 Assembly Language Program for 2’s Complement of an 8-bit numbers.	Experiments	BL5-Evaluate	2
5	Write 8085 Assembly Language Program for finding the smallest number in an array of five different 8 bit numbers.	Experiments	BL5-Evaluate	2
6	To study the Addressing Modes of Intel 8085 Microprocessor.	Experiments	BL2-Understand	2
7	To interface Programmable Peripheral Interface 8255 with 8085 and study its characteristics in Mode0, Mode1 and BSR Mode.	Experiments	BL6-Create	2
8	To interface 8253 Interface Board with 8085 □p and verify the operation of 8253 in six different modes.	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Ray, A.K. & Burchandi, K.M., (2012). Advanced Microprocessors and peripherals Architecture, Programming and interfacing. McGraw Hill (India) Private Limited.
Articles	https://ieeexplore.ieee.org/document/9983881
References Books	Brey, B.B., (2008).The Intel Microprocessors, Architecture , Programming and Interfacing. Pearson Education.
MOOC Courses	https://www.udemy.com/topic/microprocessors/ https://onlinecourses.nptel.ac.in/noc23_ee06/preview
Videos	https://ieeexplore.ieee.org/document/10119125

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	-	-	2	-	-	-	3	-	-	-	-	-
CO3	-	2	1	2	2	-	-	-	-	-	-	-	-	-	-
CO4	-	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Digital Signal Processing
Course Code	ECL0519[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic understanding of Fourier Series, Fourier Transform, Laplace Transform, Z-Transform, Difference & Differential Equations.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic terminologies of Signals, Systems & basic operations etc. **(BL1-Remember)** **CO2-** To understand the concepts of trigonometry, complex algebra, Fourier transform, z-transform to analyze the operations on signals and acquire knowledge about Systems **(BL2-Understand)** **CO3-** To apply the principles of discrete-time signal analysis to perform various signal operations and apply the principles of Fourier Transform analysis to describe the frequency characteristics of discrete-time signals and systems**(BL3-Apply)** **CO4-** To analyze the signals & systems by using computer programming tools to process and visualize signals & Systems **(BL4-Analyze)** **CO5-** To evaluate signal processing strategies at multidisciplinary activities.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction:Introduction to DSP, Discrete-Time Signals, Discrete-Time Systems, Analysis of Discrete-Time Linear Time-Invariant Systems, Discrete Time Systems described by Difference Equation, Implementation of Discrete-Time Systems, Signal Flow Graph representation of Digital Network.	Lecture Method/Video	12
II	Discrete Time Fourier Transform(DTFT): Concept of frequency in discrete and continuous domain and their relationship (radian and radian/sec), freq. response in the discrete domain. Discrete system's response to sinusoidal/complex inputs (DTFT), Representation of LTI systems in complex frequency domain. Z- Transforms: Definition, mapping between s-plane & z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples & exercises, characteristic families of signals along with ROC, convolution, correlation. Discrete Fourier Transforms: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	Lecture Method/Video	12
III	Realization of Digital Systems: Introduction, Direct Form Realization of IIR Systems, Cascade Realization of an IIR System, Parallel Form Realization of an IIR System, Ladder Structures: Continued Fraction Expansion of H (z), Example of Continued Fraction, Realization of a Ladder Structure, Example of a Ladder Realization Fast Fourier Transform Algorithms: Introduction, Decimation-In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency(DIF) Algorithm.	Lecture Method/Video	10
IV	Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows Examples of Filter Designs Using Windows, The Kaiser Window	Lecture Method/Video	10
V	Design of Infinite Impulse Response Digital Filters; Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All-Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters	Lecture Method/Video	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2	PPG Signal processing	PBL	BL5-Evaluate	10
3	To implement a MATLAB program for computation of N point DFT of a given sequence and to plot magnitude and phase spectrum using DFT.	Experiments	BL4-Analyze	2
2	To write a MATLAB program for Auto and cross correlation of two sequences.	Experiments	BL4-Analyze	2
3	Write a MATLAB Program to Obtain Linear Convolution of Two Finite Length Sequence	Experiments	BL5-Evaluate	2
2	To implement a MATLAB program for computation of N point DFT of a given sequence and to plot magnitude and phase spectrum using DFT.	Experiments	BL5-Evaluate	2
4	Audio Signal Processing andanalysis	PBL	BL5-Evaluate	10
4	ECG signal processing and Analysis	PBL	BL5-Evaluate	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. Salivahanan Digital Signal Processing TMH 2. John C Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education'
Articles	Tessier, R., & Burleson, W. (2001). Reconfigurable computing for digital signal processing: A survey. Journal of VLSI signal processing systems for signal, image and video technology, 28, 7-27.
References Books	1. Oppenheim & Schafer Digital Signal Processing PHI 2. Johnny R. Johnson, "Digital Signal Processing", PHI
MOOC Courses	https://nptel.ac.in/courses/117102060
Videos	https://nptel.ac.in/courses/117102060

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	2	-	-	-	3	-	-	2	-	-
CO2	3	1	1	-	-	2	-	-	-	3	-	-	3	-	2
CO3	2	2	1	2	2	-	-	-	-	-	-	-	3	2	2
CO4	3	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	2	1	-	2	-	-	-	-	-	-	-	-	1	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Mini Project
Course Code	ECD0603[P]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Field Projects							
Pre-Requisite/s	Knowledge of Electronics and Communication			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To increase writing skills and knowledge**(BL2-Understand)** **CO2-** To enhance their mental ability**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thought**(BL3-Apply)** **CO4-** To have Dissertation works as skills development in student**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours
1	Communication, Networks Physical Structures; Different Topologies, Categories of Networks: LAN, MAN, WAN, Interconnection of Networks, The internet Protocols and Standards, Standards Organizations, Network Models, Layered Tasks, The OSI Model, Different Layers in OSI Model. TCP / IP protocol suite	lecture method/Group Discussion	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Identification of a problem and formulation of a topic of project/Thesis	PBL	BL2-Understand	20
2	T0 have field work and data collection through a chosen methodology	PBL	BL5-Evaluate	20
3	Dissertation and VIVA-VOCI	PBL	BL6-Create	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	1	-	-	-	-	3	-	-	-	-	2
CO2	1	2	1	2	2	3	-	-	-	3	-	-	-	-	3
CO3	1	2	2	2	2	2	-	-	-	-	-	-	-	-	3
CO4	1	3	2	3	2	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Data Communication
Course Code	ECE0620[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	To Understand the contents and successfully complete this course, a participant must have a basic understanding of device-to-device Communication, Basics concepts of communication, digital electronics and computers.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember the concept of signals, OSI & TCP/IP reference models and discuss the functionalities of each layer in these models**(BL1-Remember)** **CO2-** Understand the flow control and error control mechanisms and apply them using standard data link layer protocols **(BL2-Understand)** **CO3-** To apply simple communication network using different topology **(BL3-Apply)** **CO4-** To analysis the network topology and circuit for communication. **(BL4-Analyze)** **CO5-** Evaluate the transport Layer Protocols (UDP, TCP) and suggest appropriate protocol in reliable/unreliable communication**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Communication, Networks Physical Structures; Different Topologies, Categories of Networks: LAN, MAN, WAN, Interconnection of Networks, The internet Protocols and Standards, Standards Organizations, Network Models, Layered Tasks, The OSI Model, Different Layers in OSI Model. TCP / IP protocol suite	lecture method/Group Discussion	9
2	Switching Techniques add Physical Layer: Circuit Switching, packet Switching and Message Switching Techniques, gateway, Routers, Physical. Layer Transmission Medium. Data Link Layer: Framing BSC, I {DLC, ARQ; Stop and Wait, Sliding Window, Efficiency Error and Correction, Parity Checks- CRC, Checksum (, MAC Sub layer LAN Protocols, ALOHA, Slotted ALOFIA, CSMA, CSMA/ CD, Token Bus, Token Ring.	lecture method/Project based learning	10
3	Need for Network Layer, Logical Addressing-lPv4 Addresses. IPv6 Addresses. Routing-Data Gram and Virtual Circuits, Dijkstra's, Bellman Ford, Distance Vector, Link State and Path Vector	lecture method/Project based learning	10
4	Transport Layer: Connection Oriented Transport Protocol Mechanism, TCP, TSAP, Transport Flow Regulation fragmentation and Reassemble, Session and Transport Interaction, Synchronization Points, Session Protocol Data Unit, Routing Protocol-Unicast, multicast and broadcast, Congestion Control and ATM, Traffic Management-AAL.X.25, Internal Layer	lecture method/Project based learning	11
5	Data Security: Synchronization, Translation, Enoyption, Decryption' Data Compression and Application Layer Protocols like: FTP, Remote Login, Virtual Terminal, and Network Management Protocols.	lecture method/Project based learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the Addressing Modes of Microcontroller 8051.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Forouzan, A. B., (2017). Data Communications and Networking. 5th Edition, Tata McGraw-Hill
Articles	https://ieeexplore.ieee.org/document/10529194
References Books	Alberto, L. G., & Widjaja, I. (2004). Communication Networks Fundamental Concepts and Key architectures, Tata McGraw-Hill Stallings, W., (2007). Data and Computer Communication, Pearson Education Larry L. Peterson, L. L., & Davie, B. S. (2007). Digital and Switching Waveforms, Elsevier
MOOC Courses	https://www.my-mooc.com/en/mooc/data-communications-and-network-services/ https://nptel.ac.in/courses/106105082
Videos	https://ieeexplore.ieee.org/document/10528863

