ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M.E. ELECTRONICS AND COMMUNICATION ENGINEERING (INDUSTRY INTEGRATED)

REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

Prerequisite for the programme: Offered if commitment for summer internship followed by projects is available for all students from industry and for collaboration with industry in delivering lectures for the subjects in all semesters in the curriculum.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To enable graduates to possess skills to develop new innovation in the field of Electronics and Communication Engineering (Industry Integrated) using analytical reasoning and state-of-the-art approaches derived from the Engineering Sciences and Engineering practice.
2. To enable graduates to create useful systems, components, or processes through agile, skillful, and innovative analysis and design, while respecting economic, environmental, cultural, and ethical standards or constraints and acquire technical and managerial leadership positions in their chosen fields.
3. To enable graduates to engage in lifelong learning, adapt to evolving Technology, work in multidisciplinary research for designing innovative products & solutions.
4. To become Entrepreneurs, understand current professional issues and apply latest technologies for the betterment of the nation and society.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1. To apply the core aspects of Electronics and Communication Engineering principles such as Signal Processing, Embedded Systems, Networking and Semiconductor Technology for designing end to end electronic products catering industry requirements.

2. To identify and utilize the strengths of current technologies used in industries in the field of Microelectronics, Signal Processing and Communication System domains in implementing ICT enabled services for societal needs.

3. To identify industrial needs and provide suitable design solutions for implementing IoT, Cyber Physical Systems for given specifications.

4. To apply the core aspects of Electronics and Communication Engineering principles such as Signal Processing, Embedded Systems, Networking and Semiconductor Technology for designing end to end electronic products catering industry requirements.

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CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND 1st SEMESTER SYLLABI
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4156	Linear Algebra, Probability and Queueing Theory	FC	3	1	0	4	4
2.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
3.	VE4151	Embedded Controllers	PCC	3	0	0	3	3
4.	II4101	Industrial Automation and Control	PCC	3	0	0	3	3
5.	II4102	Virtual Instrumentation	PCC	3	0	0	3	3
6.	EL4151	Modern Digital Communication Systems	PCC	3	0	0	3	3
7.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
8.	EL4161	Digital Communication systems Laboratory	PCC	0	0	3	3	1.5
9.	II4111	Application Software and Simulation Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**19**	**1**	**6**	**26**	**21**

*Audit course is optional

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	II4201	ASIC and FPGA Design	PCC	3	0	0	3	3
2.	II4202	Wireless Communication and Networking	PCC	3	0	0	3	3
3.	II4203	Advances in Internet of Things	PCC	3	0	0	3	3
4.	MP4251	Cyber Physical Systems	PCC	3	0	2	5	4
5.		Professional Elective I	PEC	3	0	0	3	3
6.		Professional Elective II	PEC	3	0	0	3	3
7.		Audit Course – II*	AC	2	0	0	2	0
PRACTICALS								
8.	II4211	Internet of Things Applications Laboratory	PCC	0	0	2	2	1
9.	II4212	Term Paper and Seminar	EEC	0	0	2	2	1
			TOTAL	**20**	**0**	**6**	**26**	**21**

*Audit course is optional

Note: Summer internship (in Industry) (30 days min)

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	II4301	Robotics and Automation	PCC	3	0	0	3	3
2.		Professional Elective III	PEC	3	0	0	3	3
3.		Professional Elective IV	PEC	3	0	2	5	4
4.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
5.	II4311	Summer internship (in Industry) (30 days min)	EEC	0	0	0	0	2
6.	II4312	Project Work I	EEC	0	0	12	12	6
			TOTAL	**12**	**0**	**14**	**26**	**21**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	II4411	Project Work II	EEC	0	0	24	24	12
			TOTAL	**0**	**0**	**24**	**24**	**12**

