Department of Electronics and Communication Engineering

Sikkim Manipal Institute of Technology

Course Outcomes

I SEMESTER

Sr. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	I	EC101A1	Basic Electronics	CO1. Appreciate the significance of electronics in different areas. CO2. Apply the concept of diodes in rectifiers, voltage regulators and in some other applications. CO3. Understand the operation of a transistor and its biasing techniques. CO4. Compile the different building blocks in digital electronics using logic gates and implement simple logic function using logic gates. CO5. Understand the functioning of a communication system.

III SEMESTER

Sr. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	III	MA207A1	Engineering Mathematics III	CO 1: Identify and apply the concepts of vector space in various problems of communications. CO 2: Associate and apply the concept of linear transformation in various engineering problems of networks and communications. CO 3: Formulate and apply the concept of partial differential equation in electronics engineering modeling. CO 4: Analysis and apply the concepts of numerical methods in solving engineering problems numerically. CO 5: Apply the concepts of initial value problems to find approximate solutions for engineering problems numerically.
2.		VT201A1	Electronic Devices & Components	CO1. Comprehend the fundamentals of Semiconductor Physics. CO2. Insight of P-N Junction diodes and different types of contacts.

				CO3. Apply the knowledge of Bipolar Junction Transistors (BJT) characteristics and implementation on electronic circuit design. CO4. Design different transistor amplifier circuits. CO5. Apply the knowledge of Field Effect Transistor (FET) characteristics and implementation on electronic circuit design.
3.		VT202A1	Digital Electronics and System Design	CO1. Analyze combinational logic circuits for practical applications. CO2. Explain the internal circuits of various logic family ICs. CO3. Analyze sequential logic circuit using flip-flop. CO4. Analyze synchronous sequential machine for practical applications. CO5. Describe the basics of semiconductors memories.
4.		VT203A1	Signals and Systems	CO1.Students should be able to understand basics of signals and systems and their mathematical representation. CO2.Students should be able to interpret spectral analysis of periodic and aperiodic signals using Fourier methods. CO3. Students should be able to understand the LTI systems and their effect on signals passing through them in time and frequency domains. CO4. Students should be able to apply Laplace transform to continuous-time domain signals/systems for stability analysis. CO5. Students should be able to apply Z- transform to discrete-time domain signals/systems for stability analysis.
5.		VT201A4	Electronic Devices And Components LAB.	CO 1. Understand different electronic circuits and equipments and its related techniques. CO 2. Understand and implement the basic diode characteristics and its applications viz. Regulators, Rectifiers, Clippers, Clampers, Multipliers. CO 3. Analyze and study different Passive Filters viz. C-Filter, Π- Filter.

				CO 4. Design and analyze BJT and JFET characteristics and its biasing circuits. CO 5. Understand and study the different characteristics of Optoelectronic components.
6.		VT202A4	Digital Electronics and System Design Lab	CO1. Identify and enlist the various components of combinational digital electronic circuits. CO2. Design and verify the results of digital multiplexers and decoders. CO3. Verify and evaluate the digital circuits that use flip-flops. CO4. Use flip-flops to design counters. CO5. Design sequential circuits using flip-flops and other digital components.

IV SEMESTER

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	IV	MA208A1	Engineering Mathematics IV	CO1. Define the concepts of probability, discrete and continuous random variables and apply this knowledge in to different real world situations. CO2. Apply the concepts of random process and Markov chain which are essentially models of many times dependent processes as a team or individual. CO3. Students can analyze engineering problems with the solution to the community applying the knowledge of random processes and the concepts of singularity in complex analysis. CO4. Analyze the properties of analytic functions and use them efficiently. CO5. Use concepts in Stochastic processes and Complex integrals to apply various problems that arise in Electronics and communication engineering.
2.		VT204A1	Analog Electronics Circuits	CO1: Explain and design different types of feedback amplifiers and Oscillator. CO2: Explain and design different types of power amplifiers. CO3: Explain the working principle of Operational Amplifier and implement the linear and non-linear applications of Operational Amplifier.