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	3	-	-	3	-	2
CO3	-	1	1	-	-	-	-	-	-	-	-	-	3	-	2
CO4	-	2	1	2	2	-	-	-	-	-	-	-	3	2	3
CO5	-	-	2	-	-	-	-	-	-	-	-	-	1	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Micro Electro Mechanical System (MEMS)
Course Code	ECE0665[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember the operation of micro devices, micro systems and their applications **(BL1-Remember)** **CO2-** Understand the micro electro mechanical system concept **(BL2-Understand)** **CO3-** Apply scaling laws that are used extensively in the conceptual design of micro devices and systems Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process **(BL3-Apply)** **CO4-** Analysis the concept of sensor, actuator and mems device **(BL4-Analyze)** **CO5-** Simplify and Evaluate the design of micro devices, micro systems using the MEMS fabrication process **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Overview of MEMS and Microsystems: MEMS and Microsystem, Typical MEMS and Microsystems Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystems, Miniaturization. Applications and Markets.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Working Principles of Microsystems: Introduction, Microsensors, Micro actuation, MEMS with Micro actuators, Micro accelerometers, Microfluidics. Engineering Science for Microsystems Design and Fabrication: Introduction, Molecular Theory of Matter and Inter-molecular Forces, Plasma Physics, Electrochemistry	ecture Method/ Case Study/ Video/ Group Discussion	12
3	Engineering Mechanics for Microsystems Design: Introduction, Static Bending of Thin Plates, Mechanical Vibration, Thermo mechanics, Fracture Mechanics, Thin Film Mechanics, Overview on Finite Element Stress Analysis	ecture Method/ Case Study/ Video/ Group Discussion	12
4	Scaling Laws in Miniaturization: Introduction, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Fluid Mechanics, Scaling in Heat Transfer	ecture Method/ Case Study/ Video/ Group Discussion	10
5	Overview of Micromanufacturing: Introduction, Bulk Micromanufacturing, Surface Micromachining, The LIGA Process, Summary on Micromanufacturing	ecture Method/ Case Study/ Video/ Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1) Tai-Ran Hsu, MEMS and Micro systems: Design,2nd Ed, Wiley Manufacture and Nanoscale Engineering,
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8875460/
References Books	1) Hans H. Gatzen,Volker Saile, JurgLeuthold,Micro and Nano Fabrication: Tools and Processes,Springer, 2015. 2)Dilip Kumar Bhattacharya, Brajesh Kumar Kaushik,, Microelectromechanical Systems (MEMS), Cengage Learning.
MOOC Courses	https://www-cloudfront-alias.coursera.org/learn/pressure-force-motion-humidity-sensors?specialization=embedding-sensors-motors
Videos	https://nptel.ac.in/courses/117105082

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	-	1	-	1	-
CO2	1	1	2	-	-	-	-	-	-	-	-	1	-	1	-
CO3	2	2	1	-	-	-	-	-	-	-	-	1	-	2	-
CO4	2	1	1	-	-	-	-	-	-	-	-	1	-	2	-
CO5	1	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Deep Learning
Course Code	ECE0666[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Lab only							
Course Category	Bridge Course							
Pre-Requisite/s	Knowledge of machine learning models			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe in-depth about theories, fundamentals, and techniques in Deep learnining**(BL1-Remember)** **CO2-** Identify the on-going research in computer vision and multimedia field.**(BL2-Understand)** **CO3-** Evaluate various deep networks using performance parameters.**(BL3-Apply)** **CO4-** Design and validate deep neural network as per requirements.**(BL4-Analyze)** **CO5-** To evaluate the testing performance of deep Learning models on real world dataset**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG5(Gender equality) SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction History of Deep Learning, McCulloch Pitts Neuron, Multilayer Perceptions (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feed Forward Neural Networks, Back propagation, weight initialization methods, Batch Normalization, Representation Learning, GPU implementation, Decomposition – PCA and SVD. Asynchronous Programming	Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab	10
2	Deep Feed forward Neural Networks, Gradient Descent (GD), Momentum Based GD,Nesterov Accelerated GD, Stochastic GD, AdaGrad, Adam, RMSProp, Auto-encoder,Regularization in auto-encoders, Denoising auto-encoders, Sparse auto-encoders, Contractiveauto-encoders,Variational auto-encoder, Auto-encoders relationship with PCA and SVD,Dataset augmentation. Denoising auto encoders,	Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab	8
3	Introduction to Convolutional neural Networks (CNN) and its architectures, CCNterminologies: ReLu activation function, Stride, padding, pooling, convolutions operations,Convolutional kernels, types of layers: Convolutional, pooling, fully connected, VisualizingCNN, CNN examples: LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, RCNNetc.Deep Dream, Deep Art. Regularization: Dropout, drop Connect, unit pruning, stochasticpooling, artificial data, injecting noise in input, early stopping, Limit Number of parameters,Weight decay etc.	Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab	8

4	Introduction to Deep Recurrent Neural Networks and its architectures, Back propagation Through Time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, Gated Recurrent Units (GRUs), Long Short Term Memory (LSTM), Solving the vanishing gradient problem with LSTMs, Encoding and decoding in RNN network, Attention Mechanism, Attention over images, Hierarchical Attention, Directed Graphical Models. Applications of Deep RNN in Image Processing, Natural Language Processing, Speech recognition, Video Analytics.	Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab	10
5	Introduction to Deep Generative Models, Restricted Boltzmann Machines (RBMs),Gibbs Sampling for training RBMs, Deep belief networks, Markov Networks, MarkovChains, Auto-regressive Models: NADE, MADE, PixelRNN, Generative AdversarialNetworks (GANs), Applications of Deep Learning in Object detection, speech/ imagerecognition, video analysis, NLP, medical science etc.	Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab	10

Part C

CSE0711

Project based Learning Topics

Medical Imaging Diagnosis:

- Design a deep learning model for diagnosing medical conditions (e.g., tumors, fractures) from imaging data such as X-rays, MRIs, or CT scans.
- Consider challenges such as data scarcity, interpretability of results, and ethical implications.

Natural Language Processing (NLP) for Healthcare:

- Develop a deep learning model to analyze medical texts, such as clinical notes or research papers, for tasks like entity recognition, sentiment analysis, or medical question answering.
- Address issues like domain-specific vocabulary, data privacy, and bias in language.

Autonomous Vehicles:

- Create a deep learning system for autonomous driving, focusing on perception tasks like object detection, lane segmentation, and behavior prediction.
- Explore challenges related to real-time processing, robustness to varying environmental conditions, and safety-critical decision-making.

Fraud Detection in Finance:

- Build a deep learning model to detect fraudulent transactions in financial data, such as credit card transactions or insurance claims.
- Consider imbalanced datasets, evolving fraud patterns, and the need for explainability in financial decision-making.

Climate Change Analysis:

- Develop a deep learning solution for analyzing climate data, including tasks like weather prediction, extreme event detection, and climate impact assessment.
- Address challenges such as data heterogeneity, model uncertainty, and ethical implications of environmental decision-making.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press. Chollet, F. (2021). Deep learning with Python. Manning Publications.
Articles	
References Books	Géron, A. (2019). Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems. O'Reilly. Müller, A., & Guido, S. (2016). Introduction to Machine Learning with Python: A Guide for Data Scientists. O'Reilly.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	2	2	-	-	-	2	-	-	1	2	3
CO2	3	1	-	2	2	2	-	-	-	2	-	-	1	2	3
CO3	2	2	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO5	1	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Computer Vision
Course Code	ECE0667[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Open Elective							
Pre-Requisite/s	Basic knowledge of numerical mathematics, probability and statistics, and basics of programming.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various concept of computer vision.**(BL1-Remember)** **CO2-** To understand the fundamental concepts of a image & video processing system.**(BL2-Understand)** **CO3-** Apply the concepts learnt in to design and implement with Matlab for image & video processing operations such as object detection and segmentation.**(BL3-Apply)** **CO4-** Analyze the concept of designing after applying these techniques in various applications.**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	**Image Formation and Imaging Geometry:**Human vision, Computer vision and its applications, Geometric primitives, Two-dimensional and three-dimensional transformations, 3D rotations, 3D to 2D projections, Lighting, Reflectance and Shading, Sampling and aliasing		
II	**Feature Detection and Matching:**Feature detectors and descriptors, feature matching and tracking, Edge detection, three stages of edge detection, gradient operators, Edge Linking, Edge editing and enhancement		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2		PBL		
3		PBL		
4		PBL		
5		PBL		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1.Richard Szeliski Computer Vision: Algorithms and Applications Springer 2.David A. Forsyth Computer Vision: A Modern Approach 2nd Edition, Pearson
Articles	.Multiple View Geometry in Computer Vision: R. Hartley and A. Zisserman, Cambridge University Press. Computer vision: A modern approach: Forsyth and Ponce, Pearson.
References Books	Simon. J D Prince Computer Vision: Models, Learning and Inference Cambridge University Press
MOOC Courses	https://onlinecourses.nptel.ac.in/noc19_cs58/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	-	-	-	-	-	-	-	-	1	2	1
CO2	-	2	1	1	1	-	-	-	-	-	-	-	2	1	2
CO3	-	1	1	-	2	-	-	-	-	-	-	-	2	1	2
CO4	-	1	2	-	-	-	-	-	-	-	-	-	1	2	1
CO5	-	1	1	-	-	-	-	-	-	-	-	-	3	1	2
CO6	-	-	-	1	-	-	-	-	-	-	-	-	1	2	3