TOTAL NO. OF CREDITS: 75

PROFESSIONAL ELECTIVES (PE)
SEMESTER II, ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EL4351	Optical Networks	PEC	3	0	0	3	3
2.	II4001	Network Security Technologies	PEC	3	0	0	3	3
3.	MP4074	Soft Computing Techniques	PEC	3	0	0	3	3
4.	II4072	System on Chip	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	II4071	Industry 4.0	PEC	3	0	0	3	3
2.	II4002	Broadband Access Technologies	PEC	3	0	0	3	3
3.	II4003	Smart Antennas	PEC	3	0	0	3	3
4.	EL4071	Electromagnetic Interference and Compatibility	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	II4004	Healthcare Technologies and Internet of Medical Things	PEC	3	0	0	3	3
2.	II4005	Cognitive Radio Communications	PEC	3	0	0	3	3
3.	IF4072	Computer Vision	PEC	3	0	0	3	3
4.	VL4073	MEMS and NEMS	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	II4006	Wireless Adhoc and Sensor Networks	PEC	3	0	2	5	4
2.	II4007	Real Time Systems	PEC	3	0	2	5	4
3.	II4008	Software Defined Networks	PEC	3	0	2	5	4
4.	CP4252	Machine Learning	PEC	3	0	2	5	4

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4044	நற்றமிழ் இலக்கியம்	2	0	0	0

MA4156 LINEAR ALGEBRA, PROBABILITY AND QUEUEING THEORY L T P C
3 1 0 4

COURSE OBJECTIVES:

The objective of this course is to enable the student to

- grasp the basic concepts of Probability, Random variables, correlation and regression.
- characterize the phenomena which evolve with respect to time in a probabilistic manner.
- encourage students to develop a working knowledge of the ventral ideas of linear algebra.
- acquire skills in analyzing Queueing Models.
- develop a fundamental understanding of linear programming models and apply the simplex method for solving linear programming problems.

UNIT – I LINEAR ALGEBRA 12

Vector spaces – Norms – Inner products – Eigenvalues using QR transformations – QR factorization – Generalized eigenvectors – Jordan Canonical forms – Singular value decomposition and applications – Pseudo inverse – Least square approximations.

UNIT – II PROBABILITY AND RANDOM VARIABLES 12

Probability Concepts – Axioms of probability – Conditional probability – Baye's theorem – Random variables – Probability functions – Two-dimensional random variables – Joint distributions – Marginal and conditional distributions – Correlation – Linear Regression.

UNIT – III RANDOM PROCESSES 12

Classification – Stationary random process – Markov process – Markov chain – Poisson process – Gaussian process – Auto correlation – Cross correlation.

UNIT – IV QUEUEING THEORY 12

Markovian queues – Single and multi-server models – Little's formula – Steady state analysis – Self-service queue.

UNIT – V LINEAR PROGRAMMING 12

Formulation – Graphical solution – Simplex method – Big M method – Variants of Simplex method – Transportation problems – Assignment models.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After the completion of the course, the student will be able to

- apply various methods in Linear Algebra to solve the system of linear equations.
- use two-dimensional random variables, correlations and regression in solving application problem.
- apply the ideas of Random Processes.
- understand the basic characteristic features of a queueing system and acquire skills in analyzing queueing models.
- apply the Simplex method for solving linear programming problems.

REFERENCES:

1. Miller,S.L. and Childers D.G., “Probability and Random Processes with Applications to Signal Processing and Communications”, Academic Press,2004.
2. Friedberg A.H, Insel A.J. and Spence L, “Linear Algebra”, Prentice Hall of India, New Delhi, 2004.
3. Gross, D., Shortie, J.F., Thompson, J.M and Harris, C.M., “Fundamentals of Queueing Theory”, 4th Edition, Wiley,2014.
4. T. Veerarajan, “Probability, Statistics and Random Process with Queueing Theory and Queueing Network, Tata McGraw Hill, 4th Edition,2017.
5. Taha H.A., “Operations Research: An Introduction”, 9th Edition, Pearson Education Asia, New Delhi,2016.
6. Richard Bronson, ”Matrix Operations” Schaum’s outline series, McGraw Hill, 2nd Edition, New York,2011.
7. Oliver C. Ibe, “ Fundamentals of Applied Probability and Random Processes”, Academic Press, (An Imprint of Elsevier), Boston,2014.