				CO4: Analyze and design different types of filter circuits using OPAMPs. CO5: Explain and design Multivibrators and Special functional circuits.
3.		VT205A1	Microprocessor, Microcontroller and ARM Processors	CO1. Learn about the basics of architecture of a microprocessor. CO2. Describe the architectures of 8086 microprocessors. CO3. Know about the architecture of 8051, its interrupts and interfacing applications. CO4. Understand the features of architecture of ARM7 and Applications. CO5. Interpret the exception, interrupts, and interrupt handling schemes.
4.		VT203A4	Analog Electronics & Circuits LAB.	CO 1. Understand different techniques for hardware implementation. CO 2. Design different transistor amplifier electronic circuits. CO 3. Design various types of oscillator circuits for generating frequency of oscillations. CO 4. Analyze and study different Op-Amp applications. CO 5. Design and analyze various types of multivibrators.
5.		VT204A4	Microprocessor and Microcontroller Lab.	CO 1. Write and execute 8085 assembly language programs. CO 2. Learn 8085 execution set and try to implement them in the laboratory the same for writing programs in C. CO 3. Write error free code in assembly for 8085 and 8086 microprocessors. CO 4. Debug syntax errors prompted by the TASM. CO 5. Work on ARM processors.

V SEMESTER

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes

1.	V	VT301A1	Communication Engineering	CO1. Explain the basic concepts of amplitude modulation and demodulation techniques. CO2. Analyze continuous angle (frequency and phase) modulation techniques, Evaluate the performance of analog communication systems in presence of noise. CO3. Explain the basic concepts of digital modulation. CO4. Analyze various types of multiplexing. CO5. Analyze various types of digital modulation technique.
2.		VT302A1	Introduction to Micro-Fabrication	CO 1. Elucidate the CMOS process flow. CO 2. Analyze various critical processing steps in microfabrication. CO 3. Appreciate the advanced methods involved in IC fabrication. CO 4. Analyze the advancements in CMOS process fabrication with scaling in technology. CO 5. Have an understanding and overview of interconnects, metal gate, planarization, etc.
3.		VT303A1	VLSI Verification and Testing Using Eda Tools	CO1. Understand scheduling, allocation, and binding. CO2. Describe the logic synthesis and binary decision diagram. CO3. Interpret the temporal logic and model checking. CO4. Realize the concept of testing and fault simulation. 5. Understand the test pattern generation and memory testing.
4.		VT304A1	Embedded Systems	CO1. Describe the basics of design, modelling, development of embedded systems. CO2. Develop the hardware for embedded system applications based on the processors. CO3. Simulate and synthesize the embedded system by using the Embedded system and Linux operating system. CO4. Apply various real-time algorithms and implement the RTOS development tools in building real-time embedded systems. CO5. Design various advanced embedded systems.

5.		VT301A4	HDL Simulation LAB	CO 1. Design various combinational circuits using VHDL (Dataflow and Behavioral style of modeling). CO 2. Implement various combinational circuits using VHDL (Structural style of modeling) CO 3. Implement various sequential circuits using Verilog HDL. CO 4. Design various circuits (CMOS, transmission gate and pass transistor logics) using EDA tools. CO 5. Design and implement layout of basic gates using EDA tools.
6.		VT302A4	Python Programming Lab	CO 1. Write, test, and debug simple Python programs. CO 2. Implement Python programs with conditionals and loops. CO 3. Develop Python programs step-wise by defining functions and calling them. CO 4. Use Python lists, tuples, dictionaries for representing compound data. CO 5. Read and write data from/to files in Python.

VI SEMESTER

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	VI	BA346A1	Industrial Management	CO1. Explain theories of management and their practical applications in solving business/ industrial problems. CO2. Apply the available resources to achieve the desired goal in a more efficient and effective way. CO3. Describe the Principles of organizing in management system CO4. Explain the Quantitative Techniques and Production Management in Managerial Decisions CO5. Summarize the production technique in solving the issues related with proper management of material and inventory management.

