BVRIT HYDERABAD College of Engineering for Women

(UGC Autonomous Institution | Approved by AICTE | Affiliated to JNTUH)
(NAAC Accredited – A Grade | NBA Accredited B. Tech. (EEE, ECE, CSE and IT))
Bachupally, Hyderabad -500 090

Department of Electronics and Communication Engineering

Course Outcomes – BH23 Regulations

I Year I Semester

CO No.	Course Outcomes
Elements of Electronics and Communication Engineering – **EC106ES**	
C106.1	Identify the different components and ICs used for electronic applications.
C106.2	Measure different parameters using various measuring devices.
C106.3	Distinguish various signal used for analog and digital communications
C106.4	Describe the significance of Electronics and communication subjects and various Software tools

Elements of Electronics and Communication Engineering – **EC106ES**													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C106.1	3	2	1	1	1	1	-	-	-	-	-	2	3	2
C106.2	3	2	3	1	2	2	-	-	-	-	-	2	3	2
C106.3	3	3	2	1	2	2	-	-	-	-	-	2	3	2
C106.4	3	1	1	1	2	1	-	-	-	-	-	2	2	2

I Year II Semester

CO No.	Course Outcomes
Electronic Devices and Circuits – EC204ES	
C204.1	Analyze the characteristics of PN junction diode.
C204.2	Construct diode circuits for various applications.
C204.3	Illustrate the transistor working in different configurations.
C204.4	Differentiate between FET and BJT devices.
C204.5	Illustrate the operation and characteristics of special purpose diodes.
C204.6	Use diode and transistor as switches in electronic circuits.

Electronic Devices and Circuits – EC204ES														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO 1	**PO 2**	**PO 3**	**PO4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PS O2**
C204.1	3	1	2	1	-	-	-	-	-	-	-	1	3	1
C204.2	3	1	2	1	-	-	-	-	-	-	-	1	3	2
C204.3	3	2	3	1	-	-	-	-	-	-	-	1	2	1
C204.4	3	3	3	1	-	-	-	-	-	-	-	1	2	2
C204.5	2	1	2	1	-	-	-	-	-	-	-	1	2	2
C204.6	3	3	3	1	-	-	-	-	-	-	-	1	3	2

CO No.	Course Outcomes
Electronic Devices and Circuits Laboratory – EC209ES	
C209.1	Analyze the characteristics of PN junction diode and its applications.
C209.2	Verify the characteristics of various configurations of BJT and FET devices.
C209.3	Analyze the switching characteristics of a transistor.
C209.4	Verify the characteristics of various special purpose diodes and transistors.

Electronic Devices and Circuits Laboratory – EC209ES													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C209.1	3	3	1	1	3	-	-	-	-	-	-	-	1	1
C209.2	3	3	3	1	3	-	-	-	-	-	-	-	2	1
C209.3	3	3	1	1	3	-	-	-	-	-	-	-	1	1
C209.4	3	3	3	1	3	-	-	-	-	-	-	-	2	1

II Year and I Semester

CO No.	Course Outcomes
Analog Circuits – EC302PC	
C302.1	Apply the biasing and stabilization techniques for the bipolar junction transistor and FET.
C302.2	Explore different types of single and multistage BJT amplifiers.
C302.3	Analyze the small signal model of various FET Amplifiers.
C302.4	Derive high frequency transistor parameters using hybrid pi model.
C302.5	Examine the characteristics of different Feedback Amplifiers.
C302.6	Design various sinusoidal oscillator circuits for given frequencies.

Analog Circuits – EC302PC													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C302.1	3	2	3	2	-	-	-	-	-	-	-	1	3	2
C302.2	3	3	3	3	-	-	-	-	-	-	-	1	3	2
C302.3	3	3	3	3	-	-	-	-	-	-	-	1	3	2
C302.4	3	2	3	1	-	-	-	-	-	-	-	1	3	2
C302.5	3	3	3	3	-	-	-	-	-	-	-	1	3	2
C302.6	3	2	3	2	-	-	-	-	-	-	-	1	3	2

CO No.	Course Outcomes
Digital Logic Design – EC304PC	
C304.1	Apply the concepts of number systems and codes in digital system design.
C304.2	Minimize Boolean expressions using various techniques
C304.3	Compare various characteristics of logic families.
C304.4	Realize combinational logic circuits for given specifications
C304.5	Design sequential circuits and state machines
C304.6	Realize logic circuits using programmable logic devices

Digital Logic Design – EC304PC													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C304.1	3	2	2	-	-	-	-	-	-	-	-	2	3	2
C304.2	3	3	2	1	-	-	-	-	-	-	-	2	3	2
C304.3	3	3	3	2	-	-	-	-	-	-	-	1	2	3
C304.4	3	3	3	1	-	-	-	-	-	-	-	2	3	1
C304.5	3	3	3	1	-	-	-	-	-	-	-	2	3	1
C304.6	3	3	3	2	-	-	-	-	-	-	-	2	3	3

CO No.	Course Outcomes
Signals and Systems – EC305PC	
C305.1	Analyze the Orthogonality of real and complex signals
C305.2	Determine the Spectral characteristics of Periodic and Aperiodic continuous signals
C305.3	Analyze the signal transmission through linear time invariant systems
C305.4	Apply the concepts of correlation for removal of noise
C305.5	Analyze continuous and discrete-time signals and systems using Laplace & Z Transforms respectively
C305.6	Illustrate the need for sampling theorem for analog to digital signal conversion

Signals and Systems – EC305PC													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C305.1	3	2	2	2	-	-	-	-	-	-	-	1	3	-
C305.2	3	2	2	2	-	-	-	-	-	-	-	1	2	-
C305.3	3	2	2	2	-	-	-	-	-	-	-	1	3	-
C305.4	3	2	2	1	-	-	-	-	-	-	-	1	2	-
C305.5	3	1	2	2	-	-	-	-	-	-	-	1	3	-
C305.6	3	2	2	1	-	-	-	-	-	-	-	1	2	-

CO No.	Course Outcomes
Analog Circuits Laboratory – EC306PC	
C306.1	Design amplifiers with required Q point.
C306.2	Examine the frequency response of CE amplifier for low and high frequencies.
C306.3	Analyze the frequency response of multistage and feedback amplifiers
C306.4	Design and verify the Colpitts and RC phase shift Oscillators for a given frequency.