RM4151	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

UNIT I RESEARCH DESIGN **6**

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES **6**

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.

Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING **6**

Overview of Multivariate analysis, Hypotheses testing and Measures of Association.

Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS **6**

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS **6**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, “Professional Programme Intellectual Property Rights, Law and practice”, September 2013.

VE4151 EMBEDDED CONTROLLERS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the architecture and programming of PIC microcontrollers.
- To learn interfacing with PIC microcontrollers.
- To understand the ARM processor architecture.
- To program using ARM Instruction Set.
- To design and develop embedded applications.

UNIT I PIC MICROCONTROLLER – ARCHITECTURE **9**

RISC Vs CISC Architectures – PIC Architecture and Assembly Language Programming - Program Memory Organization- Branch, Call and Time Delay Loop - PIC I/O Port Programming - Arithmetic and Logic Instructions and Programs - PIC Bank Switching, Table Processing, Macros And Modules PIC Configuration Registers-PIC Hardware Connection-ROM Loaders.

UNIT II PIC INTERFACING **9**

PIC Timer / Counter Programming - Timers 0 And 1- Programming Timers 2 and 3 -Serial Port Programming -Interrupt Programming -Flash / EEPROM Programming - Standard and Enhanced CCP Modules -Compare Mode Programming - Capture Mode Programming- PWM Programming- ECCP Programming.

UNIT III ARM ARCHITECTURE **9**

Introduction to ARM Processor families – Pipeline- ARM7TDMI Programmers Model- Processor Modes-Program Status Registers - Vector Table- Assembler Rules and Directives - Predefined Register Names – Macros – Assembler – Operators – Literals - Load and Store Instructions - Operand Addressing – Endianness - Arm Rotation Scheme - Loading Constants and Addresses into Registers.

UNIT IV ARM PROGRAMMING **9**

ARM Instruction Set - Data Processing Instructions – Branch Instructions -– Load Store Instructions – Software Interrupt Instruction – Program Status Register Instructions – Conditional Execution - Thumb Instruction Set-Thumb Programmers Model-Thumb Branch Instructions- Thumb Data Processing Instructions-Thumb Single Register Data Transfer- Thumb Multiple Register Data Transfer Instructions - Thumb Implementation.

UNIT V EMBEDDED APPLICATIONS 9

ADC, DAC and Sensor Interfacing –LCD and Keyboard Interfacing -Calculator with Keypad – Relays and Optoisolators - Stepper Motor Interfacing - DC Motor Interfacing - PWM Motor Control with CCPDC - Motor Control With ECCP.

SUGGESTED ACTIVITIES:

1: Interfacing PIC microcontrollers with peripherals.
2: Assignments on programming ARM processors.
3: Design embedded systems for real – time applications.

COURSE OUTCOMES:

CO1: Understand the architecture of a PIC microcontroller.
CO2: Program using PIC microcontrollers.
CO3: Program using ARM processors.
CO4: Design interfacing circuits with PIC microcontrollers.
CO5: Design embedded applications to solve real world problems.

TOTAL:45 PERIODS

REFERENCES:

1. Muhammad Ali Mazidi, "PIC Microcontrollers and Embedded Systems using Assembly and C for PIC18 ", Pearson Education, 2016.
2. William Hohl, "ARM Assembly Language", CRC Press, Second Edition, 2015.
3. John B. Peatman, "Design with PIC Microcontrollers", Pearson Education, Singapore – 1998
4. Andrew Sloss, Dominic Symes, and Chris Wright, "ARM System Developer's Guide Designing and Optimizing System", The Morgan Kaufmann Series, 2004.
5. Steve Furber,"ARM System-on-Chip Architecture", Addison- Wesley Professional; ll Edition 2000.