2.		VT305A1	Semiconductor Materials Synthesis and Characterization	CO 1. Understand the Silicon extraction and purification process. CO 2. Understand Crystallography of Si. CO 3. Understand various methods of crystal growth. CO 4. Understand principle, operation and practice of sub-merged arc furnace, energy and process calculation. CO 5. Understand key methods of physicochemical, morphological and analytical characterization techniques.
3.		VT306A1	Microelectronics & VLSI Design	CO 1. Design basic CMOS structure and calculate various numerical parameters related to CMOS design. CO 2. Design different combinational and sequential MOS device. CO 3. Draw the stick diagram and layout of CMOS device in different technology. CO4. Describe different Micro-electronics process used in VLSI design CO5. Describe different Physical design and test the validity of design.
4.		VT303A4	Communication Engineering Lab	CO1. Design various filters using OPAMPS. CO2. Implement various Analog Modulation Techniques. CO3. Implement various Multiplexing Techniques. CO4. Implement Sampling and Digital Modulation Techniques. CO5. Implement Differential Modulation Techniques.
5.		ECVT304A4	ARM based SOC Design Lab	CO1. Know about Verilog HDL and hierarchical modelling concept. CO2. Know about ARM cortex architecture. CO3. Understand AMBA protocol. CO4. Understand AHB protocol. CO5. Program an SoC using C language.

Program Elective-1

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	III	**VT201A3**	**Electromagnetic Theory**	CO1. Students should be able to comprehend the concepts of electrostatics and apply the knowledge in solving the relevant problems. CO2. Students should be able to comprehend the concepts of magnetostatics and apply the knowledge in solving the relevant problems. CO3. Students should be able to apply the Maxwell equations in steady and time-varying conditions. CO4. Students should be able to analyze the electromagnetic wave propagation through different media and power measurement using Poynting vector theorem. CO5. Student should be able to explain the characteristics of transmission line.
2.		**VT202A3**	**Network Analysis and Synthesis**	CO1: Apply the network theorems of electrical networks and initial conditions in electrical circuits. CO2: Use Laplace transform to solve differential equations for electrical networks. CO3: Determine the network function and two port network parameters of an electrical network. CO4: Apply graph theory for solving electrical network problems. CO5: Synthesize passive networks and design of filters.
3.		**VT203A3**	**Object Oriented Programming using C++**	CO1. The students should be able to understand the basic concept of Object-oriented programming. CO2. The students should be able to understand the basic features and syntaxes of C++. CO3. The students should be able to write programs using the different concepts of objobject-orientedogramming. CO4. The students should be able to understand file handling and input output operation. CO5. The students should be able to apply the concept of OOPs to solve some practical problems.

4.		**VT204A3**	**Internet of Things**	CO1: The students should be able to explain the basic features and requirements of IoT. CO2: The students should be able to establish the need of Big Data solution strategy in corporate. CO3: The students should be able to explain various short range communication protocols used for different IoT applications. CO4: The students should be able to explain various long and medium range communication protocols used for different IoT applications. CO5: The students should be able to elucidate how IoT can be deployed in different application scenarios.
5.		**VT205A3**	**COMPUTER ORGANIZATION AND ARCHITECTURE**	CO1. To demonstrate an understanding of the organization of a computer system. CO2. To identify instruction sets, processor structure and its functions. CO3. To have knowledge on memory system and I/O organization. CO4. To explain the working of a control unit and its operations. CO5. To discover parallelism and features of parallel processing and superscalar operations.

Program Elective-2

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	IV	**VT206A3**	**Computer Networks**	CO1. Analyse different types of network topologies. CO2. Inspect error detection and correction in data link layer and analyze the working of protocols involved in this layer. CO3. Build the skills in classless and classful addressing and sub-netting. CO4. Identify the Client/Server Paradigm and the protocols involved in this layer. CO5. Analyze the applications protocols and know the actual application implementation in the areas such as security, banking sector and novel area of interest.

