VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

ACCREDITED BY NAAC WITH 'A++' GRADE
Ibrahimbagh, Hyderabad-31
Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored
by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SCHEME OF INSTRUCTION AND SYLLABI UNDER CBCS FOR
B.E. (ECE) VII and VIII Semesters
With effect from 2024-25
(For the batch admitted in 2021-22)
(R-21)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Phones: +91-40-23146040, 23146041
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Institute Vision

Striving for a symbiosis of technological excellence and human values

Institute Mission

To arm young brains with competitive technology and nurture holistic development of the individuals for a better tomorrow

Department Vision

Striving for excellence in teaching, training and research in the areas of Electronics and Communication Engineering and fostering ethical values

Department Mission

To inculcate a spirit of scientific temper and analytical thinking and train the students in contemporary technologies in Electronics and Communication Engineering to meet the needs of the industry and society with ethical values

B.E (ECE) Program Educational Objectives (PEO's)	
PEO I	Graduates will be able to identify, analyze and solve engineering problems.
PEO II	Graduates will be able to succeed in their careers, higher education, and research.
PEO III	Graduates will be able to excel individually and in multidisciplinary teams to solve industry and societal problems.
PEO IV	Graduates will be able to exhibit leadership qualities and lifelong learning skills with ethical values.

B.E. (ECE) PROGRAM OUTCOMES (PO's) Engineering Graduates will be able to:	
PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.
PO4	Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Lifelong learning: Recognize the need, and for have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

B.E (ECE) PROGRAM SPECIFIC OUTCOMES (PSO's)	
PSO I	ECE students will be able to analyze and offer circuit and system level solutions for complex electronics engineering problems, keeping in mind the latest technological trends.
PSO II	ECE students will be able to apply the acquired knowledge and skills in modeling and simulation of communication systems.
PSO III	ECE students will be able to implement signal and image processing techniques for real time applications.

With effect from the academic year 2024-25

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS) :: IBRAHIMBAGH, HYDERABAD – 500 031.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION **(R-21)** :: B.E. - ECE : SEVENTH SEMESTER (2024 - 25)

B.E (ECE) VII - Semester								
Course Code	**Name of the Course**	**Scheme of Instruction**			**Scheme of Examination**			**Credits**
		Hours per Week			**Duration in Hrs**	**Maximum Marks**		
		L	**T**	**P**		**SEE**	**CIE**	
THEORY								
U21PC710EC	Microwave Engineering	3	1	-	3	60	40	4
U21PC720EC	VLSI Design	3	1	-	3	60	40	4
U21PE7XXEC	Professional Elective – I	3	-	-	3	60	40	3
U21PE7XXEC	Professional Elective – II	3	-	-	3	60	40	3
PRACTICALS								
U21PC711EC	Microwave Engineering Lab	-	-	2	3	50	30	1
U21PC721EC	VLSI Design Lab	-	-	2	3	50	30	1
U21PE7XXEC	Professional Elective – I Lab	-	-	2	3	50	30	1
U21PE7XXEC	Professional Elective – II Lab	-	-	2	3	50	30	1
U21PW719EC	Project Seminar	-	-	2	-	-	30	1
TOTAL		**12**	**2**	**10**	**-**	**440**	**310**	**19**
GRAND TOTAL		**24**				**750**		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Microwave Engineering

SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:1:0	SEE Marks : 60	Course Code: **U21PC710EC**
Credits : 4	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Analyze the field components of waveguides 2. Understand the characteristics of Microwave sources and components	On completion of the course, students will be able to 1. Anlayze the E and H fields components of parallel and rectangular waveguides. 2. Describe the characteristics and applications of circular waveguides and cavity resonators. 3. Analyze the scattering parameters of microwave components. 4. Demonstrate the characteristics of Microwave sources. 5. Describe the characteristics of microwave solid-state devices.

CO-PO/PSO Mapping

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

UNIT-I :

Guided waves: Propagation of TE, TM and TEM waves between parallel planes. Velocity of propagation, wave impedance, attenuation in parallel plane guides.

UNIT-II:

Wave Guides: TE and TM waves in rectangular waveguides, Wave Impedance, Characteristic Impedance, Attenuation in wave guides. Introduction to Circular wave guides, Cavity resonators, resonant frequency, Applications of cavity resonators. Slotted wave guide structures

UNIT-III:
Microwave Circuits and Components: Concept of Microwave circuit, Normalized voltage and currents, Introduction to scattering parameters and their properties, Reciprocal and Non-reciprocal components: E and H Plane Tees, Magic Tee Directional coupler, Attenuators, Phase Shifters, Isolators and circulators.

UNIT-IV:
Microwave Tubes: High frequency limitations of conventional tubes, Bunching and velocity modulation, mathematical theory of bunching, principles and operation of two cavity, multi cavity, Reflex Klystron. Principle and operation of magnetrons, TWT.

UNIT-V:
Microwave Solid State Devices: Principles of operation, characteristics and applications of Varactor, PIN diode, GUNN diode and IMPATT diode, Elements of strip lines and micro strip lines. Design analysis of microstrip lines.

Learning Resources:

1. Samuel Y. Liao, Microwave Devices and Circuits, 3rd ed, Pearson, 2003.
2. Edward C. Jordon, Keith G. Balmain, "Electromagnetic Waves and Radiating Systems", 2015, Pearson, 2nd Edition.
3. R.E. Collins, "Foundations of Microwave Engineering", II edition, Wiley, 2001.
4. K.C. Gupta "Microwaves", John Wiley & Sons, 2012
5. Annapurna Das, Sisir K. Das, "Microwave Engineering" Tata McGraw-Hill Education, 2000
6. https://swayam.gov.in/nd1_noc19_ee57
7. https://swayam.gov.in/nd1_noc19_ee68

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI Design

SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:1:0	SEE Marks : 60	Course Code: **U21PC720EC**
Credits : 4	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To understand the MOS fabrication technologies, electrical properties and develop layout of MOS circuits, subsystem, memory elements and perform testing.	On completion of the course, students will be able to 1 Acquire fundamental knowledge on MOSFET characteristics and its parameters 2 Analyze the fabrication process and physical design of CMOS circuits. 3 Identify the suitable basic digital building blocks in the design of digital systems. 4 Analyze the various types of memory cells. 5 Identify testing methods in VLSI Design.

CO-PO/PSO Mapping

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

UNIT-I:

Basic electrical properties of MOSFET: MOS Transistor threshold voltage, trans conductance, output conductance, Figure of merit, Body Effect, pull-up to pull-down ratio for NMOS inverter driven by another NMOS inverter/one or more pass transistors, NMOS transistor model, Sheet Resistance, Area Capacitance.

UNIT-II:

Introduction to CMOS fabrication process, Twin tub Process, latch up in CMOS circuits.

CMOS circuit physical design process: MOS Layers, Stick diagrams, Euler Path in stick diagram, Design rules, types of design rules, Layout diagrams of Basic CMOS Logic gates.

UNIT-III:

CMOS Subsystem design: Architectural issues, Carry select adder, carry save adder and Carry Skip adder, Multiplication: array multiplication, Wallace tree multiplication. Multiplexer and D Flip-Flop using Transmission gates.

UNIT-IV:

Design of Basic Memory Cells: Classifications of Memories, one and three transistor dynamic RAM cells, four transistor and six transistor Static RAM, Read only memory: Basic ROM architecture, NOR and NAND based ROM Memory Design. EPROM, EEPROM.

UNIT-V:

CMOS testing: role of testing, types of testing, functionality tests, manufacturing tests, stuck-at faults, short circuit and open circuit faults, controllability , observability, delay fault testing, level sensitive scan design, Boundary scan architecture.

Learning Resources:

1. Kamran Eshraghian, Douglas A. Pucknell, "Basic VLSI Design", PHI.
2. Introduction to VLSI circuits and Systems by John P. Uyemura, Wiley student edition.
3. Neil H.Weste, kamraneshraghan, "Principles of CMOS VLSI design", Pearson education.
4. https://nptel.ac.in/courses/108107129/
5. https://nptel.ac.in/courses/117101058/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Microwave Engineering Lab

SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 0:0:2	SEE Marks : 50	Course Code: **U21PC711EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Understand the basic characteristics of Microwave sources 2 Verify the relationship between guided wavelength and free space wavelength 3 Understand the measurement of various parameters of microwave components	On completion of the course, students will be able to 1 Describe the characteristics of microwave sources 2 Estimate the guide wave length and free space wave length 3 Measure the VSWR and impedance of unknown load 4 Determination of the scattering matrix of microwave Components/Junctions 5 Demonstrate characteristics of ferrite devices

CO-PO/PSO Mapping

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

Experiments:

1. Characteristics of Reflex Klystron oscillator
2. Characteristics of Gunn diode oscillator
3. Measurement of frequency and Guide wavelength
4. Measurement of VSWR of a given load
5. Measurement of impedance
6. Scattering matrix of a Directional coupler.
7. Scattering matrix of Waveguide Tees: E plane, H plane

8. Scattering matrix of Magic Tee.
9. Characteristics of Isolator and its scattering matrix
10. Characteristics of Circulator and its scattering matrix
11. Calibration of attenuator at a given frequency
12. Calibration of frequency meter at a given frequency

New / Additional experiments planned:

1. Characteristics of Slotted waveguide in X Band
2. Design and analysis of Microstrip Antenna Array using ADS

Mini Project(s):

Simulation and analysis of waveguide components

Learning Resources:

1. Advanced Design Software(ADS)

The break-up of CIE :

1. No. of Internal Tests	:	1
2. Max. Marks for internal tests	:	12
3. Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI Design Lab

SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 0:0:2	SEE Marks : 50	Course Code: **U21PC721EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To perform VLSI design of CMOS circuits using EDA Tools.	On completion of the course, students will be able to 1. Demonstrate the knowledge of digital circuit design flow. 2. Analyse the process of simulation of combinational sequential circuits. 3. Validate and demonstrate the results of digital circuits.

CO-PO/PSO Mapping

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

1. Characteristics of NMOS and PMOS transistors.
2. Design and simulate CMOS inverter.
3. Design and simulate two input CMOS NAND/NOR gate.
4. Design and simulate CMOS Full adder
5. Design and simulate the D-Flip Flop.
6. Simulate the dynamic memory 1 Transistor and 3 Transistor cells.
7. Simulate the static memory 6 Transistor cell.
8. Layout of CMOS inverter
9. Perform DRC and LVS of CMOS inverter
10. Perform parasitic extraction of CMOS inverter
11. Perform Post layout level simulation of CMOS inverter
12. Perform CMOS circuit testing for stuck at 1 and stuck at o faults.

New / Additional experiments planned:

1. Design and simulate 4-bit carry select adder.
2. Simulate the static memory 4 transistor SRAM memory cell.

Note:

Minimum of twelve experiments are to be conducted.

The break-up of CIE : Internal Tests + Day to day Assignments

1.	No. of Internal Tests	:	1
2.	Max. Marks for internal tests	:	12
3.	Marks for day-to-day laboratory class work	:	18

Duration of Internal Test: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Project Seminar

SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 0:0:3	SEE Marks : -	Course Code: **U21PW719EC**
Credits : 1	CIE Marks : 30	Duration of SEE : -

COURSE OBJECTIVES	COURSE OUTCOMES
Prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.	On completion of the course, students will be able to 1. To select the complex engineering problems beneficial to the society after thorough literature survey 2. To identify the modern tools for solving the problems. 3. To analyze and comprehend the experimental results 4. To communicate effectively the experimental results with report and presentation following ethics 5. To work in teams and adapt for the advanced technological changes

CO-PO/PSO Mapping

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

Note: CO1 & CO2 must be mapped with one of the relevant PSOs based on the domain of the project with 3
CO3: can be mapped to appropriate PSO with level 2

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.

Project seminar topics may be chosen by the student with advice and approval from the faculty members. Students are to be exposed to the following aspects of seminar presentation.

