PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636011

DEGREE OF MASTER OF SCIENCE
(CHOICE BASED CREDIT SYSTEM)

SYLLABUS FOR

M.Sc., ELECTRONICS AND COMMUNICATION

(SEMESTER PATTERN)
(For Candidates admitted in the Colleges affiliated to Periyar University from 2023-2024 onwards)

Objective:

The postgraduate (PG) degree **in Electronics and Communication** intends to develop new work opportunities for research-oriented technocrats and entrepreneurs, who will shape the scientific and technological area. Curriculum, course content, and assessment all plays a significant influence in the development of PG students, research scholars and engineers. As a result, it should be compromised with basic understanding of current developments in the sector. Based on this viewpoint, the expert committee created a syllabus **for M.Sc. Electronics and Communication** programme that includes a wide range of topics in order to suit industry and research expectations.

Employment Opportunities:

IT sectors /Defense/Railways/ISRO/DRDO/ Circuit designer.
Electronics /Communications /Bio Medical sectors and mobile communication 3.Government of Telecommunication /Air Force/Navy.

Eligibility for Admission:

A candidate who has passed **B.Sc., Electronics and Communication/ B.Sc., Electronics and Communication systems / B.Sc., Electronics /B.Sc., Physics/ B.Sc., industrial Electronics / B.Sc., IoT / B.Sc., Computer Science/BCA/B.Sc.,IT / B.Sc., Data science** degree of this University or any of the above degree of any other university accepted by the syndicate as equivalent there to, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc., Electronics and Communication degree examination of this university after a course of study of two academic years**.(As per the guidelines for the admission of Post Graduate (PG) students by Department of Collegiate Education, Chennai.)**

Medium of Instruction: Medium of instruction and examination shall be in ENGLISH.
Regulations Duration of the course: Two Years divided into Four semesters. Each semester willbe of 90 working days.

SCHEME OF EXAMINATIONS:

As per the CBCS pattern with SE (Secured External Examinations score) and IA (Internal Assessment score)

Marks For Internal: (For All PG courses)

Cycle Test And Model Exam	:15marks
Assignment	:5 Marks
Seminar/Attendance	:5marks

Marks For External :(Max. Marks:75,Passing minimum:38,Time:3Hours)
Part A (10X1=10marks), Answer All questions, Two questions from each unit
Part B (5X5=25marks), Answer All questions, One question from each unit with internal Choice
Part C (5X8=40marks),Answer All questions, One question from each unit with internal Choice

<u>Practical Papers:</u> TIME: 3Hours, Maximum Marks:60(External)and40(Internal)

Internal Marks Distribution:	40 Marks
Model Exam	:20 Marks
Record Work	:10 Marks
Attendance	:10marks
External Marks Distribution:	60 Marks
Circuit Construction	:40 Marks
Tabulation And Graph	:10 Marks
Correct Output	:10marks

Project Work:(Maximum Marks):IA:40marks and SE:160 Marks

Internship/Fieldwork :Duration 15- days.

	S.No	Subject Status	Subject Title	Hrs /Wk	Credit	Exam Hrs	Internal	External	Total
	1	2	3	4	5	6	7	8	9
SEMESTER-1									
1.	23PECCT01	Core –1	Electronic Properties of Materials	5	4	3	25	75	100
2.	23PECCT02	Core –2	Analog and Digital System Design	5	4	3	25	75	100
3.	23PECCT03	Core –3	Advanced Microprocessors	5	4	3	25	75	100
4.	23PECME01A/ 23PECME01B	Elective -1 (Any one)	A.Quantum Optical Communication/ B.Computer Networks	4	2	3	25	75	100
5.	23PECME02A/ 23PECME02B	Elective-2 (Any one)	A. Mathematical Methods and Network /B. Biomedical Instrumentation	4	2	3	25	75	100
6.	23PECCP01	Core practical -1	Analog Electronic Design Lab	3	2	3	40	60	100
7.	23PECCP02	Core practical -2	Digital Electronic Design Lab	3	2	3	40	60	100
Subtotal				30	20	-	-	-	700
SEMESTER –II									
8.	23PECCT04	Core-4	Electromagnetics, Microwave and Antenna	5	4	3	25	75	100
9.	23PECCT05	Core-5	Microcontrollers, Embedded System and IOT applications	5	4	3	25	75	100
10	23PECCT06	Core-6	Digital Communication System	5	4	3	25	75	100
11.	23PECME03A/ 23PECME03B	Elective -3 (Any one)	A.Nano Electronics/ B.Smart Manufacturing	3	2	3	25	75	100
12.	23PECME04A/ 23PECME04B	Elective -4 (Any one)	A. Optoelectronics and Optical Fiber Communication / B.Artificial Intelligence Using Machine Learning	3	2	3	25	75	100
13.	23PECCP03	Core Practical– 3	Microcontroller’s Lab	3	2	3	40	60	100
14.	23PECCP04	Core Practical– 4	Embedded System Design and IoT Lab	3	2	3	40	60	100
15.	23PECNE01	NON – MAJOR Elective(NME-1)	PCB Designing Tools	2	2	3	25	75	100