Analog Circuits Laboratory – EC306PC													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C306.1	3	3	3	2	3	-	-	-	-	-	-	-	2	1
C306.2	3	3	2	2	3	-	-	-	-	-	-	-	2	1
C306.3	3	3	2	2	3	-	-	-	-	-	-	-	2	1
C306.4	3	3	3	2	3	-	-	-	-	-	-	-	1	1

CO No.	Course Outcomes
Digital Logic Design Laboratory – EC307PC	
C307.1	Realize different combinational circuits using gates
C307.2	Implement Boolean functions using combinational building blocks
C307.3	Design and verify sequential circuits and state machines using flip flops
C307.4	Realize all logic gates using DTL and TTL logic families

Digital Logic Design Laboratory – EC307PC													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C307.1	3	3	3	2	2	-	-	-	-	-	-	2	1	3
C307.2	3	3	3	2	2	-	-	-	-	-	-	2	1	3
C307.3	3	3	3	3	2	-	-	-	-	-	-	2	1	3
C307.4	3	3	3	1	2	-	-	-	-	-	-	2	1	1

CO No.	Course Outcomes
Basic Simulation Laboratory – EC308PC	
C308.1	Perform various operations on signals
C308.2	Verify the properties of LTI system and its response for different inputs.
C308.3	Analyse the signals and systems using various transforms
C308.4	Verify the application of convolution and correlation in signal analysis

Basic Simulation Laboratory – EC308PC													
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C308.1	3	1	-	1	3	-	-	-	-	-	-	1	1	-
C308.2	3	2	-	2	3	-	-	-	-	-	-	1	2	-
C308.3	3	2	-	2	3	-	-	-	-	-	-	2	2	-
C308.4	3	2	-	2	3	-	-	-	-	-	-	2	2	-

II Year and II Semester

CO No.	Course Outcomes
Probability Theory and Stochastic Processes (EC401PC)	
C401.1	Apply the basic concepts, theorems related to probability and its applications
C401.2	Analyze various distribution and density functions of a random variable.
C401.3	Perform operations on single and multiple random variables for information retrieval
C401.4	Estimate the statistical parameters of a random process in time domain.
C401.5	Estimate the spectral characteristics of a random process.
C401.6	Summarise various types of noise and its impact on system performance

Probability Theory and Stochastic Processes (EC401PC)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C401.1	3	3	1	2	1	1	1					1	1	
C401.2	3	3	3	3	1	2	2					2	2	
C401.3	3	3	3	3	2	2	2					2	2	
C401.4	3	3	3	3	2	2	2					2	2	
C401.5	3	3	3	3	2	2	2					2	2	
C401.6	3	3	3	3	2	2	2					2	2	

CO No.	Course Outcomes
Electromagnetic Fields and Transmission Lines (EC402PC)	
C402.1	Apply the laws of electrostatics for different types of charge distributions.
C402.2	Understand the principles of steady magnetic field.
C402.3	Analyze boundary conditions using Maxwell's equations at different media interfaces.
C402.4	Solve the Maxwell's equations of Time Varying fields and obtain the wave phenomenon in various media.
C402.5	Analyze the Wave Equations and classify conductors, dielectrics and evaluate the UPW Characteristics for several practical media of interest.
C402.6	Analyze the Design aspect of transmission line parameters and configurations.

Electromagnetic Fields and Transmission Lines (EC402PC)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C402.1	3	3	1	2	1	1	1					1	1	
C402.2	3	3	3	3	1	2	2					2	2	
C402.3	3	3	3	3	2	2	2					2	2	
C402.4	3	3	3	3	2	2	2					2	2	
C402.5	3	3	3	3	2	2	2					2	2	
C402.6	3	3	3	3	2	2	2					2	2	

CO No.	Course Outcomes
Analog and Digital Communications (EC403PC)	
C403.1	Analyze various modulation/demodulation techniques of amplitude modulation.
C403.2	Explain various modulation/demodulation techniques of angle modulation.
C403.3	Explain different types of pulse analog modulation techniques.
C403.4	Classify various types of transmitters and receivers used in AM and FM.
C403.5	Explain various pulse code modulation techniques.
C403.6	Analyze various digital modulation/demodulation techniques and source codes.

Analog and Digital Communications (EC403PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C403.1	3	3	2	2	-	-	-	-	-	-	-	1	2	-
C403.2	3	3	2	2	-	-	-	-	-	-	-	1	2	-
C403.3	3	3	2	2	-	-	-	-	-	-	-	1	2	-
C403.4	3	3	2	2	-	-	-	-	-	-	-	1	2	-
C403.5	3	3	3	2	-	-	-	-	-	-	-	1	2	-
C403.6	3	3	3	3	-	-	-	-	-	-	-	1	2	-

CO No.	Course Outcomes
Linear and Digital IC Applications (EC404PC)	
C404.1	Describe the principles of Op-Amps and derive the applications of the same.
C404.2	Analyse IC 555 timer and its applications
C404.3	Choose the appropriate ADC and DAC in real life applications
C404.4	Design combinational logic circuits for various applications using ICs
C404.5	Design sequential logic circuits for simple applications using ICs
C404.6	Illustrate the architectural features and programming technologies of various FPGAs

Linear and Digital IC Applications (EC404PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C404.1	3	2	2	2	-	-	-	-	-	-	-	2	3	2
C404.2	3	3	2	1	-	-	-	-	-	-	-	2	3	2
C404.3	3	3	3	2	-	-	-	-	-	-	-	1	2	3
C404.4	3	3	3	2	-	-	-	-	-	-	-	2	3	2
C404.5	3	3	3	2	-	-	-	-	-	-	-	2	2	2
C404.6	3	3	2	1	-	-	-	-	-	-	-	2	3	3

CO No.	Course Outcomes
Electronic Circuit Analysis (EC405PC)	
C405.1	Analyze different types of power amplifiers forgiven specifications.
C405.2	Design various types of tuned amplifiers for specific applications.
C405.3	Design different multivibrators using transistors.
C405.4	Optimize time base waveform generators.
C405.5	Apply the concepts of synchronization and frequency division in relaxation and sweep circuits.
C405.6	Illustrate the operation, types, and pedestal removal of sampling gates.

Electronic Circuit Analysis (EC405PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C405.1	2	1	1	1								1	2	1
C405.2	3	3	3	2								1	2	1
C405.3	3	3	2	3			2					2	2	1
C405.4	2	2	2	1		2	2						1	1
C405.5	2	2	2	1		2	2						1	1
C405.6	2	2	2	1		2	2						2	1

CO No.	Course Outcomes
Analog and Digital Communications Laboratory (EC406PC)	
C406.1	Analyze the spectrum of various analog modulation/demodulation techniques.
C406.2	Understand multiplexing and demultiplexing using FDM.
C406.3	Examine various pulse modulation/demodulation techniques.
C406.4	Analyze different digital modulation/demodulation schemes

Analog and Digital Communications Laboratory (EC406PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C406.1	3	2	2	2	3	-	-	-	-	-	-	1	2	-
C406.2	3	2	2	3	3	-	-	-	-	-	-	1	2	-
C406.3	3	2	2	3	2	-	-	-	-	-	-	1	2	-
C406.4	3	2	2	2	2	-	-	-	-	-	-	1	2	-

CO No.	Course Outcomes
Linear and Digital IC Applications Laboratory (EC407PC)	
C407.1	Design analog circuits for practical applications using Op Amp IC-741.
C407.2	Design multi vibrators using IC555 and Schmitt trigger using IC741
C407.3	Design waveform generators, ADC and DAC.
C407.4	Design combinational and sequential circuits using digital ICs.