2.		**VT207A3**	**ELECTRONIC INSTRUMENTATION AND MEASUREMENTS**	CO1. Summarize the basic measurement concepts. CO2. Analyze the concept of various bridges and their applications. CO3. Describe various electronic measuring instrument, display devices and recorders. CO4. Explain the knowledge of sensors and transducers. CO5. Discuss on telemetry and tele-control.
3.		**VT208A3**	**Data Structure**	CO1 Explain the basic concepts of data structures and algorithms. CO2 Apply basic techniques of stacks and queues. CO3 Describe implementation of linear data structures such as linked lists. CO4 Summarize non-linear data structures such as trees and graph. CO5 Extract concepts about searching and sorting techniques.
4.		**VT209A3**	**Advanced Electronic Devices**	CO1: Analyze the issues in scaling MOS transistor. CO2: Explain the controlling mechanism of short channel effect. CO3: Explain the working principle of advanced junction diode. CO4: Analyze and design high speed devices. CO5: Explain and design of low dimensional structure devices.

Program Elective-3

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	V	**VT301A3**	**FPGA ARCHITECTURE**	CO1. Comprehend low and programmable devices. CO2. Understand Spartan 6 basics CO3. Use Virtex 5 clock sources and FIFO. Comprehend various I/O standards. CO4. Use memory, and DSP blocks in complex. Comprehend SerDes. CO5. Comprehend JTAG. Distinguish RISC-based soft processors from Xilinx, and Altera.

2.		**VT302A3**	**DIGITAL SIGNAL PROCESSING**	CO1. Analyze basic signals, systems, sampling and DTFT. CO2. Analyze the frequency response of discrete time domain signals using DFT and FFT. CO3. Design analog and digital IIR filters for given specifications. CO4 Design FIR filters for given specifications. CO5 Realize digital systems based on IIR and FIR filter structures.
3.		**VT303A3**	**VLSI PHYSICAL DESIGN**	CO1. Understand partitioning, floor planning, and placement. CO2. Familiar with the routing and clock design. CO3. Interpret statistic timing analysis and timing closure. CO4. Realize the concept of physical synthesis. CO5. Understand the low-power design.
4.		**VT304A3**	**Java Programming**	CO1. Use the syntax and semantics of java programming language and basic concepts of OOP. CO2. Develop reusable programs using the concepts of inheritance, polymorphism and interfaces. CO3. Transfer reusable programs using the concepts Strings handling, Interfaces and Packages. CO4. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes. CO5. Design event driven GUI and web related applications which mimic the real word scenarios.
5.		**VT305A3**	**Database Management Systems**	CO1. Define fundamental elements of a relational database management system. CO2. Describe entity-relationship diagrams to represent simple database application scenarios. CO3. Interpret the basic concepts of relational data model, and Map Entity-relationship model, Relational database design, relational algebra, and database language SQL. CO4. Connect database using SQL. CO5. Relate database using NoSQL.

Program Elective-4

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	VI	**VT306A3**	**ADVANCED SEMICONDUCTOR DEVICES AND FLEXIBLE ELECTRONICS**	CO1. Understand the operation of PN junction, bipolar transistor, and related devices. CO2. Understand the operation of MOSFET and related devices. CO3. Use microwave diodes, quantum effect devices, and hot-electron devices. CO4. Understand the photonic devices. CO5. Have an idea of flexible electronics.
2.		**VT307A3**	**Linear and Digital Control Systems**	CO1. Describe the mathematical model of electrical and mechanical systems CO2. Explain the stability in the time domain and the calculation of steady-state error. CO3. Illustrate the stability in frequency domain CO4. Explain Digital Control Systems using state space representation. CO5. Summarize the various type of controller operation.
3.		**VT308A3**	**Information Theory and Coding**	CO1. Describe the mathematical model of electrical and mechanical systems CO2. Explain the stability in the time domain and the calculation of steady-state error. CO3. Illustrate the stability in frequency domain CO4. Explain Digital Control Systems using state space representation. CO5. Summarize the various type of controller operation.
4.		**VT308A3**	**Information Theory and Coding**	CO1. Calculate information, entropy and kraft's inequality. CO2. Identify the concept of Shannon's theorem. CO3. Analyze the concept of mutual information and channel capacity. CO4. Inspect error detection and correction in linear block codes. CO5. Construct convolutional codes and turbo codes.
5.		**VT309A3**	**MEMS & NEMS**	CO1. Explain the basics of the Micro Electronic Mechanical System. CO2. Design different MEMS devices. CO3. Manufacture different MEMS devices. CO4. Design different MEMS devices used in medical Science. CO5. Design different NEMS devices.