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Antenna & Wave Propagation
Course Code	ECL0617[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic concepts on electromagnetic waves and a good hold on communication systems.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get familiarized with various antennas and their parameters.**()** **CO2-** To understand various types of antenna and modes of propagation**(BL2-Understand)** **CO3-** To apply the concept of the principle of pattern multiplication to antenna arrays.**(BL3-Apply)** **CO4-** To analyze various type antennas and various modes of propagation. es of dipol**(BL4-Analyze)** **CO5-** To evaluate the performance of various types of antennas and antenna arrays and their design.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Antennas Basics Introduction, Basic Antenna Parameters: Radiation Pattern, Beam Area or Solid Angle, Radiation Power Density, Radiation Intensity, Antenna Gain, Directivity, Effective Apertures, Resolution, Effective Height, Antenna Bandwidth, Input Impedance, Beam Width, Polarization, Antenna Radiation Efficiency, RADAR Range Equation, Radiation Resistance, Antenna Temperature.	Lecture Method / Video/ Group Discussion / Case study / Simulation	12
2	Point Sources and Arrays Introduction, Point Sources, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources, Principle of Pattern Multiplication, Linear Arrays of n-isotropic Point Sources of Equal Amplitude and Spacing, Broadside Array and End Fire Array, Linear Broadside Array with Non-uniform Amplitude Distributions with Binomial Array and Dolph-Tchebyscheff Arrays.	Lecture Method/ Video/ Group Discussion / Case study / Simulation	10
3	Dipole Antenna Infinitesimal Dipole and Small Dipole: Radiated Fields, Power Density and Radiation Resistance, Field Regions, Directivity, Effective Aperture. Region Separation: Fraunhofer Region, Radiating Near Field Region, Reactive Near Field Region.	Lecture Method / Video/ Group Discussion / Simulation	10
4	Wave Propagation Fundamental Equation for Free Space Propagation, Modes of Propagation: Ground wave Propagation, Sky Wave Propagation, Critical Angle and Critical Frequency, Virtual Height, Skip Distance and LUF, MUF. Space Wave Propagation: LOS, Effective Earth Radius, Effect of Earths Curvature on Tropospheric Propagation.	Lecture Method/ Video/ Group Discussion / Simulation	10
5	Types of Antennas: Yagi-Uda Antenna, Loop Antenna. Helical Antenna, Log-Periodic Antenna, Horn Antenna, Micro Strip Antennas: Rectangular Patch and Circular Patch Antenna. Reflector Antennas Flat Sheet Reflectors, Corner Reflectors, The Parabolic Reflectors.	Lecture Method/ Video/ Group Discussion / Case study / Simulation	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the variation of field strength of radiated with distance from transmitting antenna.	Experiments	BL4-Analyze	2
2	To plot the radiation pattem of an Omni Directional Antenna (Polar plot on log / linear scales & Cartesian plot on log / linear scales)'	Experiments	BL4-Analyze	2
3	To plot radiation pattem of Directional Antenna (Polar plot of Azimuth & Elevation planes on log / linear scales and Cartesian plot on log scales)'	Experiments	BL4-Analyze	2
4	Design and Simulation of a Microstrip Patch Antenna for Wi-Fi Applications	PBL	BL6-Create	30
5	Design and Simulation of a Yagi-Uda Antenna for Broadcasting Systems	PBL	BL6-Create	30
5	Design and Simulation of a Slot Antenna for Mobile Communication	PBL	BL6-Create	30
5	Design and Simulation of a Helical Antenna for Satellite Communication	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	(1) C. A. Balanis Antenna Theory Analysis and Design Wiley India Pvt. Ltd (2) K. D. Prasad, Antennas and Wave Propagation Satya Prakashan.
Articles	(1) Ojha, S.S., Tomar, R.S., Akashe, S., Dhakad, B., Mishra, S., Sharma, M. (2023). Dual-Band Antenna and Low Pass Filter Design for Wireless Energy Harvesting. In: Tomar, R.S., et al. Communication, Networks and Computing. CNC 2022. Communications in Computer and Information Science, vol 1893. Springer, Cham. https://doi.org/10.1007/978-3-031-43140-1_21 (2) Bellofiore, Salvatore, et al. "Smart-antenna systems for mobile communication networks. Part 1. Overview and antenna design." IEEE Antennas and Propagation Magazine 44.3 (2002): 145-154.
References Books	(1) R. E. Collin, Antennas and Wave Propagation, WileyIndia Pvt. Ltd. (2) A. R. Harish and M. Sachidananda Antennas and Wave Propagation Press.Oxford University Press (3) John D Krauss, Ronald J Marhefka and Ahmad S. Khan, Antennas and Wave Propagation TMH, New Delhi
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_ee20/preview
Videos	https://www.youtube.com/watch?v=t-AP3ya8Pao

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	3	2	1	-	-	2	-	-	-	3	-	-	3	-	2
CO3	2	2	1	2	2	-	-	-	-	-	-	-	3	2	2
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	1	2	-	2	-	-	-	-	-	-	-	-	1	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Micro controller & Embedded System
Course Code	ECL0618[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Basic knowledge of Digital System Design Course			**Co-Requisite/s**	Understanding the prerequisites of digital system design			
Course Outcomes & Bloom's Level	**CO1-** To remember the basic terminologies of Microcontrollers, Microprocessors & Embedded Systems**(BL1-Remember)** **CO2-** To understand the important functions, concepts & architecture of microcontrollers. **(BL2-Understand)** **CO3-** To apply the knowledge of microcontroller programming and system to perform a specific task**(BL3-Apply)** **CO4-** To analyse the results by using computer-based tools/kits for engineering applications. Use computer programming tools to process and visualize I/O Peripheral operations.**(BL4-Analyze)** **CO5-** To evaluate the applications of microcontrollers in various fields such as research and industries **(BL5-Evaluate)** **CO6-** To create/provide solutions for real world embedded systems. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Antennas Basics Introduction, Basic Antenna Parameters: Radiation Pattern, Beam Area or Solid Angle, Radiation Power Density, Radiation Intensity, Antenna Gain, Directivity, Effective Apertures, Resolution, Effective Height, Antenna Bandwidth, Input Impedance, Beam Width, Polarization, Antenna Radiation Efficiency, RADAR Range Equation, Radiation Resistance, Antenna Temperature.	Lecture method/Group Discussion	10
2	Introduction to 8051 Assembly Language Programming, Assembling and Running an 8051 Program, The Program Counter and ROM Space in the 8051, 8051 Data Types and Directives, 8051 Flag Bits and the PSW Register, 8051 Register Banks and Stack, 8051 I/O Programming, I/O Bit Manipulation Programming	Lecture method/Project based learning	12
3	Programming the 8051 Timers, Counter Programming, Basics of Serial Communications, 8051 Connection to RS-232, 8051 Serial Port Programming in Assembly Language.	Lecture method/Project based learning	12
4	8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupts Priority in the 8051.	Lecture method/Project based learning	12
5	Interfacing with 8051: Memory Address Decoding 8031 / 51 Interfacing with External ROM, 8051 Data Memory Space, LCD, Keyboard, Parallel and Serial ADC, DAC Interfacing, Stepper Motor and DC Motor. PIC Microcontrollers: PIC Micro-Controllers-Overview; Features, PIC-18 Architecture.	Lecture method/Project based learning	14

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the variation of field strength of radiated with distance from transmitting antenna.	Experiments	BL2-Understand	2
3	To move block of data bytes present in internal memory with starting address 10H and ending address 20H to the destination memory with starting address 30H.	Experiments	BL4-Analyze	2
4	To find the Factorial of a number.	Experiments	BL4-Analyze	2
5	To convert a BCD number into its equivalent ASCII code.	Experiments	BL5-Evaluate	2
6	To generate a Square Wave of 50% Duty Cycle having frequency 5 KHz at port pin P1.0.	Experiments	BL5-Evaluate	2
7	To generate external interrupt INT0 and INT1 by connecting push button switch. Glow LEDs connected at port P1 one by one when interrupt INT0 occurs. LEDs should flash when interrupt INT1 occurs.	Experiments	BL6-Create	2
8	To transmit letter “E” continuously using serial port.	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Mazidi, M.A., & Mazidi, J. G. (2007). The 8051 Microcontroller and Embedded Systems. Pearson Education
Articles	https://ieeexplore.ieee.org/document/10497037
References Books	Ayala, K. (2007). The 8051 Microcontroller. Third Edition, Cengage Learning.
MOOC Courses	https://www.mooc-list.com/tags/microcontrollers#google_vignette https://onlinecourses.nptel.ac.in/noc20_cs14/preview
Videos	https://ieeexplore.ieee.org/document/10493392

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	3	2	1	-	-	2	-	-	-	3	-	-	3	-	2
CO3	2	2	1	2	2	-	-	-	-	-	-	-	3	2	2
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	1	2	-	2	-	-	-	-	-	-	-	-	1	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Cellular & Mobile communication
Course Code	ECL0621[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic Concept of Communication			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of analog & digital communication.**(BL1-Remember)** **CO2-** To understand & gain knowledge on the concept of cellular communication and devices.**(BL2-Understand)** **CO3-** To apply frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, handoff techniques.**(BL3-Apply)** **CO4-** To analyze path loss and interference for wireless telephony and their influences on a mobile communication system's performance.**(BL4-Analyze)** **CO5-** To evaluation of various cellular parameters (gain, fading, propagation losses, etc). **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Evolution of Mobile Radio Communication Fundamentals. Large Scale Path Loss: Propagation Models, Reflection, Diffraction, Scattering, Practical Link Budget Design using Path Loss Model. Small Scale Fading & Multipath Propagation and Measurements, Impulse Response Model and Parameters of Multipath Channels. Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small Scale Fading.	Lecture Method / Video/ Group Discussion / Case study	12
2	Equalizers- Fundamentals of Equalization, Equalizers in Communication Receiver, Linear Equalizer, Algorithms for Adaptive Equalization, Diversity Techniques. Characteristics of Speech Signals, Quantization Techniques, Vocoders, Linear Predictive Coders, Multiple Access Techniques for Wireless Communications.	Lecture Method / Video/ Group Discussion	10
3	Cellular Fundamentals: Cellular Concepts, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Improving Coverage and Capacity in Cellular System.	Lecture Method / Video/ Group Discussion / Case study	10
4	Global System for Mobile (GSM): GSM System for Mobile: Services and Features, System Architecture, Radio Sub system Channel Types, Frame Structure. CDMA Digital Cellular Standard (IS 95), Frequency and Channel Specifications, Forward CDMA Channel and Reverse CDMA Channel.	Lecture Method / Video/ Group Discussion	10
5	Introduction to Mobile Ad-hoc Networks, Mobile Data Networks, Wireless Standards IMT2000, Introduction to 4G,5G and Concept of NGN	Lecture Method / Video/ Group Discussion / Case study	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	(1) T. S. Rappaport, Wireless Communication-Principles and Practice, Pearson Education (2) R. Pandya Mobile and Personal Communication System Prentice Hall of India (3) V.K.Garg, J. E.Wilkes, Principle and Application of GSM Pearson Education, 5th edition
Articles	(1) Novlan, Thomas David, et al. "Analytical evaluation of fractional frequency reuse for OFDMA cellular networks." IEEE Transactions on wireless communications 10.12 (2011): 4294-4305. (2) Gu, Guifen, and Guili Peng. "The survey of GSM wireless communication system." 2010 international conference on computer and information application. IEEE, 2010.
References Books	(1) Lee, Cellular and Mobile Communication, McGraw Hill (2) Faher Kamilo Wireless Digital Communication Prentice Hall of India
MOOC Courses	https://nptel.ac.in/courses/106106167
Videos	https://www.youtube.com/watch?v=HcphXq4TMxk