Linear and Digital IC Applications Laboratory (EC407PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C407.1	2	1	3	3	3	-	-	-	-	-	-	2	2	3
C407.2	1	2	2	2	3	-	-	-	-	-	-	1	2	2
C407.3	2	1	2	3	3	-	-	-	-	-	-	2	3	3
C407.4	1	2	3	3	3	-	-	-	-	-	-	3	2	2

CO No.	Course Outcomes
Electronic Circuit Analysis Laboratory (EC408PC)	
C408.1	Design and verify power amplifiers and find efficiency.
C408.2	Design and verify tuned amplifiers and find Q-factor.
C408.3	Design and verify different Multivibrators.
C408.4	Verify the operation of sampling gates and sweep generators

Electronic Circuit Analysis Laboratory (EC408PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C408.1	3	3	3	2	3							1	2	1
C408.2	3	3	3	2	3							1	2	1
C408.3	3	3	3	3	3		2					2	1	1
C408.4	3	2	3	3	3	2	2					3	1	1

III Year I Semester

CO No.	Course Outcomes
Microcontrollers (EC501PC)	
C501.1	Differentiate architectural features and modes of operation of 8086 microprocessor and 8051 microcontrollers.
C501.2	Summarize the addressing modes, instruction set and assembler directives of 8086 Microprocessor and 8051 Micro controller.
C501.3	Write assembly language programs for 8086 Microprocessor and 8051 Microcontroller.
C501.4	Explore serial communication standards and interface various peripheral devices, memory with 8051 microcontrollers.
C501.5	Analyze the architectural features and instruction set of ARM processor
C501.6	Describe the architectural feature of CORTEX and OMAP processors

Microcontrollers (EC501PC)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C501.1	3	3	3	2	1						1	3	3	3
C501.2	3	3	2						1		2	2	3	3
C501.3	3	3	2	2					2			3	3	3
C501.4	3	3	2	2	2	2	2	1	2	2	2	2	2	2
C501.5	3	3	2	2	2							2	2	2
C501.6	3	3	2	2	2							2	2	2

CO No.	Course Outcomes
Antennas and Wave Propagation (EC502PC)	
C502.1	Understand the fundamental antenna parameters involved in designing antennas.
C502.2	Examine the radiation pattern of linear wire antennas.
C502.3	Analyze the geometric characteristics of different antenna types.
C502.4	Create varied antenna arrays to optimize gain in the desired direction.
C502.5	Evaluate antenna performance by measuring antenna parameters.
C502.6	Investigate the attributes of wave propagation in diverse atmospheric layers.

Antennas and Wave Propagation (EC502PC)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C502.1	3	3	3	3			1					2	2	
C502.2	3	3	3	3		1	1					2	2	
C502.3	3	3	3	3	2	1	1					2	2	
C502.4	3	3	3	3	1	1	1					2	2	
C502.5	3	3	3	3	2	1	1					2	2	
C502.6	3	3	3	3			1					2	2	

CO No.	Course Outcomes
Control Systems (EC503PC)	
C503.1	Evaluate the types of control systems for real time applications.
C503.2	Compute transfer function of a system by different techniques.
C503.3	Evaluate the time response of systems for standard input signals.
C503.4	Probe the stability of a system using time and frequency domain approach
C503.5	Examine the performance of systems with compensators and controllers
C503.6	Construct state models for continuous & discrete time systems and Comment on controllability and observability of the system

Control Systems (EC503PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C503.1	3	3	2	2								2	2	
C503.2	3	3	2	2									2	
C503.3	2	2	2	1								2	2	
C503.4	3	2	2	2								1	2	
C503.5	3	2	2	1								1	2	
C503.6	3	2	2	1								2	2	

CO No.	Course Outcomes
Computer Organization and Operating Systems (EC511PE)	
C511.1	Implement Micro-operations in Design, Organization and Architecture of a basic computer.
C511.2	Design a suitable Control unit for a decided set of Instructions
C511.3	Implement data transfer with appropriate IO Interface and Interrupt mechanism
C511.4	Choose suitable type of Memory for a given purpose and appropriately manage it
C511.5	Handle the deadlocks efficiently.
C511.6	Implement efficient File Management techniques through System Calls.

Computer Organization and Operating Systems (EC511PE)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C511.1	2	1	3	2	1	1			2		1	2		
C511.2	2	1	2	1		1	1		1		1	1		
C511.3		1	2	1					1			1		
C511.4			1	1								1		
C511.5	1	1	1	1								1		
C511.6		1	1	1										

CO No.	Course Outcomes
Data Communications and Computer Networks (EC512PE)	
C512.1	Understand the basics of communication and computer networks.
C512.2	Analyze various link and access control mechanisms in the data link layer.
C512.3	Design subnets and calculate the IP addresses to fulfill the network requirements of an organization.
C512.4	Apply various routing algorithms for best effort delivery service.
C512.5	Choose appropriate transport layer protocol for reliable/unreliable communication.
C512.6	Analyze the features and operations of various application layer protocols.

Data Communications and Computer Networks (EC512PE)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C512.1	1	2	2	3	2	1	1	1	2	1	2	1	3	2
C512.2	2	2	3	3	1	1	-	1	1	1	3	2	2	3
C512.3	2	2	2	3	2	1	-	-	-	1	1	1	3	2
C512.4	2	3	3	3	3	1	1	2	2	2	3	2	3	3
C512.5	1	3	2	3	1	2	1	1	1	1	2	2	2	2
C512.6	2	2	2	2	1	1	-	-	-	-	1	1	2	1

CO No.	Course Outcomes
Electronic Measurements and Instrumentation (EC513PE)	
C513.1	Illustrate the characteristics and operating principles of measuring systems.
C513.2	Summarize the construction and operation of various Wave Analyzers and Signal generators.
C513.3	Analyse the working principles and applications of different types of Oscilloscopes
C513.4	Utilise transducers to compute various electrical parameters.
C513.5	Measure R, L and C values using different bridge circuits.
C513.6	Make use of measuring devices to measure different physical parameters

Electronic Measurements and Instrumentation (EC513PE)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C513.1	3	1	1										1	
C513.2	3	3	2				1			1			1	
C513.3	3	2	2	2						1			1	
C513.4	3	3	3	1									1	
C513.5	3	2	1	1			1						1	1
C513.6	3	2	1	1			1						1	1

CO No.	Course Outcomes
Artificial Intelligence (EC514PE)	
C514.1	Identify suitable search agents for problem solving.
C514.2	Apply adversarial search techniques on various problem domains.
C514.3	Make use of mathematical logic for knowledge representation and inference mechanism.
C514.4	Construct real knowledge bases in various domains.
C514.5	Define the problem of planning in deterministic, fully observable and static environments.
C514.6	Apply Probabilistic Reasoning under uncertainty.

Artificial Intelligence (EC514PE)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C514.1	3	3	3	3	2	3	2	1	2	2	3	3	3	3
C514.2	3	3	3	3	2	3	2		1	1	2	3	3	2
C514.3	3	2	3	3	2	2	1	1	2	3	1	2	3	2
C514.4	3	3	3	2	2	2	2		2	3	2	1	2	1
C514.5	3	2	2	3	1			1		1		1	2	1
C514.6	2	3	2	1					2	1		2	1	1

CO No.	Course Outcomes
Advanced Communication Laboratory (EC506PC)	
C506.1	Analyze the radiation patterns of different antennas.
C506.2	Generate different types of signals.
C506.3	Analyze different digital modulation and demodulation schemes.
C506.4	Examine various coding techniques

Advanced Communication Laboratory (EC506PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C506.1	3	2	1	1	3	1			1	1		1	1	
C506.2	3	2	1	1	3	1			1	1		1	1	
C506.3	3	2	1	1	3	1			1	1		1	1	
C506.4	3	2	1	1	3	1			1	1		1	1	

CO No.	**Course Outcomes**
Microcontrollers Laboratory (EC507PC)	
C507.1	Develop 8086 assembly language programs using macro assembler.
C507.2	Build 8051 assembly language programs for simple arithmetic and logical operations and verify using Keil IDE.
C507.3	Write assembly language programs to configure various peripheral devices using 8051 kits.
C507.4	Interface various input/output devices to ARM Cortex M3 processor using development board and GNU toolchain.