16	23PECHR01	HR	Human Rights	1	1	3	25	75	100
	Subtotal			30	23	-	-	-	900
SEMESTER -III									
17.	23PECCT07	Core-7	Advanced Power Electronics and Virtual Instrumentation	5	4	3	25	75	100
18.	23PECCT08	Core-8	Mobile, Optical and Data Communication systems	5	4	3	25	75	100
19.	23PECCT09	Core-9	Digital Signal and Image Processing	5	4	3	25	75	100
20.	23PECCT10	Core-10	RF Circuit and Satellite Communication	5	4	3	25	75	100
21.	23PECME05A/ 23PECME05B	Elective -5 (Any one)	A.Research Methodology/ B. Solar Energy Systems	2	2	3	25	75	100
22.	23PECCP05	Core Practical-5	Advanced Communication Lab	3	2	3	40	60	100
23.	23PECCP06	Core Practical-6	DSP MAT Lab and LABVIEW Instrumentation Lab	3	2	3	40	60	100
24.	23PECNE02	NON – MAJOR Elective(NME-2)	Cyber Security	2	2	3	25	75	100
25.	23PECIO01	Intern Ship (Any one)	Field Survey/Industrial Activity/ MOOC courses	-	2	-	25	75	100
Subtotal				30	26				800
SEMESTER –IV									
26.	23PECCT11	Core-11	Introduction of Python and Android Application Tools Development	5	4	3	25	75	100
27.	23PECCT12	Core-12	VLSI Design and VHDL programming	5	4	3	25	75	100
28.	23PECME06A/ 23PECME06B	Elective-6 (Any one)	A . Robotics and Automation / B.e-Vehicles Technologies	4	3	3	25	75	100
29.	23PECCP07	Core Practical-7	VLSI and Android Application development Lab	3	2	3	40	60	100
30.	23PECCP08	Core Practical-8 /Skill Enhancement course(SEC-1)	Object Oriented Programming using Python Lab.	3	2	3	40	60	100

31.	23PECPR01	Core Project -1	Project Work with viva-voce	8	7	3	40	160	200
32.	23PECEX01	Activity-1	Extension Activity	2	1	-	-	-	-
Subtotal				30	23	-	-		700
TOTAL				***120***	***92***				***3100***

Core Theory -12, Core Lab-8,Elective -6, N M E -2, Project -1, SEC-1. Intership-1 Ex.activity-1

M.Sc. Electronics and Communication / Semester -I / Ppr.no.1/ Core – 1

ELECTRONIC PROPERTIES OF MATERIALS

OBJECTIVES: To understand the basic electronic properties of materials to explore the novel devices in electronics industries.

UNIT I

Electrical properties of metals: Conductivity, reflection and absorption, Fermi surfaces, superconductivity, thermoelectric phenomena. Conduction in metals oxides, amorphous materials.

UNIT II

Dielectric Properties of materials: Macroscopic electric field, local electric field at an atom, dielectric constant and polarizability, ferroelectricity, anti ferroelectricity, phase transition, piezoelectricity, ferro elasticity, electrostriction.

UNIT III

Optical properties of materials: Optical constants and their physical significance, Kramers – Kronig Relations, Electronic intern bond and intra bond transitions Relations between Optical properties and band structure – colour of material (Frenkel Excitons), Bond Structure determination from optical spectra reflection, refraction, diffraction, scattering, dispersion, photoluminescence, Electroluminescence.