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	-	-	2	-	-	-	3	-	-	3	-	2
CO3	-	2	1	2	2	-	-	-	-	-	-	-	3	-	2
CO4	-	2	1	3	-	-	-	-	-	-	-	-	3	2	3
CO5	-	-	-	2	-	-	-	-	-	-	-	-	1	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Machine Learning/SWAYAM
Course Code	ECL0662[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of Linear Algebra and Statistics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various concept of machine learning.**(BL1-Remember)** **CO2-** To understand the basic concepts of machine learning, various machine learning models, Performance Evaluation techniques and how to improve the performance of the Machine Learning models.**(BL2-Understand)** **CO3-** To implement various Machine Learning Models.**(BL3-Apply)** **CO4-** To train & test machine Learning Models. **(BL4-Analyze)** **CO5-** To evaluate the performance of Machine Learning Models.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction: Evolution of Mobile Radio Communication Fundamentals. Large Scale Path Loss: Propagation Models, Reflection, Diffraction, Scattering, Practical Link Budget Design using Path Loss Model. Small Scale Fading & Multipath Propagation and Measurements, Impulse Response Model and Parameters of Multipath Channels. Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small Scale Fading.	Lecture Method/Video Clips	12
II	Linear Regression: Linear regression, estimating the coefficients, accessing the accuracy of coefficient estimates, accessing the accuracy of the model, multiple linear regression, qualitative predictors Classification: Logistic regression, estimating regression coefficients, making predictions, multiple logistic regressions, linear discriminant analysis, Bayes' theorem of classification, LDA for p=1, LDA for p>1, quadratic discriminant analysis	Lecture Method/Video Clips/Simulation	10
III	Resampling Methods, Model Selection and Regularization: Cross- validation, leave-one-out crossvalidation, k-fold cross-validation, the bootstrap, subset selection, shrinkage methods, ridge and lasso regression, dimension reduction methods, principal components regression, partial least square. Tree Based Methods: Advantages and disadvantages of trees, regression Trees, classification trees, bagging, random forest, boosting.	Lecture Method/Video clip/Simulation	12
IV	Support Vector Machine: Maximum margin classifier, classification using a separating hyperplane, the maximal margin classifier, support vector classifier, support vector machines, classification with non-linear decision boundaries, support vector machine, one-versus-one classification, one-Versus many classification.	Lecture Method/Video Clips/Simulation	10
V	Unsupervised Learning and Reinforcement Learning: Principle component analysis, what are principal components, clustering methods, k- means clustering, hierarchical clustering, Independent component analysis,	Lecture Method/Video	12

	latent semantic indexing, Markov Models, Hidden Markov Models, Reinforcement Learning.		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1		Experiments	BL5-Evaluate	2
1	Write a program to Pre-processing of data for.csv file.	Experiments	BL4-Analyze	2
2	Write a program to implement Logistics Algorithm for .csv file.	Experiments	BL5-Evaluate	2
3	Write a program to implement Decision Tree Algorithm for .csv file.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems
Articles	B. D. Shivahare, S. Suman, S. S. N. Challapalli, P. Kaushik, A. D. Gupta and V. Bibhu, "Survey Paper: Comparative Study of Machine Learning Techniques and its Recent Applications," 2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM), Gautam Buddha Nagar, India, 2022, pp. 449-454, doi: 10.1109/ICIPTM54933.2022.9754206.
References Books	D. E. Goldberg Genetic Algorithms in Search, Optimization & Machine Learning Pearson
MOOC Courses	https://onlinecourses.nptel.ac.in/noc23_cs18/preview
Videos	https://www.youtube.com/watch?v=fC7V8QsPBec

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	3	-	-	-	-	-	-	2	-	1	2
CO3	1	-	1	-	1	-	-	-	-	-	-	-	-	2	2
CO4	2	2	-	-	1	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	-	-	-	-	-	-	1	-	-	-	1	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Major Project-I
Course Code	ECD0704[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To increase writing skills and knowledge**(BL1-Remember)** **CO2-** To enhance their mental ability**(BL2-Understand)** **CO3-** To inculcate the ability to express innovative opinion and thought**(BL3-Apply)** **CO4-** To have Dissertation works as skills development in student **(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	Identification of a problem and formulation of a topic of project/Thesis	PBL	BL2-Understand	15
Module-2	T0 have field work and data collection through a chosen methodology	PBL	BL3-Apply	15
Module-3	Dissertation and VIVA-VOCI	PBL	BL4-Analyze	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	
Articles	https://www.ietlucknow.ac.in/sites/default/files/mag/Projects%20of%20Electronics%20and%20communication%20deptt._1.pdf
References Books	
MOOC Courses	https://www.coursera.org/learn/major-engineering-project-performance
Videos	https://nptel.ac.in/courses/110104073

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	1	-	-	1	2	3	-	-	-	3	1	-
CO2	-	3	2	3	-	3	1	-	3	3	-	2	-	2	2
CO3	-	-	3	3	3	-	-	3	3	3	1	2	-	3	2
CO4	-	-	-	-	-	-	3	3	3	3	2	3	-	3	3
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Nanoelectronics
Course Code	ECE0736 [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Basic knowledge of electronics and material science			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Know the principles behind Nanoscience engineering and Nanoelectronics.**(BL1-Remember)** **CO2-** To Understand the effect of particles size on mechanical, thermal, optical and electrical properties of nanomaterials.**(BL2-Understand)** **CO3-** Apply the knowledge to prepare and characterize nanomaterials.**(BL3-Apply)** **CO4-** Analyse the process flow required to fabricate state-of-the-art transistor technology.**(BL4-Analyze)** **CO5-** To evaluate the stability and characteristic of various types of nanoelectronics devices**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Overview of nanoscience and engineering. Development milestones in microfabrication and electronic industry. Moore‘s law and continued miniaturization, Classification of Nanostructures, Electronic properties of atoms and solids: Isolated atom, Bonding between atoms, Giant molecular solids, Free electron models and energy bands, crystalline solids, Periodicity of crystal lattices, Electronic conduction, effects of nanometerlength scale, Fabrication methods: Top down processes, Bottom up processes methods for templating the growth of nanomaterials, ordering of nanosystems	Lecture Method/ / Video/ Group Discussion / Case study	12
2	Characterization: Classification, Microscopic techniques, Field ion microscopy, scanning probe techniques, diffraction techniques: bulk and surface diffraction techniques (Text 1). Inorganic semiconductor nanostructures: overview of semiconductor physics. Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, super-lattices, band offsets, electronic density of states	Lecture Method/ / Video/ Group Discussion / Case study	10
3	Fabrication techniques: requirements of ideal semiconductor, epitaxial growth of quantum wells, lithography and etching, cleaved-edge over growth, growth of vicinal substrates, strain induced dots and wires, electrostatically induced dots and wires, Quantum well width fluctuations, thermally annealed quantum wells, semiconductor nanocrystals, collidal quantum dots, self-assembly techniques.(Text 1). Physical processes: modulation doping, quantum hall effect, resonant tunneling, charging effects, ballistic carrier transport, Inter band absorption, intraband absorption, Light emission processes, phonon bottleneck, quantum confined stark effect, nonlinear effects, coherence and dephasing, characterization of semiconductor nanostructures: optical electrical and structural	Lecture Method/ / Video/ Group Discussion / Case study	10
4	Carbon Nanostructures: Carbon molecules, Carbon Clusters, Carbon Nanotubes, application of Carbon Nanotubes.	Lecture Method/ / Video/ Group Discussion / Case study	10
5	Nanosensors: Introduction, What is Sensor and Nanosensors?, What makes them Possible?, Order From Chaos, Characterization, Perception, Nanosensors Based On Quantum Size Effects, Electrochemical Sensors, Sensors Based On Physical Properties, Nanobiosensors, Smart dust Sensor for the future. Applications: Injection lasers, quantum cascade lasers, single-photon sources, biological tagging, optical memories, coulomb blockade devices, photonic structures, QWIP‘s, NEMS, MEMS	Lecture Method/ / Video/ Group Discussion / Case study	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Ed Robert Kelsall, Ian Hamley, Mark Geoghegan, —Nanoscale Science and Technologyǁ, John Wiley, 2007. 2. Charles P Poole, Jr, Frank J Owens, —Introduction to Nanotechnologyǁ, John Wiley, Copyright 2006, Reprint 2011. 3. T Pradeep, —Nano: The essentials-Understanding Nanoscience and Nanotechnologyǁ, TMH.
Articles	Chau, Robert, et al. "Integrated nanoelectronics for the future." Nature materials 6.11 (2007): 810-812.
References Books	Ed William A Goddard III, Donald W Brenner, Sergey E. Lyshevski, Gerald J Iafrate, —Hand Book of Nanoscience Engineering and Technologyǁ, CRC press, 2003.
MOOC Courses	https://archive.nptel.ac.in/courses/117/108/117108047/
Videos	https://www.youtube.com/watch?v=wdNFCWLuC10&t=2s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	3	-	2	-	-	-	3	-	-	1	-	2
CO3	-	2	1	2	2	-	-	-	-	-	-	-	2	-	2
CO4	-	2	1	-	-	-	-	-	-	-	-	-	1	3	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Wireless Ad hoc Networks
Course Code	ECE0752[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Basic knowledge of communication			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of communication. **(BL1-Remember)** **CO2-** To understand the under lying technologies of wireless networks.**(BL2-Understand)** **CO3-** Apply to select the appropriate protocol for various applications**(BL3-Apply)** **CO4-** Analyze energy management in ad-hoc wireless networks.**(BL4-Analyze)** **CO5-** Evaluate the existing network and improve its quality of service and deficiencies in existing wireless protocols for MAC layer and Network layer, and then go onto formulate new and better protocols.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Wireless Ad Hoc Networks Introduction to various Wireless Networks and Standards (802..11 / 802.15.4), Cellular and Wireless Ad Hoc Networks, Architecture of Wireless Ad Hoc Network, Issues and Challenges in Wireless Ad Hoc Networks, Applications of Wireless Ad Hoc Networks	Lecture Method / Video/ Group Discussion / Case study / Simulation	12
2	MAC Protocol for Wireless Ad hoc Networks Introduction to Medium Access Control (MAC) Protocols, Issues in Designing a MAC Protocol for Wireless Ad Hoc Networks, Performance Parameters of Wireless Ad Hoc Networks, Classification of MAC Protocols for Wireless Ad Hoc Networks.	Lecture Method / Video/ Group Discussion / Case study / Simulation	10
3	Routing Protocol for Wireless Ad hoc Networks Introduction, Issues in Designing a Routing Protocol for Wireless Ad Hoc Networks, Classification of Routing Protocols, Destination Sequenced Distance Vector (DSDV) Routing Protocol, Dynamic Source Routing (DSR) Protocol, Ad Hoc Distance Vector (AODV) Routing Protocol, Zone Routing Protocol (ZRP), Multicasting Routing in Wireless Ad Hoc Networks.	Lecture Method / Video/ Group Discussion / Case study / Simulation	10
4	Wireless Sensor Networks Introduction to Wireless Sensor Networks, Comparison with Wireless Ad Hoc Networks, Architecture of Wireless Sensor Network, Issues and Challenges of Wireless Sensor Networks, Design Requirements of Wireless Sensor Networks, Performance Parameters of Wireless Sensor Networks, Applications of Wireless Sensor Networks	Lecture Method / Video/ Group Discussion / Simulation	10
5	Hardware Components and Protocols for Wireless Sensor Networks Introduction to Wireless Sensor Nodes, Architecture of a Basic Sensor Node, Hardware Components of Wireless Sensor Networks, Different Sensor Nodes, MAC Protocols and Routing Protocols for Wireless Sensor Networks, Various Network Simulators for Wireless Sensor Networks.	Lecture Method / Video/ Group Discussion / Case study / Simulation	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	(1) C Siva Ram Murty and B S Manoj, Wireless Communication-Principles and Practice, Pearson Education (2) Mohamed Illayas, Handbook of Ad Hoc Wireless Network, CRC Press (3) Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons, Wireless Sensor Networks Technology, Protocols, and Applications, John Wiley & Sons.
Articles	(1) Sharma, Bharati, Mayank Satya Prakash Sharma, and Ranjeet Singh Tomar. "A survey: Issues and challenges of vehicular ad hoc networks (VANETs)." Proceedings of International Conference on Sustainable Computing in Science, Technology and Management (SUSCOM), Amity University Rajasthan, Jaipur-India. 2019. (2) Sharma, Bharati, Mayank Satya Prakash Sharma, and Ranjeet Singh Tomar. "A survey: Issues and challenges of vehicular ad hoc networks (VANETs)." Proceedings of International Conference on Sustainable Computing in Science, Technology and Management (SUSCOM), Amity University Rajasthan, Jaipur-India. 2019.
References Books	(1) Mohamed Illayas and Imad Mahgoub, Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems, CRC Press.
MOOC Courses	https://nptel.ac.in/courses/106105160
Videos	https://www.youtube.com/watch?v=tlqkVh2AmuI