- Selection of Topic & Literature Survey (5M)
- Solution & Clarity in Implementation (5M)
- Modern Tool usage & Implementation (5M)
- Results and Analysis (5)
- Team Work / Report writing & Presentation with ethics (10M)

Each student is required to:

1. Submit a one-page synopsis in the beginning of the seminar talk for display on the notice board.
2. Give a 20 minutes presentation through LCD power point presentation followed by a 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled from the 3rd week of the semester to the last week of the semester and any change in schedule should be discouraged.

Students are required to submit a report on the project seminar.

- Batch size shall be 2 (or) 3 students per batch.
- Two reviews – One during 5th week and another during 10th week and final evaluation shall be conducted during 15th to 16th week.
- Students are required to give Presentations during the reviews.
- Students are required to submit project seminar report.

B.E (ECE) VII & VIII - Semester for the Academic Year 2024 – 2025
Professional Electives (R-21)
(Students can opt for all professional electives from single stream or several streams)

Professional Elective Stream	Embedded Systems and VLSI Stream		Communication Engineering Stream		Signal Processing Stream		Networking Stream	
Semester – VII								
Professional Elective – I (Theory courses)	U21PE710EC	Advanced Embedded Systems	U21PE720EC	Software Defined Radio and its Applications	U21PE730EC	Artificial Neural Networks	U21PE740EC	Voice and Data Networks
Professional Elective – I (Lab courses)	U21PE711EC	Advanced Embedded Systems Lab	U21PE721EC	Software Defined Radio and its Applications Lab	U21PE731EC	Artificial Neural Networks Lab	U21PE741EC	Voice and Data Networks Lab
Professional Elective – II (Theory courses)	U21PE750EC	IoT Architectures and Protocols	U21PE760EC	Mobile Cellular Communication	U21PE770EC	Digital Image and Video Processing	U21PE780EC	Network Security
Professional Elective – II (Lab courses)	U21PE751EC	IoT Architectures and Protocols Lab	U21PE761EC	Mobile Cellular Communication Lab	U21PE771EC	Digital Image and Video Processing Lab	U21PE781EC	Network Security Lab
Semester – VIII								
Professional Elective – III	U21PE81XEC	Real Time Systems	U21PE82XEC	Satellite Communication	U21PE83XEC	Image and Video processing using Machine Learning	U21PE84XEC	Wireless Sensor Networks
		Low Power VLSI Design		Optical Fiber Communication		Speech and Audio Signal Processing		Optical Networks
Professional Elective – IV	U21PE85XEC	FPGA Architectures and Applications	U21PE86XEC	Radar and Navigation Systems	U21PE87XEC	Adaptive Signal Processing	U21PE88XEC	Blockchain Technology and its Applications
		Industrial IoT and Applications		Global Positioning System		Biomedical Signal Processing		Network Management
				Coding Theory and Techniques		Language Models and Applications		

B.E (ECE) VII - Semester

Professional Electives

(R-21)

for the Academic Year: 2024 - 2025

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Advanced Embedded Systems

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code : **U21PE710EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Define and classify embedded system and to interpret design process and challenges. 2 Summarize the RISC concepts and describe the ARM architecture, Interpret serial and parallel bus communication protocols. 3 Describe system design and co-design issues along with various laboratory, IDE tools and design case studies.	On completion of the course, students will be able to 1 Define embedded system & describe the embedded system product design life cycle and challenges. 2 Analyse the ARM Core embedded design and construct ARM assembly programs. 3 Apply knowledge to design networked embedded systems using serial protocols. 4 Justify the importance of hardware software co-design and models involved with different embedded software architectures. 5 Acquire the knowledge of embedded IDEs to design and specify debugging techniques.

CO-PO/PSO Mapping

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

UNIT – I :

Embedded System Design: Introduction, Trends, Definition, Classifications; Embedded Product Development Life Cycle. CPU selection– hardware, software, memories, and I/O. Challenges in designing Embedded System; Design Metric of Embedded System.

UNIT - II:

ARM Processor Fundamentals: ARM Cortex-M based microcontroller architecture: ARM ISA, Memory Address Map, ARM Registers, ARM Cortex M4 Core Registers, ARM assembly programs: data transfer and branching instructions; ARM addressing modes; AMBA System Bus and Bus Matrix, Memory and Peripherals, JTAG Debug System

UNIT - III:

Embedded Networking: Embedded Networking design considerations; Embedded Networking through serial protocols: UART, I2C, SPI, CAN, IEEE1394 and USB; Porting of TCP/IP: Socket selection; HTTP client-server model.

UNIT - IV:

Hardware Software Codesign: Comparison of Co-Design Approaches; Formulation of the HW/SW scheduling, Optimization of Design Metric: Case study of Embedded Adaptive Cruise Control ECU Design.

Embedded Software Architectures: Round Robin, RR with interrupt driven, and Functional Queue architectures.

UNIT - V:

Embedded development tools: Host and Target machines, instruction packing: Endianness: Big-endian and little-endian ISA; application translation process for hardware executable: Intel and Motorola modes.

Debugging Methods: Testing on Host–Instruction set Simulators, native tools – IDEs, cross-compilers; ICE, JTAG, laboratory tools: Multi meter, CRO, Logic Analyzer & protocol sniffers.

Learning Resource:

1 Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, and Shujen Chen. 2016. "ARM Assembly Language Programming & Architecture (Volume 1)"

2 Raj Kamal. "Embedded Systems" 4th Edition 2020, McGraw Hill Education (India) Private Limited.

3 Wayne Wolf. 2008. Computers as Components, Second Edition: Principles of Embedded Computing System Design (2nd. ed.). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

4 https://onlinecourses.nptel.ac.in/noc20_cs15/preview

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Advanced Embedded Systems Lab

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 0:0:2	SEE Marks : 50	Course Code: **U21PE711EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Execute ARM assembly programs for data processing needs. 2. Design electronic systems with Cortex M4 MCUs 3. Design and Realize a System Design using embedded C with ARM Cortex M4 MCU.	On completion of the course, students will be able to 1. Implement ARM assembly data processing instructions for Cortex M4. 2. Construct programs & Validate designs using cross assembler & compiler. 3. Develop embedded C drivers for on-chip peripherals of STM32F411RE. 4. Design system level solutions with off-chip components in Proteus 5. Realize a complete system using ARM Cortex M4 with different I/Os.

CO-PO/PSO Mapping

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

List of Experiments

Cycle – 1:

1. Assembly language programs to perform arithmetic operations
2. ARM assembly to do different logical operations; CPSR flags.
3. Load & Store instructions: LDR, LDRH, LDRB, STR, STRH, STRB
4. ARM Addressing: Immediate, register & register indirect modes
5. Branching instructions of ARM: BCS, BCC, BNE, BLS, BHI
6. Unconditional Call instructions for ARM: B, BL, BX

Cycle – 2:

7. GPIO programming in embedded C for STM32F's CortexM4MCU
8. Seven segment LED display interfacing with STM32F MCU
9. I/O port programming with CortexM4 ARM Assembly
10. Interfacing a switch to STM32F and controlling the LED
11. Interfacing LCD (2x16) and development of driver for ARM
12. Keypad interface driver implementation in embedded C
13. Integration of LCD and Keypad for User Interface options in C

Hardware and Software Tools used in the Lab:

Cross Compiler	Keil µVision5 IDE
Targets	STM32F401RE (Simulation) STM32F411RE (Board) STM32F446RE (Board)
Simulation Software	Proteus 8.12 IDE
Debugger	JTAG SWI STM32

The break-up of CIE : Internal Tests + Day to day Assignments

1. No. of Internal Tests : 1
2. Max. Marks for internal tests : 12
3. Marks for day-to-day laboratory class work : 18

Duration of Internal Test: 3 Hours

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Software Defined Radio and its Applications

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs/Week): 3:0:0	SEE Marks: 60	Course Code: **U21PE720EC**
Credits: 3	CIE Marks: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course aims to provide students with a comprehensive understanding of Software Defined Radio (SDR) principles and technologies, focusing on GNU Radio, RTL-SDR, Pluto SDR, and USRP platforms. Through theoretical instruction and hands-on exercises, students will learn to use GNU Radio for signal processing tasks, explore RTL-SDR for practical applications such as spectrum analysis, delve into Pluto SDR for wireless communication implementations, and master USRP platforms for advanced SDR applications. Additionally, students will explore advanced topics and real-world applications in SDR, engage in collaborative projects, and develop practical skills to design and implement custom SDR solutions, fostering a deep understanding of SDR concepts and proficiency in utilizing SDR technologies.	On completion of the course, students will be able to 1. Analyze GNU Radio for various signal processing, and communication applications. 2. Develop the skills to set up, configure, and operate RTL-SDR devices for practical applications. 3. Implementing signal processing algorithms and communication techniques using Pluto SDR and GNU Radio. 4. Configure and interface with USRP devices using GNU Radio 5. Design and implement custom communication systems, and apply advanced signal processing techniques for SDR applications

CO-PO-PSO Mapping:

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

UNIT-I: Introduction to GNU Radio

Introduction to GNU Radio, Role of GNU Radio in SDR applications, Introduction to GNU Radio Toolkit, GNU Radio Architecture and Components, GNU Radio Companion (GRC): Basics and Workflow
Signal Processing Blocks in GNU Radio, Communication blocks in GNU Radio

UNIT-II: RTL-SDR

Software Defined Radio (SDR) concepts: benefits, limitations, block diagrams, Introduction to RTL-SDR hardware, Installation and setup of RTL-SDR software. Basic signal reception using RTL-SDR, Signal Reception Techniques with RTL-SDR, Spectrum Analysis using RTL-SDR

UNIT-III: Pluto SDR

Hardware Overview and Specifications, Setting up Pluto SDR Environment (Drivers, Firmware)

Pluto SDR Applications and Use Cases, Signal Processing with Pluto SDR, Configuring Pluto SDR with GNU Radio

UNIT-IV: USRP

USRP Hardware Overview and Specifications, Installing and Configuring USRP Drivers and Software

Advanced Signal Processing Techniques with USRP, Designing Custom Communication Systems with USRP, Setting up USRP with GNU Radio

UNIT-V:

Advanced Signal Processing Techniques in GNU Radio, Real-world SDR applications and case studies,

Digital Modulation Schemes and Demodulation Techniques, Spectrum Monitoring, Cognitive Radio

Design and Implementation of SDR Application

Learning Resources:

1. Travis F. Collins, Robin Getz, Di Pu, Alexander M. Wyglinski, "Software-Defined Radio for Engineers" Analog Devices perpetual eBook license – Artech House copyrighted material. 2018 ISBN-13: 978-1-63081-457-1
2. Marcus D. Leech. "Software Defined Radio using GNU Radio". CreateSpace Independent Publishing Platform, 2015.
3. GNU Radio Companion: The Software Defined Radio Cookbook by Andreas Jahn, Benjamin M. Klein (2010)
4. Hacking RF: Learn How to Build Software Defined Radios by Nickolas Palazzo (2016)

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Software Defined Radio and its Applications Lab

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 0:0:2	SEE Marks : 50	Course Code: **U21PE721EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To equip students with the knowledge, skills, and practical experience necessary to excel in the field of Software Defined Radio using GNU Radio, RTL-SDR, Pluto SDR, and USRP platforms. Through hands-on experimentation, collaborative projects, and critical analysis, students will develop a deep understanding of SDR principles and applications.	On completion of the course, students will be able to 1 Design and implement SDR applications using GNU Radio Companion (GRC). 2 Configure RTL-SDR devices, capture radio signals, and perform spectrum analysis using GNU Radio 3 Implementing wireless communication and signal processing applications using Pluto SDR 4 Implementing signal processing algorithms, and performing real-time spectrum analysis using USRP.