Microcontrollers Laboratory (EC507PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C507.1	3	3	3	2	3	2	1		2	2	2	2	3	3
C507.2	3	3	3	2	3	2	1		2	2	2	2	3	3
C507.3	3	3	3	2	3	2	1		2	2	2	2	3	3
C507.4	3	3	3	2	3	2	1		2	2	2	2	3	3

III Year-II Semester

CO No.	Course Outcomes
IoT Architectures and Protocols (EC601PC)	
C601.1	Articulate the concept of IoT, its architectures and functional stacks
C601.2	Explore different sensing and actuation elements in IoT.
C601.3	Interpret the transition from Machine-to-Machine (M2M) to IoT
C601.4	Understand the data link and network layer protocols for diverse IoT networks.
C601.5	Understand the Transport, Session and service layer protocols for diverse IoT networks.
C601.6	Acquire knowledge on the role of Security in IoT protocols.

IoT Architectures and Protocols (EC601PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C601.1	3	-	1	1	-	-	-	-	-	-	-	-	1	1
C601.2	3	-	1	1	-	1	-	-	-	-	-	-	1	1
C601.3	3	2	1	1	-	1	-	-	-	-	-	-	1	1
C601.4	3	2	-	1	-	-	-	-	-	-	-	-	1	1
C601.5	3	2	-	1	-	-	-	-	-	-	-	-	1	1
C601.6	3	2	-	1	-	-	-	-	-	-	-	-	1	1

CO No.	Course Outcomes
Digital Signal Processing (EC602PC)	
C602.1	Determine the behavior of LTI systems by solving difference equation
C602.2	Analyze digital signals in frequency domain using DFS and DFT
C602.3	Compute DFT using FFT algorithms
C602.4	Design and implement IIR and FIR digital filters
C602.5	Understand the concepts of multi rate digital signal processing
C602.6	Analyze the effects of finite word length representation

Digital Signal Processing (EC602PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C602.1	3	3	2	3	2							1	1	
C602.2	3	3	2	2	2							1	2	
C602.3	3	3	1	2	2							1	1	
C602.4	3	3	3	2	2							2	2	
C602.5	3	3	3	2	2							2	2	
C602.6	2	2	2	2	2							2	2	

CO No.	Course Outcomes
CMOS VLSI Design (EC603PC)	
C603.1	Summarize the steps in VLSI fabrication process of different MOS Technologies
C603.2	Examine the electrical properties and models of CMOS circuits.
C603.3	Construct layouts using stick diagrams in accordance with the design rules.
C603.4	Implement complex digital logic circuits using switch logic.
C603.5	Build different VLSI subsystems using CMOS logic.
C603.6	Apply the concept of testing in fault tolerant system design.

CMOS VLSI Design (EC603PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C603.1	3								1	1		2	1	
C603.2	3	3	1	2								2	2	2
C603.3	3	3	3	2					1	1		2	2	
C603.4	3	3	3	2								2	3	2
C603.5	3	3	3	2								2	2	2
C603.6	3	3		2								2	1	1

CO No.	Course Outcomes
Digital Design through Verilog HDL (EC611PE)	
C611.1	Understand concepts of verilog HDL for designing of digital circuits
C611.2	Design low level modules as a primitive gate for higher level abstraction like RTL
C611.3	Design digital logic circuits with the use of flow charts, algorithms and truth tables
C611.4	Model the data flow level circuits and write switch level circuits
C611.5	Analyse the sequential and combinational circuits
C611.6	Enhance the concepts of sequential and concurrent statements

Digital Design through Verilog HDL (EC611PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C611.1	2	1	1	-	-	-	-	-	-	-	-	2	1	
C611.2	1	2	2	-	-	-	-	-	-	-	-	2	2	2
C611.3	1	1	2	-	-	-	-	-	-	-	-	2	2	
C611.4	2	1	1	-	-	-	-	-	-	-	-	2	3	2
C611.5	1	1	2	-	-	-	-	-	-	-	-	2	2	2
C611.6	3	3		2								2	1	1

CO No.	Course Outcomes
Cellular and Mobile Communications (EC612PE)	
C612.1	Understand various techniques that improves the efficiency of cellular communication system
C612.2	Design an effective cellular system considering the effects of co-channel and non-co-channel interferences
C612.3	Explore the factors that affect signal coverage in various contours
C612.4	Illustrate the concepts of effective frequency management and channel assignment
C612.5	Assimilate the concept of handoff mechanism and dropped call
C612.6	Understand the Concepts of Intelligent Cell

Cellular and Mobile Communications (EC612PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C612.1	2	2	1	1								2	1	
C612.2	3	3	3	3								2	2	
C612.3	3	3	3	3								2	2	
C612.4	2	3	2	2								2	2	
C612.5	2	2	1	2								2	2	
C612.6	2	1	1	1								3	2	

CO No.	Course Outcomes
Machine Learning (EC613PE)	
C613.1	Understand the basic concepts of Machine Learning Techniques.
C613.2	Evaluate various supervised, unsupervised learning algorithms with ensemble techniques.
C613.3	Apply the neural network concepts with Perceptron and Back Propagation.
C613.4	Make use of Dimensionality Reduction concepts for model building.
C613.5	Apply evolutionary computing algorithms approach for search and optimization.
C613.6	Analyze the concepts of Reinforcement Learning for building autonomous systems.

Machine Learning (EC613PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C613.1	3	3	3	3	3	3	3				3	3	3	3
C613.2	3	3	3	3	3	3	3				3	3	3	3
C613.3	3	3	3	3	3	3	3				3	3	3	3
C613.4	3	3	3	3	3	3	3				3	3	3	3
C613.5	3	3	3	3	3	3	3				3	3	3	3
C613.6	3	3	3	3	3	3	3				3	3	3	3

CO No.	Course Outcomes
Electronic Sensors (EC614PE)	
C614.1	Illustrate the characteristics and operating principles of Sensors
C614.2	Summarize the construction and operation of various Electro Mechanical Sensors.
C614.3	Analyze the working principles and applications of different Thermal Sensors
C614.4	Explore the working principles of different Magnetic Sensors
C614.5	Utilize Radiation and Electro Analytical Sensors to compute radiation and various electrical parameters.
C614.6	Make use of smart sensors to measure different physical parameters and apply them in various Fields

Electronic Sensors (EC614PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C614.1	3	1	1		1	1						1	1	
C614.2	3	3	2			1	1			1		1	1	
C614.3	3	2	2	2	1	1				1		1	1	
C614.4	3	3	3	1								1	1	
C614.5	3	2	1	1			1					1	1	1
C614.6	3	2	1	1			1					1	1	1

CO No.	Course Outcomes
Digital Signal Processing Laboratory (EC604PC)	
C604.1	Generate sinusoidal and noise waveforms using different approaches.
C604.2	Analyze Impulse and frequency response of various digital filters.
C604.3	Verify different algorithms of DSP through simulation.
C604.4	Implement various DSP algorithms in hardware.