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	-	2	-	-	-	-	-	3	-	2	-	-	-
CO2	-	2	-	3	-	-	-	-	-	3	-	2	-	-	-
CO3	-	3	-	3	-	2	-	-	-	1	1	2	-	-	-
CO4	-	2	-	1	2	-	-	-	-	-	1	2	-	-	-
CO5	-	1	-	-	2	-	-	-	-	-	-	1	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	IoT Data Analytics
Course Code	ECE0763 [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Open Elective							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Be able to understand the concepts and applications of IoT, and understand the core problems (e.g., networking, sensing) for building IoT systems **(BL1-Remember)** **CO2-** Be able to understand and manage the knowledge of models and principles and compare the performance of key techniques for IoT data analytics**(BL2-Understand)** **CO3-** Apply statistical methods to develop and evaluate the models. **(BL3-Apply)** **CO4-** Analysis the data collected from different applications. **(BL4-Analyze)** **CO5-** Evaluate statistical methods in EDA. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
I	INTRODUCTION : Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues	Lecture Method/Video Clips/Group Discussion	10
II	DATA COLLECTION AND PRE-PROCESSING: Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.	Lecture Method/Video	10
III	EXPLORATORY DATA ANALYTICS: Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.	Lecture Method/Video	10
IV	MODEL DEVELOPMENT: Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.	Lecture Method/Video Clips/Group Discussion	10
V	MODEL EVALUATION: Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.	Lecture Method/Video	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2-4	Real time collected Data preprocessing	PBL	BL4-Analyze	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Jojo Moolayil Smarter Decisions: The Intersection of IoT and Data Science SAE Publication Iqbal Hussein Electric and Hybrid Vehicles: Design Fundamentals CRC Press, 2003
Articles	Al-Ali, A. R., et al. "Role of IoT technologies in big data management systems: A review and Smart Grid case study." Pervasive and Mobile Computing (2024): 101905.
References Books	Cathy O'Neil and Rachel Schutt Doing Data Science O'Reilly , 2015 David Dietrich, Barry Heller, Beibei Yang Toney Weir Data Science and Big data Analytics EMC 2013
MOOC Courses	https://www.udemy.com/course/iot-data-analytics/?couponCode=24T3MT53024
Videos	https://www.youtube.com/watch?v=JIi_jUvVAHw

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	1	-	-	-	-	-	-	-	1	-	1
CO2	2	-	1	1	-	-	-	-	-	-	-	-	-	1	-
CO3	-	2	-	2	-	-	-	-	-	-	-	-	1	-	1
CO4	1	2	-	-	1	-	-	-	-	-	-	-	-	2	-
CO5	1	-	1	-	2	-	-	-	-	-	-	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Cloud Computing
Course Code	ECE0764[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To provide students with the fundamentals and essentials of Cloud Computing.**(BL1-Remember)** **CO2-** To provide sound foundation to compare the advantages and disadvantages of various cloud computing platforms to start using cloud computing services in their real life.**(BL2-Understand)** **CO3-** To apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost. Identify resource management fundamentals**(BL3-Apply)** **CO4-** Program data intensive parallel applications in the cloud. i. e. Analyze the performance, scalability, and availability of the underlying cloud technologies and software**(BL4-Analyze)** **CO5-** Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google App Engine.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to Cloud Computing: Overview of Computing, Cloud computing (NIST Model), Properties, Characteristics and disadvantages of Cloud Computing, Role of Open Standards	Lecture Method/Video Clips/Group Discussion	10
II	Cloud Computing Architecture: Cloud Computing Stack, Service Models: Infrastructure aa a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Cloud Computing Deployment models: Public, Private, Hybrid	Lecture Method/Video Clips/Group Discussion	10
III	Service Management in Cloud Computing: Service Level Agreement (SLA), Cloud Economics, Resource Management in Cloud Computing	Lecture Method/Video Clips/Group Discussion	10
IV	Data Management in Cloud Computing: Looking at Data, Scalability and Cloud Services, Database and Data Stores in Cloud, Large Scale Data Processing	Lecture Method/Video Clips/Group Discussion	10
V	Cloud Security: Infrastructure Security, Data Security and Storage, Identity and Access Management, Access Control, Trust, Reputation, Risk Research Trends in Cloud Computing, Fog Computing	Lecture Method/Video Clips/Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms Wiley,2011
Articles	Dang, L.M.; Piran, M.J.; Han, D.; Min, K.; Moon, H. A Survey on Internet of Things and Cloud Computing for Healthcare. Electronics 2019, 8, 768. https://doi.org/10.3390/electronics8070768
References Books	Barrie Sosinsky, Cloud Computing Bible, John Wiley & Sons, 2010
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_cs14/preview
Videos	https://www.coursera.org/browse/information-technology/cloud-computing

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	2	-	-	-	-	-	-	-	2	-	-
CO2	-	2	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	2	1	-	3	-	-	-	-	-	-	-	-	2	-	-
CO4	-	2	1	3	1	-	-	-	-	-	-	-	-	3	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Microwave Engineering
Course Code	ECL0723[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic knowledge of analog & digital communication and concept of EMT			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concept of electromagnetic theory.**(BL1-Remember)** **CO2-** To understand basic concepts and applications of microwave systems.**(BL2-Understand)** **CO3-** To solve problems related to microwave transmission lines, microwave waveguide.**(BL3-Apply)** **CO4-** To analyze, test and use various passive microwave components for different applications.**(BL4-Analyze)** **CO5-** To evaluation of various characteristic and microwave parameters like VSWR, impedance, power, wavelength etc. of microwave devices.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to waveguide: General Representation of EM Field in terms of TEM, TE and TM Components, Uniform Guide Structures, Rectangular Waveguides, Circular Waveguides, Solution in terms of Various Modes, Degenerate Modes, Dominant Modes, Power Transmission and Power Loss, Excitation of Waveguides, Introduction to Micro strip Line.	Lecture Method / Video/ Group Discussion / Case study / Simulation	12
2	Microwave Networks and Components: Transmission Line Ports of Microwave Network, Scattering Matrix, Properties of Scattering Matrix of Reciprocal, Non Reciprocal, Loss less, Passive Networks, Examples of Two, Three and Four Port Networks, Waveguide Components; Attenuator, Phase Shifters and Couplers, Principle of Operation and Properties of E-plane, H-plane, Tee Junctions of Waveguides, Hybrid T, Multi-hole Directional Coupler, Directional Couplers, Microwave Resonators- Rectangular.	Lecture Method / Video/ Group Discussion / Simulation	10
3	Microwave Solid State Devices and Application: PIN Diodes, Properties and Applications, Microwave Detector Diodes, Detection Characteristics, Varactor Diodes, Parametric Amplifier Fundamentals, Manley-Rowe Power Relation, Amplifiers, Transferred Electron Devices, Gunn Effect, Various Modes of Operation of Gunn Oscillator, IMPATT, TRAPATT and BARITT.	Lecture Method / Video/ Group Discussion / Simulation	10
4	Microwave Vacuum Tube Devices: High Frequency Limitations, Principle of Operation, Performance and Application of; Klystron, Multi Cavity Klystron, Reflex Klystron, Principle of Operation, Performance and Applications of Magnetron and TWT, Slow Wave Structures, Approximate Gain Relationship in Forward Wave TWT.	Lecture Method / Video/ Group Discussion	10
5	Microwave Measurements: Measurement of Power, High, Medium and Low-Level Power Measurement Techniques, Wavelength, Impedance, Attenuation, Slotted Line Arrangement and VSWR Meter, Microwave Bench Components and Source Modulation.	Lecture Method / Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	1. To Study the characteristics of the reflex Klystron tube and to determine its electronic tuning range.	Experiments	BL5-Evaluate	2
2	2. To determine the frequency and wave length in a rectangular waveguide working in TE10 mode.	Experiments	BL5-Evaluate	2
3	3. To determine the standing - wave ratio and reflection coefficient.	PBL	BL5-Evaluate	2
3	4. To study the attenuator (fixed and variable type).	Experiments	BL5-Evaluate	2
4	5. To study the function of multi hole directional coupler by measuring the following parameters 1. Mainline and auxiliary-line VSWR 2. The coupling factor and directivity of the coupler.	Experiments	BL5-Evaluate	2
5	6. To study the isolator and circulators.	Experiments	BL5-Evaluate	2
5	Design of Novel Multi-Band Antenna for Satellite Applications	PBL	BL6-Create	30
4	Design of Compact Size Tri-Band Stacked Patch Antenna for GPS and IRNSS Applications	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	(1) D.M. Pozar, Microwave Engineering, John Wiley & Sons
Articles	(1) Banik, S. B. A. S. G. S., Sanghamitra Bandyopadhyay, and S. Ganguly. "Bioeffects of microwave—a brief review." Bioresource technology 87.2 (2003): 155-159. (2) Seeds, Alwyn J., and Keith J. Williams. "Microwave photonics." Journal of lightwave technology 24.12 (2006): 4628-4641.
References Books	(1) Samuel Y Liao, Samuel Y Liao, Prentice Hall of India (2) Das Microwave EngineeringTMH (3) Collins Foundations of Microwave Engineering Wiley India (4) Rao Microwave Engineering PHI Learning
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ee103/preview
Videos	https://www.youtube.com/watch?v=NW1NXoM4q5c