CO-PO/PSO Mapping

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

Experiments:

1. Generating and Visualizing Signals using GNU Radio
2. Implement an amplitude modulation (AM) transmitter and receiver using GNU Radio blocks.
3. BPSK (Binary Phase Shift Keying) Modulation and Demodulation using GNU Radio blocks.
4. QPSK (Quadrature Phase Shift Keying) Modulation and Demodulation using GNU Radio blocks.

5. Design of Digital filter for removing of noise
6. Design of Signal Recording and Playback
7. Receiving and Demodulating FM Radio Signals using RTL SDR
8. Exploring the Radio Spectrum using RTL SDR
9. Design of FM transmitter and using Pluto SDR
10. Experiment with different modulation schemes and observe the impact on communication performance using Pluto SDR
11. Implement a frequency-shift keying (FSK) transmitter and receiver using USRP.
12. Experiment with different modulation schemes and observe the impact on communication performance using USRP

New / Additional experiments planned:

1. Implement a simple OFDM transmitter by dividing the data stream into subcarriers using a Packet Packer block.
2. Implement a DTMF decoder in GNU Radio to identify the dialled digits based on the received frequencies.
3. Software Defined Radio (SDR) for GSM Signal Analysis using Pluto SDR.
4. Implement a real-time spectrum analyzer using USRP and GNU Radio for spectrum monitoring applications.

Mini Project(s):

Capture LoRa packets used in various IoT applications.

Learning Resources:

1. GNU radio

The break-up of CIE :

1.	No. of Internal Tests	:	1
2.	Max. Marks for internal tests	:	12
3.	Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Artificial Neural Networks

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE730EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To acquire knowledge on Neural networks and its applications.	On completion of the course, students will be able to 1 Interpret basics of Neural Networks. 2 Apply activation functions. 3 Apply Feed forward neural networks. 4 Apply Feedback Neural Networks. 5 Design Neural Network Models for various applications.

CO-PO/PSO Mapping

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

UNIT – I

Basics of Neural Networks: Characteristics of Neural Networks, Artificial Neural Networks Terminology, Models of Neuron, Topology, Basic Learning Laws

UNIT – II

Activation and Synaptic Dynamics: Introduction, Activation Dynamics Models , Synaptic Dynamics Models, Learning Methods
Pattern Recognition: Pattern Recognition Problem, Basic Functional Units

UNIT – III

Feedforward Neural Network: Introduction, Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks

UNIT – IV

Feedback Neural Networks: Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks.

Common Neural Architectures: Recurrent Neural Networks, Convolutional Neural Networks.

UNIT-V

Applications of ANN: Neural networks for binary and multi classification tasks, neural networks for regression tasks, Handwritten digit recognition using Neural Network

Learning Resources:

1. B. Yegnanarayana - Artificial neural network, PHI Publication.2012.
2. Charu C. Aggarwal-Neural Networks and Deep Learning, Springer 2018.
3. Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005.
4. Mohammad H. Hassoun – Fundamentals of artificial neural networks - MIT Press, 1995.
5. https://nptel.ac.in/courses/117105084

The break-up of CIE: Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Artificial Neural Networks Lab

(Professional Elective-I)
SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code: **U21PE731EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To implement Neural Network techniques using MATLAB.	On completion of the course, students will be able to 1. Implement fundamental Neuron concept. 2. Apply Perceptron Learning Techniques. 3. Implement Hopfield Neural Network. 4. Design and implement Neural Networks for classification and regression tasks. 5. Design and implement Neural Networks for real time applications

CO-PO/PSO Mapping

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

List of Experiments

Cycle-I

1. Weight and Bias effect on Neuron
2. Activation function effect on Neuron
3. Perceptron Learning rule for computing new weights
4. Perceptron Learning by changing number of epochs
5. Hopfield Neural Network
6. Generate Feedforward Neural Network

Cycle-II

1. Feedforward Neural Network with gradient descent and variable learning rate gradient descent.
2. Neural Network for Binary Classification
3. Neural Network for Multi Classification
4. Neural Network for Regression problem
5. Handwritten digit recognition using Neural Network
6. Image classification using Neural Network

New/ Additional experiments planned:

1. Machine Learning using Neural Networks
2. Deep Learning using Neural Networks

Learning Resources/Tools

1. MATLAB 2023a.
2. B. Yegnanarayana - Artificial neural network PHI Publication.2012.
3. Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005
4. Mohammad H. Hassoun – Fundamentals of artificial neural networks - MIT Press ,1995

The break-up of CIE :

1. No. of Internal Test	:	1
2. Max. Marks for internal test	:	12
3. Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Voice and Data Networks

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE740EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To acquire knowledge on concepts of voice communication, data communication and switching components in telecommunication systems.	On completion of the course, students will be able to 1 Design various types of networks considering their design conditions. 2 Apply various switching techniques. 3 Apply data plane and control plane concepts. 4 Apply standards of 3G and 4G. 5 Understand 5G technologies.

CO-PO/PSO Mapping

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

UNIT – I

Network requirements, Network Performance parameters, Network Terminology, Voice and data networks, Issues in design of voice and data networks. Network architecture, Network software.

UNIT – II

Switching, Three Stage Space Division Switch, Blocking and Non-blocking switching, Introduction to Signaling System Number 7 (SS7), Circuit Switching and Packet Switching, Multiplexing.

UNIT – III

Network layer-date plane: Input and output processing, input and output queuing, packet scheduling.
Control plane: Routing in Internet. OSPF, BGP Software defined networking (SDN) fundamentals

UNIT – IV

Evolution from 3G to 4G: 3G W-CDMA(UMTS), 3G CDMA, 3G TD-SCDMA, 3G evaluation to 4G, OFDM, LTE.

UNIT-V

Evolution of LTE technology to beyond 4G, 5G road map, Allocation of new spectrum for 5G, Spectrum sharing, 5G architecture, Overview of cognitive radio technology in 5G wireless, Spectrum optimization using cognitive radio.

Learning Resources:

1. L. Peterson and B. S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufman, 2011.
2. Theodore S. Rappaport, "Wireless Communications Principles and Practice" 2nd edition, Pearson, 2010.
3. Fundamentals of 5G Mobile Networks Hardcover, by Jonathan Rodriguez, Wiley.
4. 4G, LTE-Advanced Pro and The Road to 5G by Erik Dahlman.
5. D. Bertsekas and R. Gallager, "Data Networks", 2nd Edition, Prentice Hall, 1992.
6. Kumar, D. Manjunath and J. Kuri, "Communication Networking: An analytical approach", 1st Edition, Morgan Kaufman, 2004.
7. https://nptel.ac.in/courses/106105082

The break-up of CIE: Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Voice and Data Networks Lab

(Professional Elective-I)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 2:0:0	SEE Marks : 50	Course Code: **U21PE741EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To understand the simulation using packet tracer. 2 To implement the interior and exterior routing protocols. 3 To implement the voice communication.	On completion of the course, students will be able to 1 Acquire knowledge of using simulators for different connections. 2 Able to find the shortest path in the network using distance vector algorithm. 3 Identify different network interfaces and routing protocols. 4 Develop different subnetting protocols. 5 Apply the voice communication concepts

CO-PO/PSO Mapping

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

LIST OF EXPERIMENTS:

Cycle-1

1 Interpreting Layer 2 and Layer 3 devices
2 Demonstrating Distribution Layer Functions
3 Configuring routing information protocol.
4 Configuring WEP on a Wireless Router
5 Exploring Different layer 2 devices Options

6 Implementing classless inter domain routing.

Cycle-2

7 Examining Network Address Translation
8 Observing Static and Dynamic Routing
9 Configuring a Cisco Router as a DHCP Server
10 Generating LTE Waveforms using MATLAB
11 OFDM Modulation using MATLAB
12 LTE OFDM Modulator using MATLAB

Additional Experiments

1 Configure IPv4 and IPv6 Static and Default Routes
2 Configure Layer 3 Switching and Inter-VLANRouting
3 Implement VLANs and Trunking

List of Equipment :

Software: Packet tracer & MATLAB
Equivalent Hardware: Standalone desktops

The break-up of CIE:

1.	No. of Internal Test	:	1
2.	Max. Marks for internal test	:	12
3.	Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IoT Architectures and Protocols

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE750EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The purpose of this course is to impart knowledge on IoT Architecture, practical constrains, various protocols and multiple case studies.	On completion of the course, students will be able to 1. Understand the Architectural Overview of IoT 2. Enumerate the need and the challenges in Real World Design Constraints 3. Choose the required protocol for a given application. 4. Explore IoT usage in various applications 5. Understand the Security requirements in IoT.

CO-PO/PSO Mapping

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

UNIT - I : IoT

Definition and Technologies that led to evolution of IOT, Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment. M2M and IoT Technology Fundamentals- Devices and gateways, Introduction to cloud IOT platforms like MS Azure, AWS IOT, Google Cloud IOT, Thingworx, Business processes in IoT.

UNIT - II : IoT Reference Architecture

Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. IoT edge system architecture.
Real-World Design Constraints: Technical Design constraints, Connectivity constraints, Data representation and visualization, Big Data Management.

UNIT - III : IoT communications

Data link and physical layer Protocols: PHY/MAC Layer (IEEE 802.11, IEEE 802.15), Bluetooth Low Energy, Thread, introduction to Wi-SUN.
Network Layer Protocols: IPv6, 6LoWPAN;
Transport layer protocols: TCP, UDP;
Messaging protocols: Quality of services in MQTT, standards and security in MQTT, CoAP, AMQP.

UNIT - IV : Case Studies

Smart Cities, Smart Homes, Smart Transportation, Smart Healthcare, Precision Agriculture, Connected Vehicles.

IOT in Indian Scenario: i) IOT and Aadhaar ii) IOT for health services. iii) IOT for financial inclusion. iv) IOT for rural empowerment v) India Urban Data Exchange (IUDX).

Industry 4.0: Industrial Internet of Things (IIoT), Reference Architecture, Characteristics of Industry 4.0.

UNIT - V : Securing the Internet of Things

Security Requirements in IoT Architecture - Security in Enabling Technologies, Security Concerns in IoT Applications.

Security Architecture in the Internet of Things - Security Requirements in IoT, Insufficient Authentication/Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability, Attacks Specific to IoT. Security and Vulnerabilities – Secrecy & Secret Key Capacity, Authentication/Authorization for Smart Devices, Transport Encryption, Secure Cloud/Web Interface, Secure Software/Firmware, Physical Layer Security.

Learning Resources:

1 Pethuru Raj and Anupama C. Raman, —The Internet of Things: Enabling Technologies, Platforms, and Use Cases", 1st Edition, 2017, CRC Press.

2 David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henny "IoT Fundamentals: Networking technologies Protocols, and Use Cases for the internet of things", June, 2017, Cisco press.

3 Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, —From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, 2014, Academic Press.

4 Arshdeep Bahga, Vijay Madisetti, —Internet of Things: A Hands-on Approach‖, Universities Press, 2014.

5 Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren, Packt Publishing, 2016.

6 Securing the Internet of Things Elsevier Authors: Shancang Li Li Da Xu, Paperback ISBN: 9780128044582,Imprint: Syngress Published Date: 13th January 2017.

7 https://nptel.ac.in/courses/106105166/5

8 https://nptel.ac.in/courses/108108098/4

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IoT Architectures and Protocols Lab

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week): :0:0:3	SEE Marks : 50	Course Code: **U21PE751EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To enable the students with SiWx917 SoC based programming with built in peripheral and interfacing off chip peripherals to develop real world applications using Simplicity Studio & WiSeConnect SDK tools.	On completion of the course, students will be able to 1. Apply knowledge in writing the programs using Simplicity Studio. 2. Implementing the power saving mechanisms in Wi-Fi. 3. Apply knowledge in making Silicon lab boards as access point and MQTT client. 4. Choose suitable protocol for a specified application. 5. Develop real world applications using Silicon lab boards.