Digital Signal Processing Laboratory (EC604PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C604.1	2	1			3				2	2		1	1	
C604.2	2	3	2	2	3				2	2		1	2	
C604.3	2	2	2	1	3				2	2		1	2	
C604.4	3	2	2	2	3				2	2		1	2	

CO No.	Course Outcomes
CMOS VLSI Design Laboratory (EC605PC)	
C605.1	Verify the functionality of digital circuits using Xilinx ISIM simulator
C605.2	Implement digital circuits on various FPGA boards using Xilinx tools
C605.3	Design layout for digital circuits and perform physical verification
C605.4	Analyze static timing, IR drop and crosstalk in digital circuit layouts

CMOS VLSI Design Laboratory (EC605PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C605.1	3	3	2	1	3			2	2	2		3	3	1
C605.2	3	3	3	2	3			2	2	2		2	2	1
C605.3	3	3	3	1	3			2	2	2		3	2	
C605.4	3	3	3	3	3			2	2	2		2	3	

CO No.	Course Outcomes
IoT Architectures and Protocols Laboratory (EC606PC)	
C606.1	Analyze integration of sensors and actuators with IoT boards.
C606.2	Establish interfaces between the sensors and processor to facilitate data transmission.
C606.3	Perform automation and processing of images using Arduino, NodeMCU, or Raspberry Pi
C606.4	Understand the application of SPI, I2C and UART communication Protocols.

IoT Architectures and Protocols Laboratory (EC606PC)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C606.1	2	2	2	2	2	2	1	-	-	-	-	-	2	2
C606.2	2	2	2	2	2	2	1	-	-	-	-	-	2	2
C606.3	2	2	2	2	2	2	1	-	-	-	-	-	2	2
C606.4	2	2	2	2	2	2	1	-	-	-	-	-	2	2

Open Elective-1 (III Yr-II Semester)

CO No.	Course Outcomes
Microcontrollers (EC600OE)	
C6EC1.1	Differentiate between microprocessors and microcontrollers in terms of architecture and functionality.
C6EC1.2	Summarize the addressing modes, instruction set and assembler directives of 8086 Microprocessor and 8051 Micro controller.
C6EC1.3	Develop programming skills in assembly language for 8086 microprocessor and 8051 microcontrollers.
C6EC1.4	Interface peripheral devices and memory with 8086 using 8255, 8257 and 8259
C6EC1.5	Implement basic hardware interfaces and connections with 8051 microcontrollers.
C6EC1.6	Interface microprocessors and microcontrollers with external devices using different communication protocols.

Microcontrollers (EC600OE)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C6EC1.1	3	3	3	2	1						1	3	3	3
C6EC1.2	3	3	2						1		2	2	3	3
C6EC1.3	3	3	2	2					2			3	3	3
C6EC1.4	3	3	2	2	2							2	2	2
C6EC1.5	3	3	2	2	2							2	2	2
C6EC1.6	3	3	2	2	2							2	2	2

CO No.	Course Outcomes
Fundamentals of IoT (EC601OE)	
C6EC2.1	Develop a clear comprehension of IoT and M2M concepts, facilitating the construction of IoT applications.
C6EC2.2	Gain expertise in programming to configure Arduino boards for various designs.
C6EC2.3	Effectively deploy python programs into Raspberry Pi boards in diverse scenarios.
C6EC2.4	Demonstrate an understanding of data handling and analytics within Software-Defined Networking (SDN).
C6EC2.5	Apply IoT concepts effectively for practical application development.
C6EC2.6	Understand the role of cloud-computing in a typical IoT system with case studies.

Fundamentals of IoT (EC601OE)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C6EC2.1	3	-	1	1	-	-	-	-	-	-	-	-	1	1
C6EC2.2	3	-	1	1	-	1	1	-	-	-	-	-	1	1
C6EC2.3	3	2	1	1	-	1	1	-	-	-	-	-	1	1
C6EC2.4	3	2	-	1	-	-	-	-	-	-	-	-	1	1
C6EC2.5	3	2	-	1	-	-	1	-	-	-	-	-	1	1
C6EC2.6	3	2	-	1	-	1	-	-	-	-	-	-	1	1

CO No.	Course Outcomes
VLSI Design (EC602OE)	
C6EC3.1	Study the steps in VLSI fabrication process for different MOS Technologies
C6EC3.2	Examine the electrical properties and models of CMOS circuits
C6EC3.3	Construct layouts using stick diagrams in accordance with the design rules.
C6EC3.4	Implement complex digital logic circuits with switch logic and CMOS dynamic logic
C6EC3.5	Build different VLSI subsystems using CMOS logic.
C6EC3.6	Explore the construction of various semiconductor memories

VLSI Design (EC602OE)														
CO	Program Outcomes (PO) and Program Specific Outcomes (PSO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C6EC3.1	3	-	-	-	-	-	-	-	1	1	-	2	1	-
C6EC3.2	3	3	1	2	-	-	-	-	-	-	-	-	2	2
C6EC3.3	3	3	3	2	-	-	-	-	1	1		2	2	-
C6EC3.4	3	3	3	2	-	-	-	-	-	-	-	2	3	2
C6EC3.5	3	3	3	2	-	-	-	-	-	-	-	2	2	2
C6EC3.6	3	3		2	-	-	-	-	-	-	-	2	1	1

IV Year I Semester

CO No.	Course Outcomes
Microwave and Optical Communications (EC701PC)	
C701.1	Analyze the characteristics of O-type and M-type tubes
C701.2	Illustrate the operation of various solid-state devices
C701.3	Explain various waveguide components and their applications.
C701.4	Estimate S-parameters of multiport junction devices
C701.5	Measure various parameters using microwave bench
C701.6	Understand an optical fiber communication system

Microwave and Optical Communications (EC701PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C701.1	3	2	1	-	-	1	1	-	-	-	-	1	1	-
C701.2	3	2	2	-	-	1	1	-	-	-	-	2	2	-
C701.3	3	3	3	1	-	1	1	-	-	-	-	2	2	-
C701.4	3	3	2	1	-	1	1	-	-	-	-	2	2	-
C701.5	3	3	2	1	-	1	1	-	-	-	-	1	2	-
C701.6	3	3	2	1	-	1	2	-	-	-	-	2	2	-

CO No.	Course Outcomes
Embedded System Design (EC711PE)	
C711.1	Distinguish the embedded systems from general purpose processing systems.
C711.2	Recommend suitable hardware for different applications of embedded systems.
C711.3	Select different types and amount of memory based on embedded system specifications.
C711.4	Explain the Embedded firmware design approaches, development languages and device drivers
C711.5	Analyze the issues and techniques of Task synchronization and communication in embedded firmware.
C711.6	Differentiate between general purpose operating systems and RTOS.

Embedded System Design (EC711PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C711.1	3	3	3	2	2	1	2	-	2	-	2	2	2	3
C711.2	3	3	3	2	2	2	3	1	3	-	2	3	3	3
C711.3	3	3	3	2	2	-	2	-	2	-	2	3	2	3
C711.4	3	2	3	2	2	1	2	-	3	2	2	3	2	2
C711.5	3	3	2	2	2	-	-	-	2	-	2	2	2	1
C711.6	3	3	3	2	2	1	1	-	2	-	1	2	2	1

CO No.	Course Outcomes
CMOS Analog IC Design (EC712PE)	
C712.1	Analyse and model MOS transistors and passive components in integrated circuits, utilizing large-signal, small-signal, and sub-threshold models.
C712.2	Design and analyse analog CMOS sub-circuits, including MOS switches, diodes, active resistors, current sources and sinks and implement current mirrors and stable voltage/current references.
C712.3	Design various CMOS amplifiers, such as differential amplifiers, Cascode amplifiers, and high-gain amplifier architectures, and understand how to optimize these designs for specific applications.
C712.4	Design CMOS operational amplifiers, including two-stage and Cascode op-amps, and apply compensation techniques to enhance stability and performance.
C712.5	Characterise and design different types of comparators, and will understand methods to enhance comparator performance and design discrete-time comparators.
C712.6	Apply theoretical knowledge to real-world design and troubleshooting scenarios, ensuring that their designs meet performance specifications and operational requirements.