Program Elective-5

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	VI	**VT310A3**	**ADVANCE VLSI AND SOC DESIGN**	CO1. Introduction to different VLSI design and performance parameters. CO2. Familiarization to data path & Interconnect aware design CO3. Skill development in Hardware Description Languages for VLSI Design. CO4. Introduction to processor design. CO5. Familiar with different Automation and testing tools in VLSI design.
2.		**VT311A3**	**SEMICONDUCTOR DEVICE MODELLING**	CO1. Understand the advanced semiconductor physics. CO2. Familiar with semiclassical transport theory. CO3. Interpret drift-diffusion model. CO4. Realize the hydrodynamic modelling. CO5. Understand the quantum transport model.
3.		**VT312A3**	**MACHINE LEARNING**	CO1: Apply the knowledge of linear regression and logistic regression for prediction and classification problems. CO2: Use supervised learning algorithms to solve classification problems. CO3: Explain the theoretical framework for analysing the generalization error of a learning algorithm. CO4: Apply unsupervised learning algorithms for dimensionality reduction and clustering techniques to real world problems. CO5: Explain the basic concept of Artificial Neural Network.

Open Elective-1

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	III	**VT201A2**	**Introduction to Complex Variables**	CO1. Understand the concept of the Algebra Geometry and Topology of the Complex Plane. CO2. Understand the concept of the Complex Functions and associated concept of Limits, Continuity and Differentiation. CO3. Exploit Complex Integration methods CO4. Understand the Properties of Analytic Functions.

				CO5. Understand the concept of Isolated Singularities and Residue Theorem.
2.		**VT202A2**	**SEMICONDUCTOR PHYSICS**	CO1: Demonstrate a clear understanding of concepts of semiconductor materials and the physics of the materials and devices. CO2: Demonstrate an understanding of Quantum Theory of Semiconductors. CO3: Build a clear knowledge and exhibit the understanding of various carrier statistics in semiconductors. CO4: Apply various models for the current transport for different conditions in a semiconductor. CO5: Exhibit a clear understanding of various carrier dynamics and mathematical derivations for continuity and concentrations in semiconductors.
3.		**VT203A2**	**PYTHON PROGRAMMING**	CO1. Understand the concept of structure, data types and variables using Python Programming Language CO2. Apply the concept of list, tuples, functions and dictionaries in Python Programs CO3. Understand and use classes and objects in Python. CO4. Read and write files in Python. CO5. Use exception handling in Python applications for error handling.
4.		**VT204A2**	**MATHEMATICS FOR COMMUNICATION ENGINEERING**	CO1. Apply matrix theory in Communication Engineering problems. CO2. Calculate gradients, derivatives and its applications CO3. Apply the constrained optimization for approximate solutions. CO4. Do statistical modelling and analysis of Communication Systems CO5. Apply Markovian process and distinguish the utility of queuing models.