Co-Po Mapping

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

Cycle-1

1. Introduction to SiWx917, WiSeConnect SDK (Software Development Kit) and Simplicity Studio.
2. Basic Wi-Fi connection with SiWx917 (With Wireshark Analysis).
3. Demonstration of power save mechanisms in Wi-Fi with SiWx917 (Demo with Energy Profiler).
4. SiWx917 as an access point.
5. SiWx917 as an Embedded MQTT Client
6. Target wake Time with SiWx917

Cycle-2

Any Two use cases

7. **People-counting application** using Silicon Laboratories development kits and a VL53L1X distance sensor.
   a. Application initialization
   b. Sensor initialization
   c. Sensor Sampling
   d. Implementation of People counting algorithm

8. **Bluetooth door lock application** using Silicon Laboratories development kits, SparkFun Micro OLED Breakout (Qwiic) board, Cap Touch 2 Click MikroE board, and BUZZ 2 click Mikroe board.
   a. Application initialization
   b. Using EFR Connect Mobile Application
   c. Locking the Door
   d. Unlock the Door
   e. Change the door unlock password and the passkey.
   f. Securing BLE Designs

9. **Smart street lighting solution** with Wi-SUN mesh using Silicon Laboratories development Kit.
   a. Adjustable lighting strategies that save energy through on/off switching
   b. Light-level management
   c. Integration with other systems to bring condition-based lighting.

Software Tools: WiSeConnect SDK (Software Development Kit), Simplicity Studio and Wire Shark.

Hardware: SiWx917 Development Kit, VL53L1X distance sensor, BUZZ 2 click Mikroe board and EFR32FG25 Wi-SUN Pro Kit.

The break-up of CIE :

1.	No. of Internal Test	:	1
2.	Max. Marks for internal test	:	12
3.	Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Mobile Cellular Communication

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U21PE760EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To impart knowledge about cellular communication system, CDMA, MIMO systems To model a wireless channel and perform BER analysis to estimate its performance.	On completion of the course, students will be able to 1. Describe the cellular system design and technical challenges in deployment. 2. Analyse the mobile radio propagation, fading, diversity concepts and the channel modelling. 3. Discuss the concept of CDMA to provide access to multiple users. 4. Perform BER analysis of multi antenna system. 5. Apply the concepts of OFDM to MIMO systems.

CO-PO/PSO Mapping

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

UNIT - I : Cellular system design concepts

Cellular system and its operation, frequency reuse, channel assignment strategies, Handoff process, factors influencing handoffs, handoffs in different Generations, Interference and system capacity, Enhancing capacity and cell coverage, Trunked radio system.

UNIT - II : Mobile Radio Wave propagation

arge scale propagation models- Free space propagation model, three basic propagation mechanisms, practical link budget design using path loss models, Impulse response of the wireless channel, small scale fading and multipath propagation, Mathematical modelling of fading channel coefficient, Parameters of mobile multipath channels, types of small-scale fading.

UNIT - III : Multiple Access schemes

FDMA, TDMA. Introduction to CDMA, Basic CDMA mechanism, Fundamentals of CDMA codes, spreading codes based on PN sequences, Correlation properties of random CDMA spreading, Advantages of CDMA, CDMA near far problem and power control. SDMA.

UNIT - IV : BER analysis

BER analysis of wired communication system, BER analysis of SISO wireless system, Diversity, BER analysis of multiple antenna system: Maximal ratio combining, Diversity order. BER analysis of CDMA systems, BER analysis of MISO wireless system.

UNIT - V: OFDM

Introduction to OFDM, Multicarrier transmission, cyclic prefix in OFDM, Schematic representation of OFDM transmitter and receiver, BER analysis of OFDM systems. Introduction to MIMO wireless communication systems, MIMO system model, MIMO ZF receiver, MIMO MMSE receiver, MIMOOFDM., ORAN for 5G communication.

Learning Resources:

1. Theodore.S. Rappaport, "Wireless Communications: Principles and Practice", 2/e, Pearson Education, 2010
2. Aditya K. Jagannatham, "Principles of Modern Wireless Communication Systems Theory and Practice", McGraw Hill Education (India) Private Limited, 2017.
3. Principles of modern CDMA/MIMO/OFDM Wireless Communications – by Prof. Aditya. K. Jagannatham, IIT Kanpur. (NPTEL Course)
4. Introduction to cellular and wireless communications - by Dr. David. Koil pillai, IITM. https://nptel.ac.in/courses/106106167/
5. https://www.coursera.org/learn/wireless-communications
6. https://www.udemy.com/introduction-to-wireless-communications

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Mobile Cellular Communication Lab

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code: **U21PE761EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To analyze wireless channel using MATLAB, SIMULINK, 5G toolbox 2. To es6tabilsh end to end communication using WiComm T, SystemVue and SDR	On completion of the course, students will be able to 1. Modeling of Wireless communication channel using MATLAB, Simulink. 2. Implement Wireless channel equalizers. 3. Testing and verification of channel parameters like SNR, BER using Matlab and 5G tool box 4. Establishing wireless connection using SDR

CO-PO/PSO Mapping

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

List of Experiments:

Exp. No.	Name of the Experiment
	Cycle -1
1	Modeling of two ray channel wireless communication systems using Matlab
2	Modeling and simulation of Multipath fading channel using Matlab
3	Design, analyze and test Wireless standards and evaluate the performance measurements such as BER, throughput, capacity, EVM for 4G and 5G using Matlab
4	Wireless Channel equalization: Zero-Forcing Equalizer (ZFE), MMSE Equalizer (MMSEE) using Matlab

5 Modeling and simulation of TDMA, FDMA and CDMA for wireless communication using Matlab

6 Implementation of Global System for Mobile Communication (GSM) using WiCOMM-T

Cycle -2

7 Wireless Path loss Computations - Study of Propagation Path loss Models : Indoor & Outdoor(Using Matlab Programming)

8 Introduction to SystemVue – QPSK modulation and Demodulation

9 Noise Scaling for Frequency-Domain Channel Modeling and time domain channel modeling using 5G tool box

10 SNR Verification for Frequency-Domain Channel Modeling and time domain channel modeling using 5G tool box

11 Implementation of baseband modulation using Systemvue

12 Implementation of RF simulation using Systemvue

New / Additional Experiments Planned

1 Establishing wireless communication with 2X2 MIMO using SDR

2 Model 5G NR Communication Links using 5G tool box

Learning Resources / Tools:

1. Communication Systems Modeling and Simulation Using MATLAB and Simulink, K C Raveendranathan, Government Engineering College, Universities Press (India) Private Ltd, 2011 ISBN: 978-81-7371-722-2; Language: English.
2. Software-Defined Radio for Engineers By Alexander M. Wyglinski, Travis F. Collins, Robin Getz, Di Pu · 2018
3. Digital Communication Systems Using SystemVue (DaVinci Engineering) Hardcover.

The break-up of CIE :

1. No. of Internal Test	:	1
2. Max. Marks for internal test	:	12
3. Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Digital Image and Video Processing

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE770EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Students will gain knowledge on digital image and video processing techniques.	On completion of the course, students will be able to 1 Describe the basic concepts of Image and Video Processing 2 Apply the equations to transform images into different domains. 3 Apply spatial and transform domain techniques to process images. 4 Analyze quality of processed images using appropriate metrics 5 Design and implement various image and video processing techniques in a range of real-world applications.

CO-PO/PSO Mapping

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

UNIT - I:

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighbourhood, adjacency, connectivity, distance measures.

UNIT - II:

Fourier transform, FFT, Discrete cosine transform, Hadamard transform, Slant transform and their properties.
Wavelet Transforms: Discrete Wavelet Transforms.

UNIT - III:

Spatial enhancement techniques: Basic Intensity Transformation functions, Histogram equalization, Histogram specification, Spatial Filtering Techniques.

Frequency domain techniques: Low pass, High pass and Homomorphic Filtering.

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square filter.

Quality assessment of enhanced images.

UNIT - IV:

Image Compression-Redundancy–inter-pixel and psycho-visual, Huffman Coding, Arithmetic coding, Lossless compression – predictive, Lossy compression-predictive and Transform coding techniques (JPEG and JPEG2000).

Image Segmentation - Point, Line and Edge Detection, thresholding - global, region-based segmentation.

Quality assessment of compressed / restored and segmented images.

UNIT - V:

Video formation, perception, and representation, two-dimensional motion estimation.

Fingerprint image enhancement, Compression of Satellite images using JPEG, Medical image segmentation, Object tracking in videos.

Learning Resources:

1 R.C. Gonzalez and R.E. Woods, Digital Image Processing, 4th Edition, Pearson, 2018.
2 Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India. 2nd edition 2004.
3 Video Processing and Communications Yao Wang, Jorn stermann, and Ya-Qin Zhang Prentice Hall, 2002 (Published September 2001).
4 Murat Tekalp, Digital Video Processing" Prentice Hall, 2nd edition 2015.
5 https://nptel.ac.in/courses/117/105/117105135/
6 https://nptel.ac.in/courses/117/105/117105079/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Digital Image and Video Processing Lab

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code: **U21PE771EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To implement image and video processing techniques using Matlab.	On completion of the course, students will be able to 1. Implement basic operations on Images and Videos. 2. Apply various transform techniques on images. 3. Implement Segmentation technique on images. 4. Design and implement compression methods on images. 5. Detect moving objects in videos.

CO-PO/PSO Mapping

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

List of Experiments

(Conduct any Twelve experiments from given list)

Cycle-I

1. Reading images
2. Reading videos
3. Pixel based operations
4. Application of DCT on Images
5. Application of HT on Images
6. Application of DWT on Images

Cycle-II

7. Image enhancement using spatial domain technique
8. Image enhancement using transform domain technique
9. Lossless Image Compression
10. Image Compression using JPEG
11. Image Segmentation using region growing
12. Object Detection in Video Signal

New/ Additional experiments planned:

1. Medical Image segmentation
2. Satellite Image Compression

Learning Resources/Tools

1. MATLAB 2023a.
2. R.C. Gonzalez ,R.E. Woods and Steven L Eddins, Digital Image Processing using MATLAB, third Edition, Gatesmark Publishing, 2020.
3. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004
4. Video Processing and Communications Yao Wang, Jorn stermann, and Ya-Qin Zhang Prentice Hall, 2002 (Published September 2001).

The break-up of CIE :

1. No. of Internal Test	:	1
2. Max. Marks for internal test	:	12
3. Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Network Security

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE780EC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity. 2 To understand the various key distribution and management schemes and to deploy encryption techniques to secure data in transit across data networks.	On completion of the course, students will be able to 1 Analyze the vulnerabilities in any computing system and able to design a security solution 2 Identify the security issues in the network and resolve it. 3 Evaluate security mechanisms using rigorous approaches 4 Analyze network security and web security requirements. 5 Illustrate the applications in networksecurity

CO-PO/PSO Mapping

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

UNIT - I :

Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT - II :

Encryption: Triple DES, International Data Encryption algorithm, Characteristics of Advanced Symmetric block ciphers. Conventional Encryption Placement of Encryption function

UNIT - III :

Public Key Cryptography Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange , Number Theory in brief.

UNIT - IV :

Message Authentication and Hash Functions Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME

UNIT - V :

IP Security Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms: Intruders, Viruses and Related threats. Fire Walls: Fire wall Design Principles, Trusted systems

Learning Resources:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
3. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
4. https://nptel.ac.in/courses/106105031/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Network Security Lab

(Professional Elective-II)
SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hrs./week) : 2:0:0	SEE Marks : 50	Course Code: **U21PE781EC**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To Learn Different Cipher Techniques. 2 To Implement the Algorithms DES, RSA, MD5, SHA-1 3 To Use Network Security Tools and Vulnerability Assessment Tools	On completion of the course, students will be able to 1 Develop code for classical Encryption Techniques to solve the problems. 2 Build cryptosystems by applying symmetric and public key encryption algorithms. 3 Construct code for authentication algorithms. 4 Develop a signature scheme using Digital signature standard. 5 Demonstrate the network security system using open-source tools

CO-PO/PSO Mapping

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

LIST OF EXPERIMENTS:

Cycle 1

1. Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher iv) Vigenère cipher.
2. Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Connect remote machine using Secure Shell (SSH)
5. Apply AES algorithm for practical applications.