CMOS Analog IC Design (EC712PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C712.1	3	3	2	2	3	1	-	-	-	-	-	-	1	-
-C712.2	3	3	3	3	3	1	1	1	2	2	1	2	1	-
C712.3	3	3	3	3	3	1	1	1	2	2	1	2	1	-
C712.4	3	3	3	3	3	1	1	1	2	2	1	2	1	-
C712.5	3	3	3	3	3	1	1	1	2	2	1	2	1	-
C712.6	3	3	3	3	3	1	1	1	2	2	1	2	1	-

CO No.	Course Outcomes
System Verilog for Verification (EC713PE)	
C713.1	Understand and apply verification processes, testbench functionality, and constrained-random stimulus generation.
C713.2	Efficiently handle built-in data types, arrays, user-defined structures, and type conversion.
C713.3	Write and execute procedural statements, tasks, functions, and manage local data storage in System Verilog.
C713.4	Separate testbench and design, control synchronous signals, and implement System Verilog assertions.
C713.5	Apply OOP principles in System Verilog, including class definition, object management, and method implementation.
C713.6	Build and optimize layered testbenches, maximize code reuse, and enhance testbench performance in simulation environments.

System Verilog for Verification (EC713PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C713.1	3	3	-	2	3	-	-	-	-	-	-	-	3	-
C713.2	3	3	3	-	3	-	-	-	-	-	-	-	2	-
C713.3	2	3	2	-	2	-	-	-	-	-	-	-	3	-
C713.4	3	2	2	-	2	-	-	-	-	-	-	-	3	-
C713.5	2	3	2	-	2	-	-	-	-	-	-	-	3	-
C713.6	3	2	2	-	2	-	-	-	-	-	-	-	2	-

CO No.	Course Outcomes
Speech Signal Processing (EC714PE)	
C714.1	Model an electrical equivalent of Speech Production system and Extract the Pitch period estimation using the autocorrelation function.
C714.2	Extract the LPC coefficients that can be used to Synthesize or compress the speech.
C714.3	Design a Homomorphic Vocoder for coding and decoding of speech.
C714.4	Enhance the speech and can design an Isolated word recognition system using HMM.
C714.5	Extract the features for Automatic speaker recognition system which can used for classification.
C714.6	Enhance of the deep learning techniques for the speech processing

Speech Signal Processing (EC714PE)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C714.1	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C714.2	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C714.3	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C714.4	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C714.5	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C714.6	3	2	1	1	-	1	-	-	-	-	-	2	2	-

CO No.	Course Outcomes
Image and Video Processing (EC721PE)	
C721.1	Explain the fundamentals of digital image processing and analyze the digital image using different image transforms.
C721.2	Apply spatial and frequency domain filtering techniques for image enhancement.
C721.3	Estimate the original image from a noisy one using different approaches in image restoration.
C721.4	Examine different types of discontinuities using image segmentation algorithms.
C721.5	Apply morphological operations, compression techniques, and basic video processing concepts on different images and videos.
C721.6	Apply deep learning techniques, including Convolutional Neural Networks (CNNs) for image processing tasks

Image and Video Processing (EC721PE)													
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C721.1	2	1	-	-	1	-	-	-	-	-	-	1	-	-
C721.2	3	3	2	2	1	1	1	-	-	-	-	2	2	-
C721.3	3	3	3	2	1	2	2	-	-	-	-	2	2	-
C721.4	3	3	3	2	1	2	2	-	-	-	-	2	2	-
C721.5	3	3	3	2	1	2	2	-	-	-	-	2	2	-
C721.6	3	3	3	2	1	2	2	-	-	-	-	2	2	-

CO No.	Course Outcomes
Coding Theory and Techniques (EC722PE)	
C722.1	Develop the ability to analyze and design error-detecting and error-correcting codes for reliable data communication and storage.
C722.2	Understand the principles of constructing and decoding linear block codes for efficient error detection and correction in digital communication systems.
C722.3	Gain knowledge to construct and implement cyclic redundancy checks and polynomial-based error-correcting codes.
C722.4	Understand the design and decoding techniques for Convolutional codes to improve transmission reliability in communication systems.
C722.5	Learn to apply iterative decoding methods and construct turbo codes for high-performance error correction.
C722.6	Acquire the skills to design and evaluate space-time coding techniques for improving reliability in wireless communication systems.

Coding Theory and Techniques (EC722PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C722.1	3	3	1	2	1	1	1	-	-	-	-	1	1	-
C722.2	3	3	3	3	1	2	2	-	-	-	-	2	2	-
C722.3	3	3	3	3	3	2	2	-	-	-	-	2	2	-
C722.4	3	3	3	3	3	2	2	-	-	-	-	2	2	-
C722.5	3	3	3	3	3	2	2	-	-	-	-	2	2	-
C722.6	3	3	3	3	3	2	2	-	-	-	-	2	2	-

CO No.	Course Outcomes
VLSI Physical Design (EC723PE)	
C723.1	apply the concepts of trade-offs, methodologies and tools to optimize physical design.
C723.2	analyze scaling methods and fabrication process challenges.
C723.3	understand innovations in interconnect technology and aggressive process projections.
C723.4	analyze fundamental graph algorithms like spanning tree, shortest path and matching.
C723.5	formulate partitioning problems for specific design styles
C723.6	analyze design-specific floorplanning problems by considering design constraints

VLSI Physical Design (EC723PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C723.1	3	3	2	-	-	-	1	-	-	2	-	1	3	2
C723.2	3	3	3	-	-	-	-	-	-	1	-	2	3	2
C723.3	3	2	3	1	-	-	1	-	-	1	-	2	3	2
C723.4	3	3	2	-	-	-	-	-	-	1	-	1	3	1
C723.5	3	3	3	-	-	-	1	-	-	2	-	1	3	2
C723.6	3	2	3	-	-	-	1	-	-	2	-	1	3	2

CO No.	Course Outcomes
Satellite Communications (EC724PE)	
C724.1	Describe the basic concepts of satellite communication and orbital mechanics.
C724.2	Analyze the functionality of various satellite subsystems.
C724.3	Design a satellite link for specified C/N
C724.4	Understand and analyze various multiple access techniques used.
C724.5	Explore about the earth station and its design.
C724.6	Analyze various parameters of LEO and GEO satellites.