Open Elective-2

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	IV	**VT205A2**	**Signal Processing for Communication**	CO1 Gain insight of Signals and its different forms. CO2 Gain idea about signal processing. CO3 gain insight of Communication systems and channels. CO4 Also learn about different type of signal processing techniques required in wireless communication system. CO5 Design a basic communication system.
2.		**VT206A2**	**Semiconductor Devices and Circuits**	CO1. Learn the important concepts related to semiconductor technology. CO2. Understand the basic concepts of carrier transport. CO3. Know the basic characteristics of MS contact, PN junctions, BJT. CO4. Explore all concepts related to MOSFET. CO5. Design an optimized CMOS inverter.
3.		**VT207A2**	**SENSORS AND ACTUATORS FOR IoT**	CO1: The students should be able to identify the components required for IoT system. CO2: The students should be able to solve problems of amplifiers and converters. CO3: The students should be able to explain the working of different sensors used in IoT. CO4: The students should be able to explain the working of different actuators used in IoT. CO5: The students should be able to integrate sensors and actuators in a single system.
4.		**VT208A2**	**ADVANCED ANTENNA DESIGN**	CO1. Understand the radiation mechanism of antenna and to solve the numerical problems related to antenna parameters. CO2. Design and interpret non uniform excitation coefficients using array synthesis techniques for minimum side lobe level. CO3. Design and analyze rectangular and circular microstrip antenna with power divider network. CO4. Understand the importance of defected ground structures and metamaterial surfaces and design high impedance surfaces.

				CO5. Exploit the antennas for wireless communication, radar applications, Software defined and cognitive radio.

Open Elective-3

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	V	**VT301A2**	**Optimization Techniques**	CO1 Apply linear algebra, vector space and probability theories for solving practical problems. CO2 Analyze the optimization problem and function. CO3 Analyze the linear/ non-linear programming model. CO4 Evaluate the Unconstrained optimization techniques. CO5 Evaluate the constrained optimization techniques.
2.		**VT302A2**	**Solid State Devices**	CO1. Learn the basic and fundamental concepts of Semiconductor Physics. CO2. Gain the knowledge and idea behind the concept of PN Junction and its related topics. CO3. Analyze the relevant concepts of MOSFET and its different types. CO4. Understand the concept behind the operating principle of various Opto-electronic devices. CO5. Recognize the importance of IC Fabrication for industrial applications.
3.		**VT303A2**	**IoT Gateways and Edge Computing**	CO1: The students should be able to explain different IoT networking protocols. CO2: The students should be able to explain Gateways for IoT networking. CO3: The students should be able to explain different IoT short and long range communication protocols. CO4: The students should be able to explain the edge and fog computing paradigms. CO5: The students should be able to explain how the concept of edge and fog

				computing is applied in different IoT applications.
4.		**VT304A2**	**ADVANCED DIGITAL COMMUNICATION**	CO1. Design matched filter for detection of digital signals in the presence of white Gaussian noise. CO2. Design waveforms to overcome ISI in band-limited channels. CO3. Design equalization circuits to overcome the effect of channel distortion. CO4. Understand the binary digital modulation schemes and M-ary modulation schemes. CO5. Design turbo and LDPC codes to overcome the effect of noise in the channel.

Open Elective-4

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	VI	**VT305A2**	**Pattern Recognition**	CO1. Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques. CO2. Understand the major approaches in statistical and syntactic pattern recognition. CO3. Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers. CO4. Summarize, analyze, and relate research in the pattern recognition area. CO5. Apply pattern recognition techniques to real-world problems.
2.		**VT306A2**	**Nano electronic Devices and Materials**	CO1: The students should be able to understand concepts of historical perspective of Nanotechnology with reference to different devices. CO2: The students should be able to understand crystallography concepts and quantum mechanical aspects of nanomaterials. CO3: The students should be able to different nanoelectronics and quantum electronic devices concepts.