6. Implement RSA Algorithm

Cycle-2

1. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
2. Calculate the message digest of a text using the MD5 algorithm.
3. Basic firewall configuration in packet tracer.
4. Write the RC4 logic using cryptography. Encrypt the text 'Hello world' using blowfish.
5. Calculate the message digest of a text using the SHA-1 algorithm.
6. Working With KF Sensor Tool for Creating and Monitoring Honeypot.

New additional experiments

1. Capture ICMPv4 packets generated by utility programs and tabulate all the captured parameters using Wireshark.
2. Demonstrate intrusion detection system (ids) using any tool

Learning Resources:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

List of Equipment :

Software: C / C++ / Java/Python or equivalent compiler GnuPG, KF Sensor /Snort, N-Stalker or Equivalent Hardware: Standalone desktops.

The break-up of CIE :

1.	No. of Internal Tests	:	1
2.	Max. Marks for internal tests	:	12
3.	Marks for day-to-day laboratory class work	:	18

Duration of Internal Tests: 3 Hours

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS) :: IBRAHIMBAGH, HYDERABAD – 500 031.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION **(R-21)** :: B.E. – ECE : EIGHTH SEMESTER (2024 - 25)

B.E (ECE) VIII – SEMESTER								
Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			Credits
		Hours per Week			Duration in Hrs	Maximum Marks		
		L	T	P		SEE	CIE	
THEORY								
U21PE8XXEC	Professional Elective – III	3	-	-	3	60	40	3
U21PE8XXEC	Professional Elective – IV	3	-	-	3	60	40	3
PRACTICALS								
U21PW819EC	Project / Internship	-	-	12	Viva-Voce	50	50	6
	TOTAL	**6**	**-**	**12**		**170**	**130**	**12**
	GRAND TOTAL	**18**				**300**		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Project / Internship

SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week): 0:0:12	SEE Marks : 50	Course Code: **U21PW819EC**
Credits : 6	CIE Marks : 50	Duration of SEE : Viva-Voce

COURSE OBJECTIVES	COURSE OUTCOMES
Prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.	On completion of the course, students will be able to 1. To select the complex engineering problems beneficial to the society and develop solutions with appropriate considerations 2. To apply modern tools and analyze the results to provide valid conclusions. 3. To communicate effectively the solutions with report and presentation following ethics 4. To work in teams and adapt for the advanced technological changes 5. To apply management principles to complete the project economically

CO-PO/PSO Mapping

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

Note: Some of relevant COs must be mapped with the relevant PSOs based on the domain and application area of the project.

Oral presentation is an important aspect of engineering education. The objective of the project is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.

Project topics may be chosen by the student with advice and approval from

the faculty members. Students are to be exposed to the following aspects of project work carried out.

Each student is required to:

1. Submit a one-page synopsis in the beginning of project work for display on the notice board.
2. Give a 20 minutes presentation through LCD power point presentation followed by a 10 minutes discussion.
3. Submit a report on the project work with list of references and slides used.

Project reviews are to be scheduled from the 3rd week of the semester to the last week of the semester and any change in schedule should be discouraged.

- Batch size shall be 2 (or) 3 students per batch.
- Project allocation by department.
- Two reviews – One during 5th week and another during 10th week and final evaluation shall be conducted during 15th to 16th week.
- Students are required to give Presentations during the reviews.
- Students are required to submit project report.

Continuous Internal Evaluation (CIE) – 50 marks:

Evaluation Criteria	Maximum Marks
Literature Survey	10
Problem Formulation	10
Design/ Methodology	10
Implementation & Results	10
Presentation & Documentation	10

Semester End Examination (SEE) – 50 marks:

Evaluation Criteria	Maximum Marks
Literature Survey	10
Problem Formulation	10
Design/ Methodology	10
Implementation & Results	10
Presentation & Documentation	10

Note: Rubrics are used for assessment and evaluation.

B.E (ECE) VIII - Semester

Professional Electives

(R-21)

for the Academic Year: 2024 - 2025

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Real Time Systems

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE81XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To Familiarize students with the aspects of developing a Real Time System and Policies for I/O management, memory management and fault tolerance in Real Time Systems.	On completion of the course, students will be able to 1 Differentiate the design principles for hard and soft real time systems. 2 Compare different scheduling algorithms and the schedulability criteria for a real time system. 3 Determine schedulability of a set of periodic tasks when sharing resources avoiding dead lock. 4 Compare different commercial RTOS and choose specific type for a particular application. 5 To analyze evaluation techniques and reliability models for Hardware Redundancy

CO-PO/PSO Mapping

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

UNIT - I : Real Time System Characteristics

Introduction to RTS, Types of RTS, Task Types, Jobs – Periodic, Sporadic, Aperiodic, Applications of RTS, Predictability, Reference Model, Types of schedulers, Cyclic and Priority based Schedulers and problem analysis

UNIT - II : Real Time Schedulers

Cyclic, priority based schedulers – static/dynamic – RM, EDF, LST, Optimality of EDF, Non-optimality of EDF, Scheduling with precedence constraints, Multiprocessor scheduling – static and dynamic systems, Problems of Predictability in multi-processor systems, Preemptive and non-preemptive priority based scheduling in uniprocessor systems.

UNIT - III : Resource sharing and Deadlock avoidance

Resource Control Model, Priority Inversion, Uncontrolled Priority Inversion, Disadvantages of Priority inversion, Priority Inheritance Protocol, Deadlocks due to Priority Inheritance Protocol, Priority Ceiling Protocol, Deadlock Avoidance, Analysis of Priority Ceiling Protocol, Stack Sharing Priority Ceiling Protocol, Priority Ceiling Protocol in Dynamic Priority Systems, Multiple units of resources, Priority ceiling, Preemption ceiling and stack based preemption ceiling protocol.

UNIT - IV : Commercial RTOS

Unix and Windows as RTOS, Real-time POSIX, Different Types of commercial RTOS, features of VxWorks, µCOS and RTLINUX. Memory, I/O management policies and Interrupt handling in Different RTOS.
Comparison and study of RTOS: Vxworks and µCOS

UNIT - V: Fault-Tolerance Techniques & RTOS Application Domains

What causes failures, Fault types, Fault detection, Hardware and software Redundancy.
Case studies: RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems.

Learning Resources:

1 uC/OS-III: The Real-Time Kernel and the Freescale Kinetis ARM Cortex-M4 Hardcover, 2011, Micrium, ISBN-13: 978-0982337523.
2 Jane W S Liu, "Real Time Systems" 2018 edition, Pearson, India.
3 David E. Simon "An Embedded Software Primer" Addison-Wesley publisher, 2004, ISBN 020161569X.
4 https://nptel.ac.in/courses/106105036/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Low Power VLSI Design

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE81XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To acquire knowledge of power dissipation in VLSI circuits. 2. Apply low power techniques in VLSI circuits.	On completion of the course, students will be able to 1. Understand the basics of VLSI technology. 2. Apply the physics of power dissipation. 3. Analyze the circuit techniques for dynamic power dissipation. 4. Apply the circuit techniques for leakage reduction. 5. Design low power arithmetic operators.

CO-PO/PSO Mapping

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

UNIT - I :

Physics of power dissipation in CMOSFET devices: introduction, Submicron MOSFET, Power dissipation in CMOS, short circuit dissipation, dynamic dissipation, load capacitance, Body Effect, Short Channel Effects, MOS Capacitances, Hot Carrier Effects.

UNIT - II :

CMOS Technology and Devices : Evolution of CMOS Technology, BiCMOS Technology, SOI CMOS Technology, Threshold Voltage , Narrow Channel Effects, Mobility & Drain Current, Subthreshold Current, Electron Temperature, Velocity Overshoot.

UNIT - III :

Circuits Techniques for Dynamic Power Reduction: Dynamic Power Consumption Components, Circuit Parallelization, Memory Parallelization, Voltage Scaling-Based Circuit Techniques: Multiple Voltages Techniques, Low Voltage Swing, Precomputation, Retiming, Gated Clocks, Circuit Technology-Dependent Power Reduction, Path Balancing.

UNIT - IV :

Circuit Techniques for Leakage Reduction: Leakage Components, Subthreshold Leakage Gate Leakage, Source/Substrate and Drain/Substrate P-N Junction Leakage, Circuit Techniques to Reduce Leakage in Logic, Dual Threshold CMOS, Multiple Supply Voltage, Runtime Standby Leakage Reduction Techniques, Leakage Control Using Transistor Stacks (Self-Reverse Bias), Sleep Transistor, Dynamic Vdd Scaling (DVS) • Dynamic Vth Scaling (DVTS).

UNIT - V :

Low-Power Arithmetic Operators : Introduction, Addition, 1-Bit Addition Cells, Sequential Adder, Propagate and Generate Mechanisms, Carry Select Adder, Carry Skip Adder, Logarithmic Number System, Logarithmic Adders, Power/Delay Comparison.

Learning Resources:

1. Low power CMOS circuits technology, logic design and cad tools by Chtristian piguet.
2. Low power CMOS VLSI circuit design by Koushik Roy & Sharath prasad.
3. Low-Voltage CMOS VLSI Circuits , James B. Kuo
4. https://onlinecourses.nptel.ac.in/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Satellite Communication

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE82XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To understand the working principles of various satellites and their importance in global communication 2 To acquire the knowledge on satellite sub systems and various factors affecting the function of communication satellite. 3 To study the need of multiple access techniques and various protocols being used in satellite communications	On completion of the course, students will be able to 1 Apply Kepler's law to find satellite orbital parameters. 2 Describe satellite subsystems like telemetry, tracking and command control. 3 Analyze Satellite link design 4 Describe the various multiple access techniques. 5 Understand the importance of special purpose communication satellite and their applications.

CO-PO/PSO Mapping

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

UNIT – I

Evolution and growth of communication satellites, synchronous satellites, frequency allocation, orbits, orbital mechanism and kepler's laws, effects of orbital inclination, azimuth and elevation, range and angle, eclipse, placements of a satellite in geo-stationery orbit.

UNIT – II

Space segment, stabilization, communication sub systems, Telemetry, tracking and command, Attitude & orbital Control Systems, Power Systems, Earth segment, large and small Earth station antennas, Redundancy configuration, Thermal System.

UNIT - III

System noise temperature and G/T ratio, Basic RF link analysis, EIRP, C/N, Interference, attenuation due to rain, cross polarization, design of uplink and down link

UNIT - IV

Multiple access techniques, SCPC companding systems, TDMA frame structure, Frame efficiency, Super frame structure, frame acquisition and synchronization, types of demand assignments, SPADE.

UNIT - V

Special purpose communication satellites, INTELAST, Global Positioning System, Echo- Cancellation techniques, Protocols, Satellite applications, Introduction to NavIC system Indian activities in satellite communication.

Learning Resources:

1. Timothy Pratt and Charles W. Bostan, Satellite Communications, 2003.
2. Dr. D.C Agarwal, Satellite Communications 7th Edition, Khanna Publishers, 1996
3. Tri-T-ha, Digital Satellite Communications, 2nd Edition, McGraw Hill, 1990.

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Optical Fiber Communication

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE82XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To familiarize with the optical sources, detectors and optical communication links.	On completion of the course, students will be able to 1 Describe the principles fiber-optic communication, the components and the bandwidth advantages. 2 Apply the properties of the optical fibers and optical components. 3 Use optical sources and detectors for various applications. 4 Analyze system performance of optical communication systems. 5 Design optical networks and understand non-linear effects in optical fibers.

CO-PO/PSO Mapping

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

UNIT – I:

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

UNIT - II:

Different types of optical fibers, Modal analysis of a step index fiber.
Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

UNIT - III:

Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

UNIT - IV:

Optical switches - coupled mode analysis of directional couplers, electro-optic switches. Optical amplifiers - EDFA, Raman amplifier. WDM and DWDM systems. Principles of WDM networks

UNIT - V:

Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solition based communication.