Satellite Communications (EC724PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C724.1	3	2	2	-	1	-	-	-	-	-	-	2	1	-
C724.2	2	2	1	2	-	-	-	-	-	-	-	1	1	-
C724.3	3	2	2	1	-	-	-	-	-	-	-	3	2	-
C724.4	2	2	2	1	-	-	-	-	-	-	-	2	2	-
C724.5	2	2	2	1	2	-	-	-	-	-	-	2	1	-
C724.6	2	2	2	-	-	-	-	-	-	-	-	-	-	-

CO No.	Course Outcomes
Microwave and Optical Communications Laboratory (EC703PC)	
C703.1	Analyse the characterizes of microwave sources
C703.2	Measure the parameters of the various microwave components
C703.3	Analyse the characterizes of optical sources
C703.4	Measure the various parameters of the optical communication system

Microwave and Optical Communications Laboratory (EC703PC)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C703.1	3	3	1	1	-	1	-	-	-	-	-	1	1	-
C703.2	3	3	2	2	-	1	-	-	-	-	-	2	2	-
C703.3	3	3	1	1	-	1	-	-	-	-	-	1	1	-
C703.4	3	3	2	2	-	1	-	-	-	-	-	1	1	-

IV Year II Semester

CO No.	Course Outcomes
System on Chip Architecture (EC811PE)	
C811.1	understand basic building blocks of SoC like processor architecture and memory interface
C811.2	explore design aspects of processor's working and selection criteria for SoC architectures
C811.3	Comprehend variations in advanced processor architectures
C811.4	Gain the knowledge on various memory subsystem designs employed in an SoC scenario
C811.5	Perceive the optimal interconnection strategies and their customization on SoC platform
C811.6	Identify the issues related to reconfigurable processor designs

System on Chip Architecture (EC811PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C811.1	3	3	2	1	-	-	-	-	-	-	-	2	1	1
C811.2	3	3	2	2	-	-	-	-	-	-	-	2	1	1
C811.3	3	3	2	2	-	-	-	-	-	-	-	2	1	1
C811.4	3	3	2	2	-	-	-	-	-	-	-	2	1	1
C811.5	3	3	2	2	-	-	-	-	-	-	-	2	1	1
C811.6	3	3	2	1	-	-	-	-	-	-	-	2	1	1

CO No.	Course Outcomes
FPGA Architectures (EC812PE)	
C812.1	Understand various types of FPGAs to be used in complex digital system designs.
C812.2	Understand various technology mapping corresponding to the type of FPGAs
C812.3	Understand logic block functionality and impact on the design style.
C812.4	Understand various routing architectures corresponding to the type of FPGAs
C812.5	Create logic functions that realize using specific FPGA device.
C812.6	Build logic models with appropriate block selection and routing flexibility for the selected FPGA devices.

FPGA Architectures (EC812PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C812.1	3	1	1	2	-	-	1	-	-	1	-	1	3	1
C812.2	3	3	3	2	-	-	2	-	-	1	-	2	3	1
C812.3	3	2	3	1	-	-	1	-	-	1	-	2	3	1
C812.4	3	3	2	2	-	-	2	-	-	1	-	1	3	1
C812.5	3	3	3	2	-	-	1	-	-	2	-	1	3	1
C812.6	3	2	3	2	-	-	1	-	-	2	-	1	3	1

CO No.	Course Outcomes
Wireless Sensor Networks (EC813PE)	
C813.1	Explore various applications of wireless sensor networks.
C813.2	Understand various challenges in designing mobile Ad-hoc networks and sensor networks.
C813.3	Analyse various network and datalink layer protocols developed for sensor networks.
C813.4	Analyse and compare various data gathering and data dissemination methods.
C813.5	Understand wireless sensor network design principles and operating systems
C813.6	Design a sensor network environment for different types of applications

Wireless Sensor Networks (EC813PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C813.1	2	1	-	-	-	-	-	-	-	-	-	-	1	-
C813.2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C813.3	2	1	1	1	1	-	-	-	-	-	-	-	1	-
C813.4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C813.5	2	1	1	-	1	-	-	-	-	-	-	-	1	-
C813.6	2	1	1	1	1	-	-	-	-	-	-	-	1	-

CO No.	Course Outcomes
Radar Systems (EC814PE)	
C814.1	Understand Basic Operation Principles of Radar and Radar equation
C814.2	Determination of Radar Range Equation and prediction of its performance
C814.3	Understand the Principle and working mechanism of different types of RADAR (CW, FM-CW, Pulse Doppler, MTI, SAR)
C814.4	Understand and analyze Various Tracking mechanisms
C814.5	Understand phase array antennas used at the Receiver, its parameters and types of displays
C814.6	Detection of Noisy signals using matched filter and concept of non-Matched filter

Radar Systems (EC814PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C814.1	3	3	-	-	-	2	1	-	-	1	-	-	-	1
C814.2	3	2	-	-	-	2	1	-	-	1	-	-	-	1
C814.3	3	2	-	-	-	2	1	-	-	1	-	-	-	1
C814.4	3	-	-	-	-	2	1	-	-	1	-	-	-	1
C814.5	3	2	-	-	-	2	1	-	-	1	-	-	-	2
C814.6	3	1	-	-	-	2	1	-	-	1	-	-	-	2

CO No.	Course Outcomes
Testing & Testability (EC821PE)	
C821.1	Identify the need for testing and categorize the different problems involved in testing.
C821.2	Summarize types of faults and choose appropriate fault models
C821.3	Illustrate the methods for test generation in combinational circuits
C821.4	Analyze the pseudo random test pattern generation techniques using Linear Feedback Shift Registers and Cellular Automata
C821.5	Categorize DFT techniques for combinational circuits
C821.6	Illustrate the methods for test generation in sequential circuits

Testing & Testability (EC821PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C821.1	3	3	-	3	-	-	-	-	-	-	-	1	-	-
C821.2	3	3	-	3	-	-	-	-	-	-	-	1	-	-
C821.3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
C821.4	3	3	3	3	-	-	-	-	-	-	-	2	-	-
C821.5	3	3	3	3	-	-	-	-	-	-	-	2	-	-
C821.6	3	3	3	3	-	-	-	-	-	-	-	2	-	-

CO No.	Course Outcomes
Navigational Systems (EC822PE)	
C822.1	Understand the basic forms, principles, and history of navigation
C822.2	Analyze the fundamentals of GPS systems
C822.3	Explore the IRNSS/NAVIC system and compare global navigation satellite systems
C822.4	Evaluate receiver architectures and the role of antennas in navigation systems
C822.5	Explain the principles of inertial navigation
C822.6	Integrate knowledge of navigation systems for real-world applications

Navigational Systems (EC822PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C822.1	3	2	1	1	-	-	-	-	-	-	-	2	1	-
C822.2	3	2	1	2	-	-	-	-	-	-	-	2	1	-
C822.3	3	2	1	2	-	-	-	-	-	-	-	2	2	-
C822.4	3	2	1	2	-	-	-	-	-	-	-	2	2	-
C822.5	3	2	1	2	-	-	-	-	-	-	-	2	1	-
C822.6	3	2	1	2	-	-	-	-	-	-	-	1	1	-

CO No.	Course Outcomes
5G and beyond Communications (EC823PE)	
C823.1	Outline the concept of MIMO communication system related to 5G technology.
C823.2	Illustrate the Concepts, Challenges and Standards of 5G
C823.3	Analyze the SMNAT architecture and Implementation
C823.4	Explain the radio wave propagation of mm waves, channel effects and Channel models
C823.5	Understand the higher layer design considerations for mm Wave
C823.6	Explore Security issues and challenges of future mobile technologies

5G and beyond Communications (EC823PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C823.1	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C823.2	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C823.3	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C823.4	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C823.5	3	2	1	1	-	1	-	-	-	-	-	2	2	-
C823.6	3	2	1	1	-	1	-	-	-	-	-	2	2	-