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	-	-	2	-	-	-	3	-	-	1	-	2
CO3	1	1	1	3	2	-	-	-	-	-	-	-	2	2	2
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	1	1	-	2	-	-	-	-	-	-	-	-	2	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	VLSI Technology
Course Code	ECL0733[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To understand the aspects of semiconductor device fabrication, such as: oxidation, photolithography, wet etching, metal deposition, ion implantation and annealing.**(BL2-Understand)** **CO2-** To apply VLSI design circuits by keeping technological process constraints in mind**(BL3-Apply)** **CO3-** To specify NMOS and CMOS design rules corresponding to 180nm, 90nm, 45 nm technologies **(BL4-Analyze)** **CO4-** To evaluate the Plan a sequence of processing steps to fabricate a solid state device to meet geometric, electrical, and/or processing parameters.**(BL5-Evaluate)** **CO5-** To create and design various hardware oriented circuits and Layout of CMOS Integrated**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Overview of Semiconductor Processing: Electronic grade silicon preparation, Crystal growth, Czochralski process, wafer-preparation, slicing, Marking, polishing, evaluation. Basic wafer fabrication operations, wafer sort, clean room construction and maintenance.	lecture method/Group Discussion	9
2	Oxidation: Objectives, Silicon dioxide layer uses, Thermal oxidation mechanism and methods, Kinetics of oxidation, Deal Grove model, Oxidation processes, post oxidation evaluation.	lecture method/Project based learning	10
3	Basic Patterning: Overview of Photo-masking process, Ten step process, Basic photoresist chemistry, comparison of positive and negative photoresists, X-ray lithography, Electron beam exposure system.	lecture method/Project based learning	10
4	Doping: Definition of a junction, Formation of doped region and junction by diffusion, diffusion process steps, deposition, drive-in-oxidation, Ion implantation- concept and system, implant damage, Comparison of diffusion and ion-implantation techniques.	lecture method/Project based learning	10
5	Deposition: Chemical Vapor Deposition (CVD), CVD Process steps, CVD System types, Low- Pressure CVD (LPCVD), Plasma-enhanced CVD (PECVD), Vapor Phase Epitaxy (VPE), Molecular Beam Epitaxy (MBE), Metalorganic CVD (MOCVD), SOS (Silicon on Sapphire) and SOI (silicon on Insulator). Brief Introduction to Metallization.	lecture method/Project based learning	11

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Sze, S.M., (2011). VLSI Technology, Second Edition, Tata McGraw Hill Publishing Co. Ltd.
Articles	https://ieeexplore.ieee.org/document/10528351
References Books	Gandhi, S. K., (1994). VLSI Fabrications Principles, Wiley Publishing Co. Ltd. Runyan, W. R., (2008). Silicon Semiconductor Technology, Tata McGraw Hill Publishing Co. Ltd. Zant, P. V., (2018). Microchip Fabrication, Tata McGraw Hill Publishing Co. Ltd.
MOOC Courses	https://nielit.gov.in/calicut/calicut/content/vlsi-beginners https://www.mooc-list.com/tags/vlsi#google_vignette
Videos	https://ieeexplore.ieee.org/document/10510835

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	-	-	2	-	-	-	3	-	-	3	-	2
CO3	-	2	1	2	2	-	-	-	-	-	-	-	3	-	2
CO4	-	2	1	3	-	-	-	-	-	-	-	-	3	2	3
CO5	-	-	-	2	-	-	-	-	-	-	-	-	1	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Web Technologies
Course Code	ECO0701B [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To teach students the basics of server side scripting using PHP**(BL1-Remember)** **CO2-** To explain web application development procedures**(BL2-Understand)** **CO3-** To impart servlet technology for writing business logic**(BL3-Apply)** **CO4-** . To facilitate students to connect to databases using JDBC**(BL4-Analyze)** **CO5-** To evalute various concepts of application development using JSP**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies. File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Simple AJAX applications.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML Parsing XML Data - DOM and SAX parsers in java	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, Reading initialization parameters, Handling Http Request & Responses, Using Cookies and sessions, connecting to a database using JDBC	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session tracking, connecting to database in JSP	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1) Web Technologies, Uttam K Roy, Oxford University Press 2) The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill
Articles	https://ieeexplore.ieee.org/document/1232045
References Books	1)Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech 2)Java Server Pages – Hans Bergsten, SPD O'Reilly
MOOC Courses	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
Videos	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO3	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO4	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO5	2	3	2	3	3	-	-	-	-	-	-	3	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Intellectual Property Rights
Course Code	ECO0701C[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Open Elective							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To introduce fundamental aspects of intellectual property rights to students who are going to play a major role in development and management of innovative projects in industries**(BL1-Remember)** **CO2-** To disseminate knowledge on patents, patent regime in India and abroad and registration aspects **(BL2-Understand)** **CO3-** To apply the concept of IPR**(BL3-Apply)** **CO4-** To analyze IPR. To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects **(BL4-Analyze)** **CO5-** Evaluating theory of probability and statistics related to IPR**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and license of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non-Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1) Nithyananda, K V. (2019). Intellectual Property Rights. India, IN: Cengage Learning India Private Limited.
Articles	http://op.niscair.res.in/index.php/JIPR
References Books	1) Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni.
MOOC Courses	https://www.udemy.com/course/certificate-course-ipr/?--=&gad_source=1&gclid=Cj0KCQjw6PGxBhCVARIsAIumnWYAVsP2ByJ2PaFsYr6Xs5JKQfqgImfwumwXAL_wj2tvGaXZiybXm1YaAsoWEALw_wcB&
Videos	https://archive.nptel.ac.in/courses/110/105/110105139/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	2	-	3	-	3	-	-	-	-	1
CO2	-	2	2	-	1	2	-	3	-	3	-	-	-	-	1
CO3	2	2	1	2	-	-	-	-	-	-	-	-	1	-	3
CO4	2	3	1	2	-	-	-	-	-	-	-	-	2	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Evaluation of Industrial Training-III
Course Code	ECP0704[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Internships							
Pre-Requisite/s	Basic theoretical knowledge of electronics and communication.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Apply theoretical knowledge from coursework to solve real-world industry problems. (e.g., utilize marketing principles to develop a campaign for a local business)**(BL1-Remember)** **CO2-** Demonstrate proficiency in industry-standard tools and technologies relevant to the internship field. (e.g., use design software to create graphics for a company website)**(BL2-Understand)** **CO3-** Analyze and interpret data collected during the internship experience. (e.g., analyze customer feedback to improve product design)**(BL3-Apply)** **CO4-** Enhance critical thinking skills by analyzing and evaluating the outcomes of assigned projects or tasks.**(BL4-Analyze)** **CO5-** Compile a comprehensive report documenting the learning experiences, challenges, and achievements during the internship period.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Learning of how to do team work, collaboration with others and learning of insight regarding the internal working atmosphere of companies.	Internships	BL2-Understand	15
2	Learning of how to use the theoretical knowledge for solving the industry problem.	Internships	BL3-Apply	15
3	Development of communication skill, managerial skill and exposure to current work practices as opposed to possibly theoretical knowledge being taught at college.	Internships	BL4-Analyze	15
4	Adapting to evolving business cultures, new methods and technologies, services, technical interface.	Internships	BL4-Analyze	15
5	Learning of how to make industrial training reports and presentation of the reports and training.	Internships	BL5-Evaluate	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	-	-	-	-	-	2	-	-	-	-	2
CO2	1	2	3	3	2	-	-	-	-	2	-	-	-	-	3
CO3	1	2	2	2	2	-	-	-	-	-	-	-	-	-	3
CO4	1	2	2	2	2	-	-	-	-	-	-	-	-	-	2
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Major Project-II
Course Code	ECD0805[P]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To increase writing skills and knowledge**(BL2-Understand)** **CO2-** To enhance their mental ability**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thought**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in student **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	Identification of a problem and formulation of a topic of project/Thesis	PBL	BL6-Create	15
Module-2	T0 have field work and data collection through a chosen methodology	PBL	BL6-Create	15
Module-3	Dissertation and VIVA-VOCI	PBL	BL6-Create	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1)Electronics for you https://www.electronicsforu.com/category/electronics-projects/hardware-diy
Articles	https://www.ietlucknow.ac.in/sites/default/files/mag/Projects%20of%20Electronics%20and%20communication%20deptt._1.pdf
References Books	1)Electronics for you https://www.electronicsforu.com/category/electronics-projects/hardware-diy
MOOC Courses	https://www.coursera.org/learn/major-engineering-project-performance
Videos	https://nptel.ac.in/courses/110104073