II4101 INDUSTRIAL AUTOMATION AND CONTROL L T P C

3 0 0 3

COURSE OBJECTIVES:

The students will be able to

- Understand PLC Instructions
- Develop Ladder Logic for working models
- Use SCADA programming
- Interface various sensors with Arduino for industrial Automation

UNIT I PROGRAMMABLE LOGIC CONTROLLERS 9

Programmable Logic Controllers (PLCs) – architecture-Types- features -Programming a PLC using ladder/connected Component workbench-Input & Output Modules- Bit Instructions- Timer & Counter Instructions- Comparison & Data Handling Instructions- Program Control Instructions- Sequencing Instructions- PLC Programming Exercises for Industrial Applications- DOL starter- Star Delta starter- Automatic water level controller- Conveyor-Lift-Bottle filling and process control applications-Analog I/Os -High speed counter-PTO PWM and RTC

UNIT II SCADA SYSTEM 9

Evolution of SCADA, Various SCADA architectures, advantages and disadvantages of each system, SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent

Electronic Devices (IED), Communication Network, SCADA Server Data acquisition systems, SCADA applications in Automation, SCADA –Memory tag, Device tag, Alarm logging, Data logging, OPC server- HMI Systems –DCS- DCS integration with PLC and Computers - Features of DCS

UNIT III ARDUINO AND SENSORS FOR INDUSTRIAL AUTOMATION AND CONTROL **9**

Arduino board and IDE – Digital and Analog I/Os – Interfacing with Sensors –IR-PIR-Ultrasonic sensor – colour sensor -barometric pressure-Pulse- smoke-Temperature - Sound-Flame – Touch-Accelerometer-Humidity and temperature - Seven segment display – LCD – Stepper Motor and DC Motor control, Graphical display, robot arm, Joystick, Wi fi interface, Blue tooth interface, Home automation, GPS tracker

UNIT IV DATA ACQUISITION SYSTEM **9**

Data acquisition of digital and analog signals (input and output) – Stand alone, LabVIEW compatible, Mat lab compatible, Real time data acquisition and storing using different data acquisition cards. Retrieving the stored data for analysis – High level language programming for using data acquisition system

UNIT V PROCESS CONTROL AND PNEUMATICS **9**

Process control- P, PI, PD.PID–Tuning methods- Statistical Process Control, Model Predictive Control, Fuzzy Logic Based Control, Neural-Network Based Control

Actuators in motor vehicles, power switches, electrical rotary and linear actuators - pneumatic system - Properties of air – Perfect Gas Laws –Components of pneumatic system- ISO symbols for their elements -Control and regulation Elements—Direction, flow and pressure control valves--Methods of actuation, types, Design of Pneumatic and Electro pneumatic circuit– Simulation of Pneumatic and Electro pneumatic circuits - Applications using Robotics

TOTAL: 45PERIODS

COURSE OUTCOMES:

The students will be able to

- Program PLC for Industrial Applications
- Interface PLC with working models
- Control Applications using SCADA programming
- Develop industrial Automationusing Arduino with various sensors

REFERENCES:

1. Gary Dunning, Introduction to Programmable Logic Controllers,3rd India edition, Cengage Learning, 2007
2. John Webb, Programmable Logic Controllers: Principles and Applications,5th edition Prentice Hall of India, 2012.
3. Krishna Kant Computer Based Process Control, Prentice Hall of India, 2004.
4. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986
5. B. G. Liptak Instrument Engineers Handbook – Process Software and Digital Network, 3rd edition, CRC Press,2002.
6. Jose A. Romagnoli, AhmetPalazoglu, Introduction to Process control, CRC Taylor and Francis group, 2005.

7. Richard Cox, Programmable Controllers, Delmer Thomson learning, 2001.
8. RichardZurawski, Industrial Communication Technology Handbook 2nd edition, CRC Press, 2015.
9. W.Bolton, “Mechatronics, Electronic Control Systems in Mechanical and Electrical Engineering”, Pearson Education, 2003
10. “Automation, Production Systems and Computer Integrated Manufacturing”- M.P. Grover, Pearson Education.
11. “Computer Based Industrial Control” – Krishna Kant, EEE-PHI 2.