Learning Resources:

1 J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
2 G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, 3rd Ed, 2002.
3 K.C. Gupta, Opto Electronic Devices and Systems, PHI Learning, 2005.
4 https://nptel.ac.in/courses/117101054/
5 https://nptel.ac.in/courses/117104127/

The break-up of CIE : Internal Tests + Assignments + Quizzes

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Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Image and Video Processing Using Machine Learning

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE83XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To introduce students to the basic concepts and techniques of Machine Learning and become familiar with regression methods, classification methods, clustering methods.	On completion of the course, students will be able to 1 Describe the basic concepts of Machine Learning 2 Apply Machine Learning techniques suitable for a given problem. 3 Apply Deep Learning techniques suitable for a given problem. 4 Analyze the performance of various models using appropriate metrics. 5 Design and implement various machine learning algorithms in a range of real-world applications.

CO-PO/PSO Mapping

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

UNIT - I :

Introduction to Machine learning, Core concepts, Data inconsistencies, Practical Machine learning applications, Types of learning problems, Machine learning architecture, Machine learning algorithms.

Linear Regression, Cost Function, Gradient Descent and Logistic Regression.

UNIT - II :

Working with Decision tress: Basics of Decision trees, uses, Advantages, Limitations, different algorithm types - ID3, C4.5, CART

Bayesian Networks: Graph theory, probability theory, Bayes theorem, working of Bayesian Networks.

UNIT - III :

Support vector Machines: Definition of SVM, uses of SVM, Basic classification principles, How Support Vector Machines Approach classification.

Clustering: Definition of clustering, clustering types-K-means, Agglomerative hierarchical, DBSCAN.

UNIT - IV :

Deep learning: Background, Deep learning Taxonomy, Hebbian learning, Perceptron Learning, Back propagation, Convolutional Neural networks, Recurrent Neural Networks, Autoencoders.

UNIT - V :

Applications of Machine learning: Image retrieval, Face recognition, Video classification. Image Segmentation using K-means clustering, Satellite Image Classification using Decision Trees. Image/Video Classification using CNN, Performance analysis of various algorithms.

Learning Resources:

1 Machine Learning, Tom M. Mitchell, 1st Edition, McGraw-Hill Education; 1st edition, 2017.
2 Introduction to Machine Learning, Ethem Alpaydin, third edition, PHI.
3 Machine Learning for Big Data: Hands on for developers and technical professionals wiley publications, 2018 by Jason Bell.
4 Practical Machine Learning. Sunila Gollapudi, Packt publishers, 2016.
5 https://nptel.ac.in/courses/106/105/106105152/
6 https://nptel.ac.in/courses/106106139/

The break-up of CIE : Internal Tests + Assignments + Quizzes

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3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Speech and Audio Signal Processing

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE83XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To understand the mechanism of speech production. 2 To analyze various speech synthesizers. 3 To study various types of coders and decoders. 4 To analyze speaker identification and verification systems.	On completion of the course, students will be able to 1 Apply the knowledge of science to design an artificial model of speech production system. 2 Analyse the types of speech signals & convert the signals to digital. 3 Synthesize the speech signal using a text as input. 4 Design speech encoder and decoder. 5 Also design an Automatic speech recognition system (ASR) by pattern matching method.

CO-PO/PSO Mapping

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

UNIT - I :

Applications of Digital Speech Processing, Phonetic Representation of Speech, Models for Speech Production-Schematic model of the vocal tract system, Source filter model for a speech signal production. Speech Quantization-Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization.

UNIT - II :

Short-Time Analysis of Speech-Short-Time Energy and Zero-Crossing Rate, Short-Time Autocorrelation Function (STACF), Short-Time Fourier Transform (STFT), The Speech Spectrogram, Speech vs Silence discrimination using energy and zero crossing, pitch period estimation using a parallel processing

approach, the Short time autocorrelation function, Average magnitude function, Pitch period estimation using the autocorrelation function. Linear Predictive Coding (LPC) Analysis. Homomorphic Speech Analysis.

UNIT - III :
Speech Synthesis Methods, Linear predictive synthesizer, phone use synthesis, Introduction to Text-to-Speech and Articulator speech synthesis.

UNIT - IV :
Lossless Audio Coding, Lossy Audio coding, Sub-band coding, Transforms coding, channel decoder, Formant decoder, Cepstral decoder, linear predictive decoder, vector quantizer coder.

UNIT - V :
Automatic Speech Recognition (ASR), The Problems and Challenges in Automatic Speech Recognition, Building a Speech Recognition System, The Decision Processes in ASR, Representative Recognition Performance, Automatic Speaker Recognition: Recognition techniques, Dynamic Time warping method of speech pattern recognition, Technology.

Learning Resources:

1. Lawrence R. Rabiner and Ronald W. Schafer, "Introduction to Digital Speech Processing", now, 2007.
2. Owens F.J., "Signal Processing of Speech", Macmillan, 2000.
3. Daniel Jurefskey & James H. Martin, "Speech and Language Processing", Pearson Education, 2003.
4. https://nptel.ac.in/courses/117105145/
5. https://onlinecourses.nptel.ac.in/noc22_ee117/preview
6. https://www.udemy.com/course/digital-speech-processing/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
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3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Wireless Sensor Networks

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE84XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Differentiate WSNs and mobile ad-hoc networks and illustrate the single node computational blocks and design challenges narrating WSN fundamental entities. 2 Analyze and Summarize the MAC (L-2) and Routing (L-3) protocols along with the physical transceiver radio design. 3 Describe WSN topology, localization along with existing hardware support and software simulators and programming models.	On completion of the course, students will be able to 1 Analuyze Wireless Sensor Network Characteristics and its challenges; and, differentiate WSN with other ad-hoc networks. 2 Illustrate architecture of Single WSN mote with Energy consumption mathematical models of a single mote both during the transmission and reception. 3 Apply Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks and their comparisons 4 Analyze different topology control and clustering schemes with localization concepts. 5 Describe some of the widely used WSN simulation tools and platforms with engineering case studies.

CO-PO/PSO Mapping

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

UNIT - I : OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks- Enabling Technologies for Wireless Sensor Networks

UNIT - II : ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of

Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concept

UNIT - III : NETWORKING SENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, Zigbee: IEEE 802.15.4 MAC Layer, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT - IV : INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT - V : SENSOR NETWORK PLATFORMS AND TOOLS

Operating Systems for Wireless Sensor Networks, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Learning Resource:

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks," John Wiley, 2005.
2. Feng Zhao and Leonidas J. Guibas, "Wireless Sensor Networks - An Information Processing Approach," Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, and Taieb Znati, "Wireless Sensor Networks-Technology, Protocols and Applications," John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs," John Wiley, 2003.
5. https://nptel.ac.in/courses/106105160/21

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
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3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Optical Networks

(Professional Elective-III)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE84XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To introduce students to the concepts of Optical Network design.	On completion of the course, students will be able to 1 Implement SONET for communication. 2 CO2: Contribute in the areas of optical network and WDM network design. 3 CO3: Implement simple optical network and understand further technology developments for future enhanced network. 4 CO4: Contribute in the area of network survivability. 5 CO5: Design WDM Network

UNIT - I :
SONET/SDH: optical transport network, IP, routing and forwarding, multiprotocol label switching.

UNIT - II :
WDM network elements: optical line terminals and amplifiers, optical add/drop multiplexers, OADM architectures, reconfigurable OADM, optical cross connects.

UNIT - III :
Control and management: network management functions, optical layer services and interfacing, performance and fault management, configuration management, optical safety.

UNIT - IV :
Network Survivability: protection in SONET/SDH & client layer, optical layer protection Schemes.

UNIT - V :

WDM network design: LTD and RWA problems, dimensioning wavelength routing networks, statistical dimensioning models. Access networks: Optical time division multiplexing, synchronization, header processing, buffering, burst switching, test beds, Introduction to PON, GPON, AON.

Learning Resources:

1 Rajiv Ramaswami, Sivarajan, Sasaki, "Optical Networks: A Practical Perspective", MK, Elsevier, 3rd edition, 2010.
2 C. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks: Concepts Design,and Algorithms", PHI, EEE, 2001

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

FPGA Architectures and Applications

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE85XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To familiarize the students with the architectural aspects of FPGA's and testing technologies of FPG's.	On completion of the course, students will be able to 1 Differentiate between ROM, PAL, PLA, SPLD, CPLD, and FPGA. 2 Compare the features of Various FPGAs in terms of their Architecture, Configurable logic block. 3 Gain knowledge on placement, routing algorithms and static timing analysis adopted in FPGAs. 4 Test a particular PLD using various techniques like design validation, Timing verification. 5 Analyze real time applications of FPGAs in various domains.

CO-PO/PSO Mapping

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

UNIT - I: Introduction to PLD's and PGA'S

Memory- Read-only memory, read/write memory - SRAM and DRAM. Programmable Logic Devices-PLAs, PALs and their applications; Sequential PLDs and their applications; State- machine design with sequential PLDs; Programmable gate arrays (pgas), Introduction to field programmable gate arrays (FPGAs),design flow using FPGA, programming technologies.

UNIT - II: FPGA Architectural Aspects

Organization of FPGAs, Programmable Logic Block Architectures, Programmable Interconnect, Programmable I/O blocks in FPGAs, Dedicated

Specialized Components of FPGAs. XILINX XC4000 Architecture, Routing Structure, Actel FPGA's Architecture, AMD FPGA architecture, Altera FPGA Architecture. Comparision of Architectural features of Commercial FPGAs

UNIT - III: Placement, Routing Algorithms and Static Timing analysis in FPGA Architectures

Placement: objectives, placement algorithms: Mincut-Based placement, iterative improvement placement, simulated annealing. Routing: objectives, segmented channel routing, Maze routing, Routability estimation, Net delays, computing signal delay in RC tree networks. Timing analysis in combinational circuits, timing analysis in sequential circuits.

UNIT - IV: Testing methods in FPGA Architectures and Logic Optimization

Stuck at faults, ATPG methods, LFSR, Scan path design, BIST Architecture, programmability failures, Fault coverage, System/Network-on-chip testing-Modular testing. Logic block functionality versus area-efficiency, Logic block area and routing model, Impact of logic block functionality on FPGA performance

UNIT - V: FPGA Application Domains

Comparison of ASIC and FPGA, Advantages of FPGAs.

Case study: Machine Learning application using FPGAs, Artificial Intelligence in FPGAs, Hardware Accelerators in FPGA Design, Generative AI using FPGAs, FPGAs in High level synthesis flow, FPGA based task scheduler for Real time systems.

Learning Resources:

1. S. Brown, R. Francis, J. Rose, Z.Vransic, "Field Programmable Gate array", BSP, 2007.
2. P.K. Chan & S. Mourad, "Digital Design Using Field Programmable Gate Array", Pearson Education 2009.
3. Spartan-3A/3AN FPGA Starter Kit Board User Guide, 2010.
4. S. Trimberger, Edr., "Field Programmable Gate Array Technology", Kluwer Academic Publications, 2004.
5. https://nptel.ac.in/syllabus/117108040/prof.Kuruvilla Varghese IISC Banglore.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Industrial IoT and Applications

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE85XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To provide students with good depth of knowledge of Designing and analysis of Industrial IoT Systems for various applications in Electronics Engineering.	On completion of the course, students will be able to 1. Gain Knowledge on the Architectural Overview of IIoT. 2. Differentiate between Embedded systems and cyber physical system. 3. Identify and analyse the processing and Security issues in IIoT. 4. Explore Advanced Technologies in IIoT. 5. Analyse case studies in linking up automation system in industries using IIoT.