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	1	-	-	1	2	3	-	-	-	3	1	-
CO2	-	3	2	3	-	3	1	-	3	3	-	2	-	2	2
CO3	-	-	3	3	3	-	-	3	3	3	1	2	-	3	2
CO4	-	-	-	-	-	-	3	3	3	3	2	3	-	3	3
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Industrial Electronics
Course Code	ECE0829[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Learn about the latest electronic devices available in industry**(BL1-Remember)** **CO2-** Be able to understand the functions of power electronics circuit**(BL2-Understand)** **CO3-** Apply critical thinking in solving industrial electronic problems **(BL3-Apply)** **CO4-** Analyze the characteristics of MOSFET, IGBT and UJT**(BL4-Analyze)** **CO5-** To evaluate the performance of various types of circuit**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Power Supplies Power supply, rectifiers (half wave, full wave), performance parameters of power supplies, filters (capacitor, inductor, inductor-capacitor, pi filter), bleeder resistor, voltage multipliers . Regulated power supplies (series and shunt voltage regulators, fixed and adjustable voltage regulators, current regulator), switched regulator (SMPS), comparison of linear and switched power supply, switch mode converter (flyback, buck, boost, buk-boost, cuk converters)	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Thyristors Silicon controlled rectifies (SCR), constructional features, principle of operation, SCR terminology, turn-on methods, turn-off methods, triggereing methods of SCR circuits, types of commutation, comparison of thyristors and transistors, thermal characteristics of SCR, causes of damage to SCR, SCR overvoltage protection circuit, seies and parrel operation of sCRs, Line commutated converters (half wave rectifier with inductive and resistive load, single phase and three phase full wave rectifiers)	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Other members of SCR family Triacs, Diacs, Quadracs, recovery characteristics, fast recovery diodes, power diodes, power transistor, power MOSFET, Insulated gate bipolar transistor (IGBT), loss of power in semiconductor devices, comparison between power MOSFET, power transistor and power IGBT	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Applications of OP-AMP Basics of OP-AMP, relaxation oscillator, window comparator, Op-comp as rectangular to triangular pulse converter and vice- versa, Wien bridge oscillator, function generator, frequency response of OP-AMP, simplified circuit diagram of OP-AMP, power supplies using OP-AMP, filters (low-pass, high pass) using OP-AMP.	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	Functions, applications, advantages and disadvantages of PLC over conventional relay controllers, comparison of PLC with process control computer system, factors to be considered in selecting PLC, functional block diagram of PLC, microprocessor in PLC, memory, input and output modules (interface cards), sequence of operations in a PLC, status of PLC, event driven device, ladder logic language, simple process control applications of PLC, Programming examples	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	Identification of a problem and formulation of a topic of project/Thesis	PBL	BL6-Create	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1) Rehg, James, A., Sartori, Glenn. Industrial Electronics. 5th ed. Upper Saddle River: Prentice Hall. 2006
Articles	https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=63
References Books	1) Maloney, Timothy. Modern Industrial Electronics, 5th ed.Upper Saddle River: Prentice Hall. 2004
MOOC Courses	https://www.coursera.org/specializations/power-electronics
Videos	https://archive.nptel.ac.in/courses/108/102/108102145/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	3	3	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO3	2	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO4	2	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO5	2	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Digital Image & Video Processing
Course Code	ECE0839[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To Remember various concept of Image and Video **(BL1-Remember)** **CO2-** Understand the Basic concept of Image processing **(BL3-Apply)** **CO3-** Apply the concept of Digital Image Processing **(BL3-Apply)** **CO4-** Analyze the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.**(BL4-Analyze)** **CO5-** Implement and evaluate the image enhancement, edge detection and noise analysis **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
1	Digital Image Fundamentals and Transforms: Elements of visual perception - Image sampling and quantization Basic relationship between pixels -Basic geometric transformations, Introduction to Fourier Transform and DFT Properties of 2D Fourier Transform FFT - Separable Image Transforms -Walsh – Hadamard - Discrete Cosine Transform, Haar , Slant - Karhunen - Loeve transforms	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Image Enhancement Techniques: Spatial Domain methods: Basic greylevel transformation-Histogram equalization - Image subtraction-image averaging -spatial filtering: Smoothing, sharpening filter, Laplacian filters- Frequency domain filters: Smoothing-Sharpening filters - Homomorphism filtering	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Image Restoration Model of image degradation / restoration Noise models-inverse filtering, least mean square filtering-constrained, mean square filtering , Blind image restoration-Pseudo inverse Singular value decomposition	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Image Compression: Lossless compression, Variable length coding- LZW coding Bit plane coding predictive coding-DPCM Lossy Compression, Transform coding Wavelet coding basics of image compression standards: JPEG., MPEG. Basic of Vector quantization Image Segmentation and Representation: Edge detection Thresholding -Region Based Segmentation-Boundary representation chair codes_ Polygonal approximation Boundary segments boundary descriptors Simple descriptors-Fourier descriptors regional descriptors-Simple descriptors- Texture	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations 2-D Motion Estimation: Optical flow, general methodologies, pixel-based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit:2	Image fusion and its separation finger print application on Matlab	PBL	BL4-Analyze	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1) Digital Signal, Image and Video Processing for Emerging by Byung-Gyu Kim 2)Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, ", 2nd edition, PHI/Pearson Education, 2002
Articles	Digital-Image-Separation-Algorithm-Based-on-Joint-PDF-of-Mixed-Images.pd https://www.researchgate.net/publication/295179793_Digital_Image_Separation_Algorithm_Based_on_Joint_PDF_of_Mixed_Images/fulltext/56c8e12 Image-Separation-Algorithm-Based-on-Joint-PDF-of-Mixed-Images.pdf
References Books	1) M. Tekalp ,"Digital video Processing", Prentice Hall International 2) A.K.Jain, Fundamentals of Digital Image Processing",1st edition, Prentice Hall India, 1988
MOOC Courses	https://www.coursera.org/courses?query=image%20processing
Videos	https://archive.nptel.ac.in/courses/117/105/117105135/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	2	-	-	-	3	-	-	-	-	1
CO2	-	2	1	-	1	2	-	-	-	3	-	-	-	-	3
CO3	3	2	1	2	-	-	-	-	-	-	-	-	-	-	3
CO4	3	3	1	2	-	-	-	-	-	-	-	-	-	-	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Soft Computing
Course Code	ECE0840 [T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Basic concepts and applications of soft computing tools such as neural networks, fuzzy logic systems, and several optimization techniques like genetic algorithms, evolutionary computation, simulated annealing etc.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe the role of artificial intelligence techniques in real world**(BL1-Remember)** **CO2-** Apply fuzzy logic controller for electrical engineering problem**(BL2-Understand)** **CO3-** Apply different neural network controller for electrical engineering problem**(BL3-Apply)** **CO4-** Apply and compare performance of different optimization techniques for electrical engineering problem**(BL4-Analyze)** **CO5-** Identify and select a suitable Soft Computing technology to solve the problem; construct a Solution and implement a Soft Computing solution**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
1	INTRODUCTION TO SOFT COMPUTING: Concept of computing systems. "Soft" computing versus "Hard" computing, characteristics of Soft computing, Some applications of Soft computing techniques.	Lecture Method / Video/ Group Discussion / Case study	12
2	FUZZY LOGIC: Fuzzy sets, logic operations, and relations; Fuzzy decision-making; fuzzy inference systems; design steps in fuzzy logic controller; application of fuzzy logic controller in Electrical engineering.	Lecture Method / Video/ Group Discussion / Case study	10
3	NEURAL NETWORKS: Basic concepts and major classes of neural networks, supervised and unsupervised learning, Single-layer perceptron, Multi-layer perceptron, Back Propagation Neural network, Recurrent neural networks, support vector machine, Application of neural network modelling / control problems in Electrical engineering	Lecture Method / Video/ Group Discussion / Case study	10
4	OPTIMIZATION TECHNIQUES: Genetic algorithms, Evolutionary Algorithm, Simulated Annealing, Ant colony optimization -Applications to Electrical engineering problems.	Lecture Method / Video/ Group Discussion / Case study	10
5	Genetic Algorithms: Advantages and Limitations of Genetic Algorithm; Applications of Genetic Algorithm; Applications of GA in Machine Learning. Introduction to Hybrid Systems; MATLAB Environment for Soft Computing Techniques.	Lecture Method / Video/ Group Discussion / Case study	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. George J.Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic, Second Edition, PHI, 2006 2. J.M.Zurada, Introduction to artificial neural systems, Jaico Publishing House, 2006 3. D.E. Goldberg, Genetic algorithms in search, optimization, and machine learning, Addison-Wesley.
Articles	1. Rao, K. Koteswara, and G. Svp Raju. "An overview on soft computing techniques." International Conference on High Performance Architecture and Grid Computing. Berlin, Heidelberg: Springer Berlin Heidelberg, 2011. 2. Das, Santosh Kumar, et al. "On soft computing techniques in various areas." Comput. Sci. Inf. Technol 3.59 (2013): 166.
References Books	1. S.N.Sivanandam, and S.N.Deepa, Principles of Soft computing, Second Edition, Wiley India Pvt. Ltd, 2013. 2. N.P.Padhy and S.P.Simon, Soft computing with MATLAB programming, Oxford publishers, 2015.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_cs17/preview
Videos	https://www.youtube.com/watch?v=6xTmkJM0Yi8&t=2s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	3	-	2	-	-	-	3	-	-	3	2	2
CO3	-	2	1	2	2	-	-	-	-	-	-	-	3	2	3
CO4	-	2	-	3	-	-	-	-	-	-	-	-	3	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Wireless Networks
Course Code	ECE0843[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Basic Knowledge of Cellular communication and communication protocols			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of cellular and mobile communication**(BL1-Remember)** **CO2-** To understand & gain the knowledge on 1G, 2G, 3G, 4G and 5G technology. **(BL2-Understand)** **CO3-** To apply to select the suitable network depending on the availability and requirement**(BL3-Apply)** **CO4-** To analyzing the suitable network depending on the availability and requirement. **(BL4-Analyze)** **CO5-** To evaluation of various mobile communication parameter (Gain, Bandwidth etc).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction and Development of Wireless Network: Growth of mobile communication, First generation system, Second Generation system, Path to third generation technology, 4G and Beyond, Next generation wireless network, Mobile communication fundamental, basic network architecture, Air interface access techniques , Roaming and Handoff/ Handover, Mobile data in wireless network.	Lecture Method / Video/ Group Discussion / Simulation	12
2	Equalizers- Fundamentals of Equalization, Equalizers in Communication Receiver, Linear Equalizer, Algorithms for Adaptive Equalization, Diversity Techniques. Characteristics of Speech Signals, Quantization Techniques, Vocoders, Linear Predictive Coders, Multiple Access Techniques for Wireless Communications. Third generation Technology: Introduction, Universal Mobile Telecommunication System (UMTS), Wideband code division multiple access(WCDMA) basics, WCDMA air interface, UMTS Terrestrial radio access network (UTRAN) architecture, High speed packet data, High speed packet access (HSPA) architecture , Code division multiple access 2000 (CDMA2000), Time division –code division multiple access (TD-CDMA), Time division –synchronous code division multiple access (TD-SCDMA)T5, Implementation , Handover and comparisons.	Lecture Method / Video/ Group Discussion / Simulation	10
3	Long Term Evolution: Introduction, LTE ecosystem, Standards, radio spectrum, LTE Architecture, User equipment (UE), Enhanced Node B (eNodeB), Core network, radio channel components, TD-LTE, LTE scheduler, Handover (X2, S1 and inter- MME), Self organizing network (SONs), Relay cell, heterogeneous network (Het NET), Vo LET, LTE advanced.	Lecture Method / Video/ Group Discussion	10
4	Worldwide Interoperability for Microwave (WIMAX): Introduction, Standards, generic WiMAX architecture, Core network, radio network, WiMAX spectrum, WiMAX modulation, Channel structure, Mixed mode, frequency planning and Quality of service (QOS), handover, WiMAX Features and applications.	Lecture Method / Video/ Group Discussion	10
5	Wi-Fi: Introduction, Standards, Protocols, Frequency Allocation, Modulation and Coding Schemes, Network architecture, Typical Wi-Fi configuration, Hotspots, VPNs, Wi-Fi Integration with 3G/ 4G security, Benefits of convergence of Wi-Fi and wireless Mobile	Lecture Method / Video/ Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	(1) Clint Smith and Daniel Collins, Wireless Network, McGraw Hill education (2) Jochen Schiller, Mobile Communications, Second Edition, Pearson Education (3) Vijay Garg, Wireless Communications and networking, First Edition, Elsevier
Articles	(1) Liang, Chengchao, and F. Richard Yu. "Wireless network virtualization: A survey, some research issues and challenges." IEEE Communications Surveys & Tutorials 17.1 (2014): 358-380. (2) Zhang, Chaoyun, Paul Patras, and Hamed Haddadi. "Deep learning in mobile and wireless networking: A survey." IEEE Communications surveys & tutorials 21.3 (2019): 2224-2287.
References Books	(1) Clint Smith and Daniel Collins, 3G Wireless with 802.16 and 802.11, McGraw Hill Education
MOOC Courses	https://archive.nptel.ac.in/courses/117/102/117102062/
Videos	https://www.youtube.com/watch?v=CUyF0YGIA5Y