II4102 VIRTUAL INSTRUMENTATION L T P C
3 0 0 3

COURSE OBJECTIVES:

The students will be able to

- understand the basics of Virtual Instrumentation
- differentiate analog and digital I/Os
- use LabVIEW for experiments
- analyze tools and applications in VI

UNIT I REVIEW OF DIGITAL INSTRUMENTATION 8

Representation of Analog signals in the Digital domain – Review of quantization in amplitude and time axis, sample and hold, sampling theorem, ADC and DAC types.

UNIT II FUNDAMENTALS OF VIRTUAL INSTRUMENTATION 10

Concept of virtual instrumentation – PC based data acquisition – Typical on board DAQ card, Resolution and sampling frequency - Multiplexing of analog inputs – Single-ended and differential inputs – Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card - Use of timer-counter and analog outputs on the universal DAQ card.

UNIT III CLUSTER OF INSTRUMENTS IN VI SYSTEM 10

Interfacing of external instruments to a PC – RS232, RS 422, RS 485 and USB standards - IEEE 488 standard – ISO-OSI model for serial bus – Introduction to bus protocols of MOD bus and CAN bus, PXI Bus

UNIT IV GRAPHICAL PROGRAMMING ENVIRONMENT IN VI 10

Concepts of graphical programming language LabVIEW – Concept of VIs and sub VI – Graphs & charts – Dataflow programming - Loops – Case and sequence structures - Types of data – Arrays & clusters – Formula nodes –math scrip integration - Local and global variables – String and file I/O – Building executables and installers – Web publishing tools

UNIT V ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI 7

Build virtual instruments like oscilloscope, FFT analyzer – Windowing and filtering tools – Introduction of Electrical power measurement suite - Simple temperature ON/OFF controller – P-I-D controller design - Simulation of a simple second order system – Building autonomous embedded system using FPGA target

TOTAL:45 PERIODS

COURSE OUTCOMES:

The students will be able to

- use VI basics for Industrial Applications
- develop Virtual Instrumentation using LabVIEW
- use DAQ for Real Time Applications

REFERENCES:

1. Jovitha Jerome, Virtual Instrumentation using LabVIEW, PHI publications, 2010
2. S.Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control',
3. Instrument society of America, 1994.
4. Peter W. Gofton, 'Understanding Serial Communications', Sybex International.
5. Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.
6. Richard Jennings & Fabiola De La Cueva, LabVIEW Graphical Programming - Fifth Edition, McGraw-Hill
7. John Essick, Hands-On-Introduction to LabVIEW for Scientists and Engineers – Fourth Edition, OXFORD Publications
8. BehzadEhsani, Data Acquisition using LabVIEW, Packt Publishing, 2016

EL4151 MODERN DIGITAL COMMUNICATION SYSTEMS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the coherent and non coherent receivers and their performance under AWGN channel conditions
- To understand the effect of signalling through bandlimited channels and Equalization techniques used to overcome ISI
- To understand different channel models, channel capacity and different block coding techniques
- To understand the principle of convolutional coding and different decoding techniques
- To understand the basics of OFDM as a multicarrier communication and CDMA as a multiuser communication technique.

UNIT I COHERENT AND NON-COHERENT COMMUNICATION 9

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – QAM modulation and demodulation Noncoherent receivers in random phase channels; MFSK receivers – Rayleigh and Rician channels – Partially coherent receivers – DPSK; M-PSK; M-DPSK-BER Performance Analysis. Carrier Synchronization Bit synchronization.

UNIT II EQUALIZATION TECHNIQUES 9

Band Limited Channels- ISI – Nyquist Criterion- Controlled ISI-Partial Response signals- Equalization algorithms– Linear equalizer – Decision feedback equalization – Adaptive Equalization algorithms.

UNIT III BLOCK CODED DIGITAL COMMUNICATION 9

Architecture and performance – Binary block codes; – Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK

demodulators– Linear block codes; Hamming; Golay; Cyclic; BCH ; Reed – Solomon codes. Space time block codes.