CO-PO/PSO Mapping

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CO1	3	3	2										1		
CO2	2	2	1										1		
CO3	2	2	1										1	1	1
CO4	3	2	2	1									1	1	1
CO5	1	1	2	1									1	1	1

UNIT-I: Introduction to Industrial IoT (IIoT) Systems & IIoT Reference Architecture:

The Industrial 4.0 Revolutions, Industrial Internet Architecture Framework (IIAF), Five Functional domains of IIAF, IIoT- Sensing and Actuation, IIoT connectivity with IEEE 802.15.4,Zigbee,6LoWPAN,Wireless HART. Industry 4.0: Globalization and Emerging Issues, Sustainability assessment of Emerging issues, LEAN Production System in Industry 4.0.IIoT Vs Automation.

UNIT-II: Cyber physical systems and Next generation sensors in Industry 4.0

Features of Cyber physical systems, Difference between Embedded system and cyber physical system, Cyber physical systems architecture for IIoT, Challenges for Cyber physical system development, Introduction to Next generation sensors, Comparision of smart senors with next generation sensors, Architecture frame work for Next generation sensors, Applications of next generation sensors, Design challenges for Next generation sensors in Industry 4.0 . Challenges for Industrial Processes in Industry 4.0.

UNIT-III: Key Enablers of Industrial IoT Processing & Security in IIoT
Necessity of IIoT processing, Challenges in IIoT processing, IIoT Supervisory control and Management, Ongoing research in IIoT processing - Processing topologies, Semantic rules in processing, Necessity of security in IIoT, Security Goals, Standards for IIoT security, Architecture frame work for Operational technology (OT) ,Security at different levels- Network level, System level. Introduction to IIoT analytics.

UNIT-IV: Advanced Technologies in IIoT
Software defined Networking- Architecture, Design Aspects, Applications and Advantages. Smart Factory- Architecture, Features, Applications and Advantages, Health care- Architecture, Challenges, Advantages, Applications. IIoT in power Plants- Architectural frame work, Design challenges, Applications and Advantages.

UNIT-V: IIoT Case Studies
Case Study analysis in Chemical & pharmaceutical industry, Case Study analysis in Unmanned Aerial Vehicles(UAV), Case study analysis in Energy management, Case study analysis in Industrial monitoring system, Case study analysis in Oil & Gas Industry.

Note: Every case study includes- Architecture Frame work, Design challenges, Role of IIoT, advantages and applications.

Learning Resources:

1. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: Apress 2018.
2. S. Misra, A. Mukherjee, and A. Roy, 2020. *Introduction to IoT*. Cambridge University Press.
   Availability: https://www.amazon.in/Introduction-IoT-Sudip-Misra/dp/1108959741/ref=sr_1_1?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-1
3. S. Misra, C. Roy, and A. Mukherjee, 2020. *Introduction to Industrial Internet of Things and Industry 4.0.* CRC Press.
   Availability: https://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3
4. https://onlinecourses.nptel.ac.in/noc23_cs52- Introduction to Industry 4.0 and Industrial Internet of Things
5. Research Papers related to the area of concept.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Radar and Navigation Systems

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE86XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Derive and understand the Radar range equation and the parameters that depends on 2 Analyze the working of Various Radars 3 Understand the different Navigation methods	On completion of the course, students will be able to 1 Derive and discuss Radar range equation and nature of detection 2 Describe about CW Radar and MTI radar 3 Interpret different tracking radars 4 Explain principles of navigation, in addition to approach and landing aids as related to navigation 5 Describe about the navigation systems using the satellite

CO-PO/PSO Mapping

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

UNIT - I :

Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar, Prediction of range performance, minimum detectable signal, receiver noise, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses.

UNIT - II :

Doppler effect, CW radar, FM CW radar, multiple frequency CW radar. MTI radar, blind speeds, delay line cancellers, staggered PRF, limitations to the performance of MTI radar.

UNIT - III :

Tracking radars: Sequential lobing, Conical scan, Monopulse: amplitude comparison and phase comparison methods, Radar antennas. Radar displays. Duplexer.

UNIT - IV :

Direction Finding - Four methods of Navigation, Loop Antenna as direction finding, An Aural Null Direction Finder, Adcock Direction Finders, Direction Finding at Very High Frequencies: The LF/MF Four course Radio Range, VHF Omni Directional Range(VOR), Errors in Direction Finding.

UNIT - V :

Hyperbolic Navigation Systems: Principle of Hyperbolic Navigation Systems: Loran and Decca and Omega System, GPS principle and operation, Position location determination and applications.

Learning Resource:

1. Merrill I. Skolnik, "Introduction to Radar Systems", 2nd Edition Tata Mc Graw-Hill 2017.
2. N.S.Nagaraja, "Elements of Electronic Navigation Systems", 2nd Edition, TMH, 2000.
3. Peyton Z. Peebles:, "Radar Principles", John Wiley, 2004 2. J.C Toomay, "Principles of Radar", 2nd Edition –PHI, 2004.
4. Radar Systems and Radio Aids to Navigation, Sen & Bhattacharya, Khanna publishers
5. NPTEL Links: https://nptel.ac.in/courses/101108056/3

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Global Positioning System

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE86XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To study basics of mathematics and science related to GNSS constellations 2 To understand the different coordinates for representation user position. 3 To study the different errors of GPS 4 To understand the GPS data formats for use of different applications 5 To acquire the knowledge of augmentation systems.	On completion of the course, students will be able to 1 Apply the knowledge of basic mathematics and science to understand the different GNSS constellations 2 Use of different coordinate systems used in user position estimation 3 Identifying the various errors of GPS. 4 Interpret the GPS data for different applications. 5 Importance of augmentation systems in various diversified applications.

CO-PO/PSO Mapping

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

UNIT - I :

GPS Fundamentals: GPS Applications , GPS Constellation, Principle of operation, GPS Orbits, Orbital mechanics and satellite position determination, Time references, Geometric Dilution of Precision: Geometrical dilution of Precision, Veritical dilution of precision, Position dilution of precision.

UNIT - II :

Coordinate Systems and errors: Geometry of ellipsoid, geodetic

reference system. Geoid, Ellipsoid, Global and Regional datum, World geodetic system- 84, Different coordinate systems, Various error sources in GPS: Satellite and receiver clock errors, Ephemeris error, Atmospheric errors, Receiver measurement noise and User Equivalent Range Error.

UNIT - III :

GPS measurements: GPS signal structure, C/A and P-codes, Code and carrier phase measurements, position estimation with pseudo range measurements, Spoofing and anti-spoofing, GPS navigation and observation data formats.

UNIT - IV :

GPS Augmentation systems: Code-based and carrier based Differential GPS(DGPS) Techniques, DGPS errors, Wide area augmentation system-architecture, GAGAN, Local area augmentation system concept.

UNIT - V :

GPS Modernization and other satellite navigation systems: Future GPS satellites, New signals and their benefits, Hardware and Software improvements, GPS integration – GPS/Geo Information System, GPS/Inertial Navigation System, GPS/pseudo lite, GPS/cellular, GLONASS, Galileo System.

Learning Resources:

1 Pratap Misra and Per Enge, "Global Positioning System Signals, Measurement, and Performance," Ganga- Jamuna Press, 2/e, Massachusetts, 2010.
2 G.S.Rao, Global Navigation Satellite Systems, Tata Mc Graw-Hill, 2010.
3 Satheesh Gopi, "Global positioning system: Principles and Application", TMH, 2005.
4 B. Hofmann-Wellenhof, H. Lichtenegger, and J. Collins, "GPS Theory and Practice," Springer Verlog, 2008.
5 Bradford W. Parkinson and James J. Spilker, "Global Positioning System: Theory and Application," Vol. II, American Institution of Aeronautices and Astronautics Inc., Washington, 1996.
6 https://nptel.ac.in/syllabus/105107062/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Coding Theory and Techniques

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE86XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To study the source coding and channel coding techniques digital data storage and transmission.	On completion of the course, students will be able to 1 Apply the probabilistic method to construct different types of source codes. 2 Identify different types of errors and to comprehend various linear block codes 3 Construct convolution codes for error detection and correction. 4 Generate LDPC codes using different methods of constructions 5 Construct Galois Fields and to apply them to generate BCH and RS codes

CO-PO/PSO Mapping

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

UNIT - I:

Coding for Reliable Digital Transmission and Storage: Source coding: Entropy encoding algorithms: Arithmetic coding and Golomb coding, Dictionary codes: Lempel-Ziv codes, Run Length Encoding.

UNIT - II:

Linear Block codes: Introduction to Linear Block Codes, Hamming codes, Repetition codes, Reed-Muller codes, the (24,12) Golay code, Product codes, Interleaved codes.

UNIT - III:

Convolutional codes: Encoding, Structural properties, State diagram, Code tree diagram, soft decision and hard decision decoding, Viterbi algorithm.

UNIT - IV:

Low Density Parity Check codes: Introduction, Properties, Graphical Representation of LDPC Codes: Tanner graphs, Types of constructions, Regular and Irregular LDPC codes, methods of constructing LDPC codes: Galleger's method, Alzebraic method, Mackay construction, Encoding and problems.

UNIT - V:

BCH and RS codes: Groups, Fields, Binary arithmetic, Construction of Galois Fields GF(2^m), Basic properties of Galois Fields, Introduction to BCH and RS codes (Encoding only).

Learning Resource:

1. K. Deergha Rao, 'Channel Coding Techniques for Wireless Communications," Second Edition, Springer 2019
2. Shu Lin and Daniel J. Costello, Jr. "Error Control Coding," 2/e, Pearson, 2011.
3. K Sam Shanmugum, "Digital and Analod Communication Systems," Wiley,2010.
4. Simon Haykin, "Digital Communication," TMH, 2009.
5. https://nptel.ac.in/courses/117106031/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Adaptive Signal Processing

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE87XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To introduce some practical aspects of signal processing, and in particular adaptive systems 2 The basic principles of adaptation which cover various adaptive signal processing algorithms (e.g., the LMS algorithm, RLS algorithm) and its applications, such as adaptive noise cancellation, interference cancelling, system identification	On completion of the course, students will be able to 1 Design and apply optimal minimum mean square estimators and in particular linear estimators. 2 Implement and analyze Wiener filters and evaluate their performance. 3 Implement and apply LMS, RLS, and Kalman filters for given applications. 4 Estimate the innovation process for Kalman filtering problem. 5 Analyze vector Kalman filters for target tracking

CO-PO/PSO Mapping

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

UNIT - I :

Approaches to the development of adaptive filter theory. Introduction to filtering, smoothing and prediction. Wiener filter theory, introduction; Error performance surface; Normal equation; Principle of orthogonality; Minimum mean squared error;

UNIT - II :

Gradient algorithms; Learning curves; LMS gradient algorithm; LMS stochastic gradient algorithms; convergence of LMS algorithms.

UNIT - III :

Applications of adaptive filter to adaptive noise cancelling, Echo cancellation in telephone circuits and adaptive beam forming

UNIT - IV :

Kalman Filter theory; Introduction; recursive minimum mean square estimation for scalar random variables; statement of the Kalman filtering problem: the innovations process; Estimation of state using the innovations process; Filtering examples

UNIT - V :

Vector Kalman filter formulation. Examples. Applications of Kalman filter to target tracking.

Learning Resource:

1 Simon Haykins, "Adaptive signal processing", PHI, 1986. 3rd EDITION
2 Sophoclas, J. Orphanidies, "Optimum signal processing an introduction", McMillan, 1985.
3 Bernard Widrow, "Adaptive signal processing", PHI,1986
4 Bozic. SM., Digital and kalman Filtering
5 https://nptel.ac.in/syllabus/117105026/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Biomedical Signal Processing

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE87XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To introduce the fundamentals of probability theory and random processes with biomedical signals applications. 2 To equip students with the fundamental tools that are used to describe, analyze and process biomedical signals. 3 To acquire the knowledge on fundamental principles in the analysis and design of filters, power spectral density estimation and non-stationary signal processing techniques with cardiological and neurological signals.	On completion of the course, students will be able to 1 Apply the probability theory and random processes techniques in analyzing biological signals. 2 Determine to best class of compression techniques to use for a particular bio medical signal to compress. 3 Possess the basic mathematical, scientific and computational skills necessary to analyze and process cardiological signals as per the requirement. 4 Ability to formulate and solve basic problems in biomedical signal analysis. 5 Possess the basic mathematical, scientific and computational skills necessary to analyze and process neurological signals as per the requirement.