CO No.	Course Outcomes
Low Power VLSI Design (EC824PE)	
C824.1	Summarize various sources of power dissipation in low power circuits
C824.2	Illustrate the need for low power circuit design and analyze the effects of short channel
C824.3	Categorize the special techniques to mitigate the power consumption in VLSI circuits
C824.4	Analyze the architectural approaches to design low power, low voltage adder and multiplier circuits
C824.5	Interpret the performance of low power, low voltage memory architectures
C824.6	Compare different technology trends for low voltage low power logic styles

Low Power VLSI Design (EC824PE)														
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C824.1	3	1	1	-	-	-	-	-	-	-	-	-	-	-
C824.2	3	3	3	3	2	-	-	-	-	-	-	1	-	-
C824.3	3	3	3	3	2	-	-	-	-	1	-	1	2	-
C824.4	3	2	3	1	1	-	-	-	-	-	-	1	2	-
C824.5	3	2	3	1	1	-	-	-	-	-	-	1	2	-
C824.6	3	1	1	-	-	-	-	-	-	-	-	2	-	-

Open Electives

CO No.	Course Outcomes
Electronics Sensors (EC700OE)	
C700OE.1	Illustrate the characteristics and operating principles of Sensors
C700OE.2	Summarize the construction and operation of various Electro Mechanical Sensors.
C700OE.3	Analyze the working principles and applications of different Thermal Sensors
C700OE.4	Explore the working principles of different Magnetic Sensors
C700OE.5	Utilize Radiation and Electro Analytical Sensors to compute radiation and various electrical parameters.
C700OE.6	Make use of smart sensors to measure different physical parameters and apply them in various Fields

Electronics Sensors (EC700OE)												
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C700OE.1	3	1	1	-	1	1		-	-	-	-	1
C700OE.2	3	3	2	-	-	1	1	-	-	1	-	1
C700OE.3	3	2	2	2	1	1		-	-	1	-	1
C700OE.4	3	3	3	1	-	-		-	-	-	-	1
C700OE.5	3	2	1	1	-	-	1	-	-	-	-	1
C700OE.6	3	2	1	1	-	-	1	-	-	-	-	1

CO No.	Course Outcomes
Digital Image Processing (EC701OE)	
C701OE.1	Explain the fundamentals of digital image processing
C701OE.2	Analyze the digital image using different image transforms
C701OE.3	Apply spatial and frequency domain filtering techniques for image enhancement
C701OE.4	Estimate the original image from a noisy one using different approaches in image restoration
C701OE.5	Examine different types of discontinuities using image segmentation algorithms
C701OE.6	Apply Morphological operations and compression techniques on different images

Digital Image Processing (EC701OE)												
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C701OE.1	3	2	1	1	1	-	-	-	-	-	-	1
C701OE.2	3	3	2	2	1	-	-	-	-	-	-	1
C701OE.3	3	3	3	3	2	-	-	-	-	-	-	2
C701OE.4	3	3	3	2	2	-	-	-	-	-	-	2
C701OE.5	3	3	3	2	3	-	-	-	-	-	-	2
C701OE.6	3	3	3	2	3	-	-	-	-	-	-	2

CO No.	Course Outcomes
Principles of Communications (EC702OE)	
C702OE.1	Understand the need of modulation and distinguish various modulation techniques.
C702OE.2	Analyze the performance of modulation schemes in time and frequency domains.
C702OE.3	Demonstrate the principles of satellite communication systems.
C702OE.4	Understand the principles and components of optical communication and real-world applications.
C702OE.5	Understand telecommunication systems and networking.
C702OE.6	Gain knowledge of cellular and mobile communication systems.

Principles of Communications (EC702OE)												
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C702OE.1	3	3	1	2	1	1	1	-	-	-	-	1
C702OE.2	3	3	3	3	2	2	2	-	-	-	-	2
C702OE.3	3	3	3	3	2	2	2	-	-	-	-	1
C702OE.4	3	3	3	3	2	2	2	-	-	-	-	2
C702OE.5	3	3	3	3	2	2	2	-	-	-	-	1
C702OE.6	3	3	3	3	2	2	2	-	-	-	-	2

CO No.	Course Outcomes
Electronic Measurements and Instrumentation (EC800OE)	
C800OE.1	Illustrate the characteristics and operating principles of measuring systems.
C800OE.2	Summarize the construction and operation of various Wave Analysers and Signal generators.
C800OE.3	Analyse the working principles and applications of different types of Oscilloscopes
C800OE.4	Utilise transducers to compute various electrical parameters.
C800OE.5	Measure R, L and C values using different bridge circuits.
C800OE.6	Make use of measuring devices to measure different physical parameters

Electronic Measurements and Instrumentation (EC800OE)												
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C800OE.1	3	1	1	-	-	-	-	-	-	-	-	-
C800OE.2	3	3	2	-	-	-	1	-	-	1	-	-
C800OE.3	3	2	2	2	-	-	-	-	-	1	-	-
C800OE.4	3	3	3	1	-	-	-	-	-	-	-	-
C800OE.5	3	2	1	1	-	-	1	-	-	-	-	-
C800OE.6	3	2	1	1	-	-	1	-	-	-	-	-

CO No.	Course Outcomes
Embedded System Design (EC801OE)	
C801OE.1	Distinguish the embedded systems from general purpose processing systems.
C801OE.2	Recommend suitable hardware for different applications of embedded systems.
C801OE.3	Select different types and amount of memory based on embedded system specifications.
C801OE.4	Explain the Embedded firmware design approaches, development languages and device drivers
C801OE.5	Analyze the issues and techniques of Task synchronization and communication in embedded firmware.
C801OE.6	Differentiate between general purpose operating systems and RTOS.

Embedded System Design (EC801OE)												
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C801OE.1	3	3	3	2	2	1	2	-	2	-	2	2
C801OE.2	3	3	3	2	2	2	3	1	3	-	2	3
C801OE.3	3	3	3	2	2	-	2	-	2	-	2	3
C801OE.4	3	2	3	2	2	1	2	-	3	2	2	3
C801OE.5	3	3	2	2	2	-	-	-	2	-	2	2
C801OE.6	3	3	3	2	2	1	1	-	2	-	1	2

CO No.	Course Outcomes
FPGA based System Design (EC802OE)	
C802OE.1	Understand and apply FPGA-based system design concepts and VLSI technology.
C802OE.2	Analyze and compare different FPGA architectures and circuit designs.
C802OE.3	Design and implement combinational logic using HDLs for FPGA applications.
C802OE.4	Develop and optimize sequential circuits with clocking and performance analysis.
C802OE.5	Design FPGA-based architectures using pipelining, scheduling, and power optimization.
C802OE.6	Apply FPGA design methodologies for verification and implementation in real-world applications.

FPGA based System Design (EC802OE)												
CO	**Program Outcomes (PO) and Program Specific Outcomes (PSO)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C802OE.1	3	2	2	1	3	-	2	-	-	2	-	2
C802OE.2	3	3	2	2	3	-	-	-	-	2	-	2
C802OE.3	3	3	3	2	3	-	-	-	-	2	2	2
C802OE.4	3	3	3	2	3	-	2	-	-	2	2	2
C802OE.5	3	3	3	2	3	2	3	-	-	2	3	2
C802OE.6	3	3	3	3	3	2	3	-	2	3	3	3