UNIT IV CONVOLUTIONAL CODED DIGITAL COMMUNICATION 9

Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

UNIT V MULTICARRIER AND MULTIUSER COMMUNICATIONS 9

Single Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), Modulation and demodulation in an OFDM system, An FFT algorithmic implementation of an OFDM system, Bit and power allocation in multicarrier modulation, Peak-to-average ratio in multicarrier modulation. Introduction to CDMA systems, multiuser detection in CDMA systems – optimum multiuser receiver, suboptimum detectors, successive interference cancellation.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1: Differentiate coherent and non coherent receivers and analyse their performance under AWGN channel conditions

CO2: Illustrate the effect of signalling through bandlimited channels and Equalization techniques used to overcome ISI

CO3: Determine the channel capacity and design various block coding techniques to combat channel errors

CO4: Construct convolutional coders and analyze the performance of different decoding techniques.

CO5: Describe the basics of OFDM as a multicarrier communication and CDMA as a multiuser communication technique.

TOTAL:45 PERIODS

REFERENCES:

1. John G. Proakis and Masoud Salehi “Digital Communication”, Fifth Edition, Mc Graw Hill Publication, 2014.
2. Simon Haykin, “Digital communication Systems”, John Wiley and sons, 2014.
3. Bernard Sklar and Pabitra Kumar Ray, “Digital Communications Fundamentals & Applications ”, second edition, Pearson Education, 2009.
4. Lathi B P and Zhi Ding, “Modern Digital and Analog communication Systems", Oxford University Press, 2011.
5. Richard Van Nee & Ramjee Prasad, “OFDM for Multimedia Communications” Artech House Publication, 2001.
6. Theodore S.Rappaport, ‘Wireless Communications”, 2nd edition, Pearson Education,2002.

EL4161	DIGITAL COMMUNICATION SYSTEMS LABORATORY	L T P C 0 0 3 1.5

COURSE OBJECTIVES:

- To study & measure the performance of digital communication systems.
- To provide a comprehensive knowledge of Wireless Communication.

- To learn about the design of digital filter and its adaptive filtering algorithms.

LIST OF EXPERIMENTS (MATLAB/SCILAB/CABVIEW)

USE APPROPRIATE SIMULATION TOOLS FOR THE FOLLOWING EXPERIMENTS:

1. Generation & detection of binary digital modulation techniques using SDR
2. Spread Spectrum communication system-Pseudo random binary sequence generation-Baseband DSSS.
3. MIMO system transceiver design using MATLAB/SCILAB/LABVIEW
4. Performance evaluation of simulated CDMA system
5. Channel Coder/decoder design (block codes / convolutional codes/ turbo codes)
6. OFDM transceiver design using MATLAB /SCILAB/LABVIEW
7. Channel equalizer design using MATLAB (LMS, RLS algorithms)
8. Design and Analysis of Spectrum Estimators (Bartlett, Welch) using MATLAB
9. BER performance Analysis of M-ary digital Modulation Techniques (coherent & non coherent) in AWGN Environment using MATLAB/SCILAB/LABVIEW
10. Design and performance analysis of Lossless Coding Techniques - Huffman Coding and Lempel Ziv Algorithm using MATLAB/SCILAB/LABVIEW
11. Noise / Echo cancellation using MATLAB (LMS / RLS algorithms).
12. Study of synchronization (frame, bit, symbol.)
13. Wireless channel characterization.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Upon the completion of course, students are able to

- Implement the adaptive filtering algorithms
- Generate and detect digital communication signals of various modulation techniques using MATLAB.
- Evaluate cellular mobile communication technology and propagation model.
- Apply mathematical formulation to analyze spectrum estimation of a signal and bit rate determination of a transmission link
- Analyze the performance of optimization algorithms for equalizing the channel or noise/echo cancellation
- Able to design synchronization algorithm for Digital Communication systems

II4111	APPLICATION SOFTWARE AND SIMULATION LABORATORY	L T P C 0 0 3 1.5

COURSE OBJECTIVE:

- To develop skills in writing programs and simulation of experiments.