CO-PO/PSO Mapping

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CO1	3	2			2										3
CO2	3	2			2										3
CO3	3	2		2	2										3
CO4	3	2			2										3
CO5	3	2			2										3

UNIT – I

Discrete and continuous Random variables: Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables.

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, noise figure of systems.

UNIT – II

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DCT and the K L transform.

UNIT – III

Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia Detection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis.
Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling. Adaptive Noise Cancelling with the LMS Adaptation Algorithm. Noise Cancelling Method to Enhance ECG Monitoring. Fetal ECG Monitoring.

UNIT – IV

Signal Averaging, polishing – mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction. Yule – walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT-V

Neurological Signal Processing: Modelling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modelling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modelling.

Learning Resources:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques – D.C.Reddy, 2005, TMH.
3. Digital Bio signal Processing – Weitkunat R, 1991, Elsevier.
4. Biomedical Signal Processing – Akay M, IEEE Press.
5. Biomedical Signal Processing –Vol. I Time & Frequency Analysis – Cohen.A, 1986, CRC Press.
6. Biomedical digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J.Tompkins, PHI.
7. https://nptel.ac.in/courses/108105101/ Biomedical Signal Processing – by Prof.Sudipta Mukhopadhyay. IITKGP
8. http://www.ecdept.iitkgp.ac.in/index.php/home/faculty/smukho

The break-up of CIE : Internal Tests + Assignments + Quizzes

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2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Language Models and Applications

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE87XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To introduce students to the fundamental concepts and techniques of Natural Language Processing (NLP) and to cultivate their familiarity with Language Models.	On completion of the course, students will be able to 1. Apply N-grams for language modeling. 2. Apply part-of speech tagging algorithms for labeling text data. 3. Analyze documents using TF-IDF vector model. 4. Apply RNNs for language modeling. 5. Apply Transformers model for constructing Large Language Models (LLMs).

CO-PO/PSO Mapping

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

UNIT-I:

Introduction: Introduction – NLP.

Regular Expressions, Text Normalization, Edit Distance: Regular Expressions, words, corpora, Text Normalization, Minimum Edit Distance.

N-gram Language Models: N-Grams, Smoothing.

Part-of-Speech Tagging: HMM Part-of-Speech Tagging. CKY parsing.

Vector Semantics and embeddings: Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Word2vec.

UNIT-II:

Neural Networks and Neural language Models: Feed forward Neural Networks, Feed forward Networks for NLP Classification and language modeling.

RNNs: Recurrent Neural Networks, RNNs as language models, RNNs for other NLP tasks, Encoder-Decoder models with RNNs, Attention.

Transformers: Self Attention Networks - Transformers, Transformers as language models, Sampling, Beam Search.

UNIT III:

Fine-Tuning and Masked Language Models: Bidirectional Transformer Encoders (BERT), Training Bidirectional Encoders, Transfer Learning through Fine-Tuning.

UNIT-IV:

Overview of large language Models: Introduction to Large language Models, Definition of LLMs, Key Characteristics of LLMs, How LLMs work, Popular LLMs,GPT-3 and ChatGPT, Domain Specific LLMs.

UNIT-V:

Applications of LLMs: Classical NLP tasks, Free-Text Generation, Information Retrieval/Neural Sematic Search. Introduction to Prompt Engineering, Working with Prompts across Models.

Learning Resources:

1. Daniel Jurafsky & James H.Martin, "Speech and Language Processing", 3rd edition, Pearson Education. (https://web.stanford.edu/~jurafsky/slp3/ Revised January, 2023).
2. James Allan, Natural Language Understanding, 2nd edition(1995),Pearson Education.
3. Sinan Ozdemir, Quick Start Guide to Large Language Models: Strategies and Best Practices for Using ChatGPT and Other LLMs (Addison-Wesley Data & Analytics Series), 2023.
4. Charnaick, Eugene, Statistical Language Learning, MIT Press, 1993.
5. Christopher D. Manning, Hinrich Schutze, Foundations of Statistical Natural Language Processing,(1999), The MIT Press.
6. Tanveer Siddiqui, US Tiwary, Natural Language Processing and IRetrieval, (2008), Oxford University Press.

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Blockchain Technology and its Applications

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE88XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To understand the significance of Block chain and architecture of Blockchain. 2. To understand the bitcoin basics and bitcoin platforms. 3. To analyse the security and use cases in Blockchain.	On completion of the course, students will be able to 1. Understand the types, benefits and limitations of block chain. 2. Explore the block chain decentralization and cryptography concepts. 3. Enumerate the bitcoin features and its alternative options. 4. Describe and deploy bitcoin platforms. 5. Summarize the security issues.

CO-PO/PSO Mapping

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

UNIT-I:

Introduction: Introduction to Blockchain, Properties of blockchain technology, Distributed systems, History of blockchain and Bitcoin, Types of blockchain. Hash functions.

Decentralization: Methods of decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized organizations and platforms for decentralization.

UNIT-II:

Blockchain: Architecture, Versions, Variants, Use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.

Bitcoins: Introducing Bitcoin, Bitcoin digital keys and addresses, Transactions, Blockchain mining. Alternative Coins. Limitations of Bitcoin.

UNIT-III:

Bitcoin basics:

Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use

UNIT-IV:

Introduction to Blockchain Platforms: Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, etc. Advantages and Disadvantages, Ethereum vs Bitcoin, Design a new blockchain, Potential for disruption, Design a distributed application, Blockchain applications.

UNIT-V:

Privacy, Security issues in Blockchain: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity
preservation, attacks on Blockchains

Block chain case studies in Retail ,Banking and Financial services, Health care, Energy and utilities

Learning Resources:

1. Mastering Block chain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017 Reference Books.
2. Imran Bashir, "Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained", Packt Publishing.
3. Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan" "Blockchain Technology" ISBN: 9789389211634 | Year: 2020.
4. Merunas Grincalaitis, "Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols", Packt Publishing.
5. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "Blockchain Architecture Design And Use Cases"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Network Management

(Professional Elective-IV)
SYLLABUS FOR B.E. VIII – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: **U21PE88XEC**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To familiarize the students with the network architectures and management issues.	On completion of the course, students will be able to 1. Explain network management perspectives 2. Apply various network management protocol 3. Identify and describe TMN standards 4. Analyze various management issues 5. Demonstrate how to correctly maintain LAN

UNIT - I:
Overview of Data Communication and Network Management – Goals, Organization and Functions; Network Management – Architecture and Organization; Network Management Perpestives; Current Status and Future of Network Management. Network Topology, Network Node Components, Transmission Technology.

UNIT - II:
Network Management Standards, Network Management Models, Organizational Model, Information Model, Communication Model. **SNMPv1 –**History of SNMP, Internet Organization and Standards, SNMP Model, Organizational Model, System Overview, Information Model. SNMP Communication Model, Functional Model.SNMPv2 and SNMv3.

UNIT - III:
TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, TMN Integrated View, TMN Implementation.

UNIT - IV:

Configuration Management, Fault Management, Performance Management, Security Management, Service Level Management, Accounting Management, Report Management, Policy-Based Management.

UNIT - V:

Setting-UP LAN Access, SNMP configuration, Switched Port Analyzer, Web Browser / Web Server Communication. IP Network Management - Configuration, Management Information Base, Simple Network Management Protocol, IP-Based Service Implementation- Network Management Issues, OSS Architecture.

Learning Resources:

1. Mani Subramanian "Network Management - Principles and Practice", Addison-Wesley, 2000.
2. Salah Aiidarons, Thomas Plevayk, "Telecommunications Network Technologies and Implementations", Eastern Economy Edition IEEE press, New Delhi, 1998.
3. Lakshmi. G, Raman, "Fundamentals of Telecommunication Network Management", Eastern Economy Edition IEEE Press, New Delhi
4. J. Richard Burke, "Network Management: Concepts and Practice, A Hands-on Approach", Pearson Education, 2008.

The break-up of CIE : Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Academic Activity Planner / Calendar for the Academic Year 2024-25

S.No.	Month	Activities planned
ODD Semester		
1	August	Introduction and objectives of CCA activities and Awareness on Library learning Resources by Mr. Ravi Kumar Librarian, VCE.
2	August	Poster Presentation on "IoT Solutions in Agriculture" in association with IETE Students' Forum (ISF)
3	August	Alumni lecture on "Pre-requisites for CAT Entrance" by Mr. Ajith, IIM Ahmedabad (2021)
4	August	Guest lecture on Being Professional a framework of Engineers mindset by Dr. T.P. Sashi Kumar, Former Scientist, Dept of Space, ISRO.
5	September	Guest lecture on "6G technologies and its challenges" by Dr. Humaira Nishat, Prof., ECE CVR College of Engineering
6	September	"Logical Wizard", A technical event conducted in association with IEEE SB VCE Unit.
7	September	Alumni lecture on "Carrier Guidance in Software Domain" by Mr. Manoj (2023), Traniee Engineer at Principal Global Solutions, Hyderabad
8	October	Guest Lecture on "Advanced Embedded Systems using STM32" by Dr. Thottempudi Pardhu, for V -sem students Assistant professor, BVRIT, HYD
9	October	Technical Essay Writing Competition "Technology in Professional Ethics– need of the hour" in association with IETE Students' Forum (ISF)
10	October	Alumni lecture "Carrier Guidance in product based companies" by Mr. Anudeep (2020) SAP Consultant at L&T.
11	October	Guest lecture on "Life Skills" by Mr. V.T. Shiva, Managing Director, RC All-Tech Power Systems Pvt. Ltd.
12	November	Hackerrank™ based coding contest "Hackathon 2024" for BE ECE Sem-III students in association with IEEE SB.
13	November	A Guidance program on "Career Opportunities after B.Tech" by Mr. S. Manimohan Trinath, GATE/ESE Trainer, motivational speaker
14	November	Hackerrank™ based coding contest "Hackathon 2024" for BE ECE Sem-1 students in association with IEEE SB.
15	November	Alumni lecture on Time Management by Keshava Murthy (1988) Freelancer Consultant, Mysuru

EVEN Semester		
16	January	Guest lecture on IOT implementation using node MCU by Dr. Shyam sunder, Associate Professor, ECE Dept, Osmania University, HYD.
17	January	"Hardware circuit design contest" in association with IEEE SB of VCE Unit.
18	January	Alumni Technical talk" by N. Anagha (2023)
19	February	Guest Lecture Introduction to RF Design, Mr. Sourabh Joshi, Senior Team Lead, MathWorks, Hyderabad
20	February	"Tech Lipi – A technical contest" in association with IETE Students' Forum
21	February	Alumni lecture on "Career in ML and Data science" Mr. N Karthik Founding Engineer at Applied AI, Hyd.
22	March	Guest lecture on Communication related by Dr. Chayan Bhar, for VI-sem students Prof. NIT Warangal.
23	March	Guest Lecture on "Developing Business Models for Sustainability in Startup's" by Dr. B. Madhura, Assistant Professor ,School of Management Studies, Hyderabad
24	March	Poster Presentation on "AI & ML solutions for Societal Problems" in association with IETE Students' Forum
25	March	Alumni lecture "Carrier Guidance "by Mr. Shiva (2008) RPO, Vijayawada
26	April	Guest Lecture on "Alumini talk on how to get into core companies" by Mr. Neeraj (2022), Silicon Labs
27	April	Hackerrank™ based coding contest "Top Coder 2025" students in association with IEEE SB
28	April	Alumni lecture "Carrier Guidance" by Mr. Praneeth (2023), Hyundai Mobi's