				CO4: The students should be able to have insights and have insights of IC fabrication and characterization processes. CO5: The students should be able to understand and know the various applications of nanoelectronics and societal impacts.
3.		**VT307A2**	**Communication Pathways between Cloud and IoT**	CO1: The students should be able to explain the gateways and pathways connection to cloud. CO2: The students should be able to explain uses of fibre optic communication for IoT networking. CO3: The students should be able to explain underlying technologies for IoT communication protocols. CO4: The students should be able to explain the role of WiFi technology in detail for IoT deployment. CO5: The students should be able to explain the role of satellite communication technology in detail for IoT deployment.
4.		**EC308A2**	**MODERN WIRELESS COMMUNICATION SYSTEMS**	CO1. Describe the effect of small scale and large scale fading on signal transmission. CO2. Design and implement diversity coding techniques to overcome the effect of fading. CO3. Apply the theory of probability and random processes in the design of baseband CDMA system. CO4. Design the transmitter and receiver blocks of OFDM for better transmission through multipath channel. CO5. Design and solve specific problems in advanced technologies like massive MIMO.

Open Elective-5

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	VII	**VT401A2**	**Time Frequency Analysis**	CO1 Apply CTFT, DTFT and DFT for analyzing the signal and system. CO2 Analyze the time – frequency nature of the signal. CO3 Apply STFT for signal analysis. CO4 Evaluate Wigner-Ville Distribution for signal analysis. CO5 Evaluate Wavelet Transform (WT) for signal analysis.

2.		**VT402A2**	**ADVANCE VLSI DESIGN AND APPLICATION**	CO1. Introduction to different VLSI design and performance parameters. CO2. Familiarization to data path & Interconnect aware design CO3. Skill development in Hardware Description Languages for VLSI Design. CO4. Introduction to processor design. CO5. Familiar with different Automation and testing tools in VLSI design.
3.		**VT403A2**	**Artificial Intelligence and machine learning**	CO1: Explain basic concept of Artificial Intelligence. CO2: Explain the search algorithm in Artificial Intelligence. CO3: Develop the concept about the logic and object CO4: Explain the concept of agent CO5: Explain and examine different AI based applications.
4.		**VT404A2**	**CODING FOR MIMO COMMUNICATION**	CO1. Characterize and model the MIMO wireless channel. CO2. Design and implement diversity coding techniques to overcome the effect of fading And Design optimal power allocation. algorithms to maximize the system capacity CO3. Assemble different forms of diversity to improve the error performance CO4. Design low-complexity, linear and non-linear receivers. CO5. Evaluate the performance of concatenated codes for MIMO communication.

Open Elective-6

Srl. No.	Semester	Subject code	Subject Name	Course Outcomes
1.	VIII	**VT405A2**	**Advance Digital Signal Processing**	CO1 Explain the basics of signal and system, DFT, Filters. CO2 Analyze and application of Multirate DSP and Discrete Hilbert transforms. CO3 Examine the Cepstrum & Homomorphic Deconvolution CO4 Evaluate the Power Spectral Estimation. CO5 Analysis of Parametric Method Of Power Spectrum Estimation.

2.		**VT406A2**	**ASIC Design**	CO1: Demonstrate VLSI tool-flow and appreciate FPG Architecture. CO2: Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design. CO3: Understand the algorithms used for ASIC construction. CO4: Understand the basics of System on Chip, on chip communication architectures like AMBA, AXI and utilizing Platform based design. CO5: Appreciate high performance algorithms available for ASICs IC.
3.		**VT407A2**	**Data Centre and Cloud Computing**	CO1: The students should be able to explain the cloud computing requirements and challenges. CO2: The students should be able to explain Cloud based IoT platform design methodology. CO3: The students should be able to explain storage hierarchy for cloud computing. CO4: The students should be able to explain the role of Data centre cloud computing. CO5: The students should be able to explain the basic concept of cloud server.
4.		**VT408A2**	**5G MOBILE COMMUNICATION**	CO1. Understand 5G spectrum requirement, its channel model and use cases. CO2. Familiarize with 5G architecture options and physical layer concepts. CO3. Examine the multicarrier techniques and new waveform options for 5G communication. CO4. Illustrate the concept of network slicing and V2V Communication. CO5. Interpret the Interference and Mobility management in 5G networks.