Programming and Simulation for laboratory experiments and Industrial Applications to be performed (10 to 14 experiments)

1. Generation of standard discrete time deterministic and random signals using simulation tools
2. Generation and detection of digital modulation techniques using simulation tools
3. Bit Error Rate Analysis of different modulation scheme in AWGN and Rayleigh fading environments using simulation tools
4. Outage Analysis of communication system in AWGN and Rayleigh fading environments using simulation tools
5. Communication system analysis using Universal Software Radio Platform
6. Design of electronic circuits for the given application and analyze its performance using simulation tools
7. Design and Testing of electronic circuits for the given application using simulation tools
8. Design and simulation of Potential Distribution/Field of the MOSFET using finite difference method.
9. Design and simulation of P-Channel and N-Channel MOSFET
10. Implementing Data communication with WIFI module
    i. Analog sensor monitoring
    ii. Digital input monitoring
11. Implementing IOT with sensors monitoring
    i. Analog sensor monitoring
    ii. Digital input monitoring
12. Implementing IOT with actuator control
    i. ON-OFF control
    ii. Analog control
13. Miniproject/Case Study

TOTAL : 45 PERIODS

COURSE OUTCOMES:

On the successful completion of the course, the students will be able to

- To design, simulate, test and analyze electronic circuits/systems for given specifications/ applications
- To design and simulate experiments and industrial applications based on communication systems using simulation tools
- To simulate experiments using available hardware and tools and implement them

AUDIT COURSES

AX4091	**ENGLISH FOR RESEARCH PAPER WRITING**	**L T P C** **2 0 0 0**

COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion

- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS 6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1 –Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

AX4092 DISASTER MANAGEMENT L T P C

2 0 0 0

COURSE OBJECTIVES:

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice

from multiple perspectives.

- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA 6

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

COURSE OUTCOMES:

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES:

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

AX4093 **CONSTITUTION OF INDIA** **L T P C**
2 0 0 0

COURSE OBJECTIVES:

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization

- of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

AX4094	**நற்றமிழ் இலக்கியம்**	**L T P C** **2 0 0 0**

UNIT I **சங்க இலக்கியம்** **6**

1. தமிழின் துவக்க நூல் தொல்காப்பியம்
   – எழுத்து, சொல், பொருள்
2. அகநானூறு (82)
   - இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195)
   - போரை நிறுத்திய ஔவையார்

UNIT II **அறநெறித் தமிழ்** **6**

1. அறநெறி வகுத்த திருவள்ளுவர்
   - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து
   – ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை

(தூய்மையை வலியுறுத்தும் நூல்)

UNIT III **இரட்டைக் காப்பியங்கள்** **6**

1. கண்ணகியின் புரட்சி
   - சிலப்பதிகார வழக்குரை காதை
2. சமூகசேவை இலக்கியம் மணிமேகலை
   - சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV **அருள்நெறித் தமிழ்** **6**

1. சிறுபாணாற்றுப்படை
   - பாரி முல்லைக்குத் தேர் கொடுத்தது,

பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்

2. நற்றிணை
   - அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618)
   - இயமம் நியமம் விதிகள்
4. தர்மச்சாலையை நிறுவிய வள்ளலார்
5. புறநானூறு
   - சிறுவனே வள்ளலானான்
6. அகநானூறு (4) - வண்டு
   நற்றிணை (11) - நண்டு
   கலித்தொகை (11) - யானை, புறா
   ஐந்தினை 50 (27) - மான்
   ஆகியவை பற்றிய செய்திகள்

UNIT V **நவீன தமிழ் இலக்கியம்** **6**

1. உரைநடைத் தமிழ்,
   - தமிழின் முதல் புதினம்,
   - தமிழின் முதல் சிறுகதை,
   - கட்டுரை இலக்கியம்,
   - பயண இலக்கியம்,
   - நாடகம்,
2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL : 30 PERIODS

<u>தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்</u>

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
   - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
   -https://ta.wikipedia.org
3. தர்மபுர ஆதின வெளியீடு
4. வாழ்வியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
   - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்