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	-	2	-	-	-	-	-	3	-	1	1	2	1
CO2	-	2	-	3	-	-	-	-	-	3	-	1	1	2	3
CO3	-	3	-	3	-	2	-	-	-	1	1	2	1	3	3
CO4	-	2	-	1	2	-	-	-	-	-	1	2	1	3	3
CO5	-	1	-	-	2	-	-	-	-	-	-	1	1	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	Optical Fiber Communication
Course Code	ECL0825[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic concept of communication and ray optics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic elements of optical fiber transmission link, fiber modes, configurations and structures.**(BL1-Remember)** **CO2-** To understand the different kind of losses and signal distortions in fibers.**(BL2-Understand)** **CO3-** To apply various laws and theory of ray optics to understand the working of optical fiber communication system**(BL3-Apply)** **CO4-** To analyze signal degradation in optical fiber.**(BL4-Analyze)** **CO5-** To evaluate the performance fiber optic transmission system. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Communication, Networks Physical Structures; Different Topologies, Categories of Networks: LAN, MAN, WAN, Interconnection of Networks, The internet Protocols and Standards, Standards Organizations, Network Models, Layered Tasks, The OSI Model, Different Layers in OSI Model. TCP / IP protocol suite	Lecture Method / Video/ Group Discussion / Simulation	12
II	Signal Degradation Optical Fibers Attenuation - Absorption losses, scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides, Information Capacity determination, Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers, Mode Coupling, Design Optimization of SM fibers, RI profile and cut-off wavelength.	Lecture Method / Video/ Group Discussion / Simulation	10
III	Fiber Optical Sources and Coupling Direct and Indirect Band gap materials-LED structures ,Light source materials, Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition, Rate equations -External Quantum efficiency, Resonant frequencies, Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers, Power Launching and coupling, Lancing schemes, Fibre-to-Fibre joints, Fibre splicing.	Lecture Method / Video/ Group Discussion / Simulation	10
IV	Fiber Optical Receivers PIN and APD diodes, Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise, Comparison of Photo detectors, Fundamental Receiver Operation, preamplifiers, Error Sources -Receiver Configuration, Probability of Error, Quantum Limit.	Lecture Method / Video/ Group Discussion	10
V	Digital Transmission System: Point-to-Point links System considerations, Link Power budget, Rise - time budget, Noise Effects on System Performance, Operational Principles of WDM, Solitons-Erbium-doped Amplifiers. Basic on concepts of SONET/SDH Network.	Lecture Method / Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Identification of a problem and formulation of a topic of project/Thesis	Experiments	BL5-Evaluate	2
2	Study of a 650nm fiber optic digital link.	Experiments	BL5-Evaluate	2
3	To measure propagation or attenuation loss in optical fiber.	Experiments	BL5-Evaluate	2
4	To measure propagation loss in optical fiber using optical power meter	Experiments	BL5-Evaluate	2
4	To measurement of the Numerical Aperture (NA) of the fiber.	Experiments	BL4-Analyze	2
5	Study of Intensity Modulation Technique using Analog input signal. To obtain intensity modulation of the analog signal, transmit it over a fiber optic cable and demodulate the same at the receiver and to get back the original signal.	Experiments	BL5-Evaluate	2
5	Design of WDM system	PBL	BL6-Create	30
5	Design of multi user OFC system	PBL		30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	(1) Gerd Keiser Optical Fiber Communication 3rd Edition McGraw Hill International,
Articles	(1) B. Dhakad, R. S. Tomar, S. Mishra, S. S. Ojha, M. Sharma and S. Akashe, "Design and Analysis of Low BER with High Speed 16 Channel WDM Communication Network for 5G and Beyond," 2023 1st International Conference on Innovations in High Speed Communication and Signal Processing (IHCSP), BHOPAL, India, 2023, pp. 541-546, doi: 10.1109/IHCSP56702.2023.10127201. keywords: {Q-factor;Optical fiber amplifiers;Technological innovation;5G mobile communication;Bit error rate;Bandwidth;Receivers;WDM;BER;OPM;EDFA;OFC}, (2) Dhakad, B., Ojha, S.S., Sharma, M. (2021). WDM Communication Network with Zero Bit Error Rate. In: Tomar, R.S., et al. Communication, Networks and Computing. CNC 2020. Communications in Computer and Information Science, vol 1502. Springer, Singapore. https://doi.org/10.1007/978-981-16-8896-6_2
References Books	(1) J. Senior Optical Communication, Principle sand Practice Prentice Hall of India. (2) J. Gower, Optical Communication System Prentice Hall of India.
MOOC Courses	https://archive.nptel.ac.in/courses/108/106/108106167/
Videos	https://www.youtube.com/watch?v=ougKUUM3hJA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	1
CO2	-	1	1	-	-	2	-	-	-	3	-	-	-	1	-
CO3	1	1	1	2	2	-	-	-	-	-	-	-	-	-	-
CO4	1	2	1	2	-	-	-	-	-	-	-	-	-	-	1
CO5	1	1	-	3	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2024-2025

(SOET)(BTech-Electronics_and_Communication)

Title of the Course	VLSI Design
Course Code	ECL0826[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To learn basic techniques and fundamental concepts the basic theory of MOS transistors and Modeling of MOSFETs. **(BL1-Remember)** **CO2-** To grasp the knowledge of common forms of physics involved in modeling of semiconductor device and designing the model of MOSFET devices.**(BL2-Understand)** **CO3-** Apply the performance of CMOS Inverter circuits on the basis of their operation and working. Also Study the Static CMOS Logic Elements, Dynamic Logic Circuit Concepts and CMOS Dynamic Logic Families.**(BL3-Apply)** **CO4-** To analyzed and evaluated the working and performance of digital and analog circuit and analyze Semiconductor Lasers, LEDs, modulators and other integrated devices. **(BL4-Analyze)** **CO5-** To design various hardware oriented circuits and Layout of CMOS Integrated Circuits.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	CMOS LOGIC: Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristates, Multiplexers, Latches and Flip-Flops, CMOS Fabrication and Layout: Inverter Cross-section, Fabrication Process, Layout Design rules, Gate Layout, Stick Diagrams. VLSI Design Flow. Regularity, Modularity, Locality.	lecture method/Group Discussion	9
2	MOS TRANSISTOR THEORY: Ideal I-V Characteristics, C-V Characteristics: MOS Capacitance Models, MOS Gate Capacitance Model, MOS Diffusion Capacitance Model. Non ideal I-V Effects: Velocity Saturation and Mobility Degradation, Channel Length Modulation, Threshold Voltage Effects. DC Transfer characteristics: Static CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin, Ratioed Inverter Transfer Function, Pass Transistor DC Characteristics.	lecture method/Project based learning	10
3	DELAY AND POWER ESTIMATIONS: Delay Estimation: RC Delay Models. Linear Delay Model: Logical Effort, Parasitic Delay, Delay in a Logic gate. Logical Effort of Paths: Delay in Multistage Logic Networks, choosing the Best Number of Stages. Power Dissipation: Static Dissipation, Dynamic Dissipation	lecture method/Project based learning	10
4	COMBINATIONAL & SEQUENTIAL CIRCUIT DESIGNS: Combinational Circuit Design: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass-Transistor Circuits. Sequential Circuit Design: Sequencing Static Circuits, Design of Latch and Flip-Flops: Static Latches and Registers, Dynamic Latches and Registers, Domino CMOS Logic.	lecture method/Project based learning	11
5	ARITHMETIC BUILDING BLOCKS AND MEMORY ARCHITECTURES: Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, Speed and Area Tradeoffs, Memory Architectures: RAM, ROM, Serial Access Memories. equations, Lossless lines, Distortion less line, Input impedance, Standing Wave Ratio and Power, The Smith chart, Some applications of transmission lines.	lecture method/Project based learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To design, circuit and layout a CMOS inverter and to calculate its leakage power, dynamic power, and average power using simulation	Experiments	BL5-Evaluate	2
4	To design, circuit and layout of two inputs, CMOS NOR Gate and to calculate its leakage power, dynamic power, and average power using simulation	Experiments	BL5-Evaluate	2
5	To design, circuit and layout of two inputs, CMOS NOR Gate and to calculate its leakage power, dynamic power, and average power using simulation	Experiments	BL4-Analyze	2
6	To design, circuit and layout of two inputs, CMOS XOR Gate and to calculate its leakage power, dynamic power, and average power using simulation	Experiments	BL4-Analyze	2
7	To design, circuit and layout of two inputs, CMOS XNOR Gate and to calculate its leakage power, dynamic power, and average power using simulation	Experiments	BL4-Analyze	2
8	To design, circuit and layout of two inputs, CMOS Half Adder and to calculate its leakage power, dynamic power, and average power using simulation	Experiments	BL6-Create	2
9	To Design the PBL of , CMOS Half Subtractor Using CMOS Transistor	PBL	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Kang, S.M., & Leblebici, Y. (2003). CMOS Digital Integrated Circuits: Analysis & Design. Third Edition, Tata McGraw Hill Publishing Co. Ltd. Weste, N. H., & Harris, D. M. (2011). CMOS Digital Integrated Circuits: Analysis & Design. Fourth Edition, Addison-Wesley Professional
Articles	https://ieeexplore.ieee.org/document/10503063
References Books	Rabaey, J., & Chandrakasan, A., Nikolic, B. (2016). Digital Integrated Circuits: A Design Perspective. Second Edition, Prentice Hall of India Wolf, W. (2002). Modern VLSI Design: System on Chip. Pearson
MOOC Courses	https://www.udemy.com/course/cmos-digital-vlsi-for-beginners/?couponCode=NVDPRODIN35 https://onlinecourses.nptel.ac.in/noc21_ee09/preview
Videos	https://ieeexplore.ieee.org/document/10527366

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	-	1	1	-	-	2	-	-	-	3	-	-	-	-	-
CO3	-	1	1	3	2	-	-	-	-	-	-	-	-	-	-
CO4	1	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO5	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-