UNIT IV

Magnetic Properties of Materials: Diamagnetism, Para magnetism, various contributionsto par and dia-magnetism, Adia-batic demagnetization, Paramagnetic susceptibility. Ferromagnetism, ferrimagnetism, ferrites, anti-ferromagnetism, curic point, temperature dependence of saturation magnetization, saturation magnetization at absolute zero, magnons and their thermal excitation, dispersion relation, Neutron Magnetic scattering, Ferrimagneticand anti-ferrimagnetic order, domains and domain walls, magnetic resonance. Coercive force, hysteresis, methods for parameters measurements.

UNIT V

: **Materials Properties at Nanoscale** Quantum Confinement in Nanomaterials-Prime materials in Nanotechnology- Nanomaterials: natural and man-made-Semiconductor Nanomaterials-Polymers and Composites-Metal Nanoparticles-Biomaterials-Unique properties of nanomaterials-Microstructure and defects in monocrystalline materials-Effect of nano dimensions on material behavior (magnetic, electrical, optical and thermal properties).

Text Books:

1. Electronic Properties of materials, R.E. Hummel, Springer New York publication
2. Solid State Physics, Dekkar, Mc Graw Higher Ed publication
3. Introduction to Solid State Physics, C.Kittle, Wiley publication
4. Principles of Electronic materials &dev, S.O. Kasap, McGraw Higher Ed Publication
5. Elementary Solid-state physics, M. Ali Omar; Pearson Publication.
6. Nanotechnology: The Science of Small-M.A Shah & K.A Shah, Wiley Publication -First Edition 2013

COURSE RESULTS: The knowledge of materials in electronics should be useful to students for further device development.

M.Sc. Electronics and Communication / Semester -I / Ppr.no.2/ Core - 2

ANALOG AND DIGITAL SYSTEM DESIGN

OBJECTIVES: To acquire and understand the basic knowledge of analog circuits and digital logic design

UNIT I
ANALOG SYSTEM DESIGN: Circuit Design and Analysis using PSPICE – Schematics, attributes and types of analysis in PSPICE, use of PROBE.

UNIT II
DESIGN AND ANALYSIS-1: Design and analysis of BJT/FET differential and multistage amplifiers, current sources, current mirrors, and active loads, small signal circuit analysis

UNIT III
DESIGN AND ANALYSIS-2: Operational Amplifiers (OPAMP)-characteristics and Applications-Integrator, Differentiator, Wave-shaping circuits, Active filters, Oscillators, Schmitt trigger circuit, non-sinusoidal oscillators and timing circuits

UNIT IV
DESIGN AND ANALYSIS-3: Design and analysis of signal conditioning circuits, Current to Voltage, Voltage to Current, Voltage to Frequency, Frequency to Voltage converters, Phase Locked Loop (PLL) and its application circuits.

UNIT V
DIGITAL SYSTEM DESIGN: Digital system design concepts, approaches, basic combinatorial and Sequential circuits, Implementation of systems like ALU, Stop watch. Finite state machines, Control unit design, Applications of FSM like sequence detector, sequence generator, Stepper control programmable logic devices-ROM, PAL, FPGA, CPLD etc., PLD based system design applications.

TEXT AND REFERENCE BOOKS:

1. Analysis and Design of Analog Integrated Circuits: Grey and Mayer
2. Electronic Circuit analysis and design: D.A.Neaman, McGraw Hill.
3. Microelectronic Circuits Analysis and Design: Rashid, PWS pub.
4. Electronic Devices and circuit theory: R. L Boylestad and L.Nashelsky,Pearson
5. M. Mano, Digital Logic and Computer Design, Prentice-Hall India.
6. M. Morris Mano, Michael D. Ciletti, “Digital Design”, Pearson, 2013.
7. Tocci, Wedmer and Moss,” Digital systems principles and applications”, 10thedition Pearson

COURSE RESULTS: Analog and digital system design is must for students to construct their own design in electronics.

M.Sc. Electronics and Communication / Semester -I / Ppr.no.3/ Core - 3

ADVANCED MICROPROCESSORS

OBJECTIVES: Study of architecture, features and programming of 8086 microprocessors

UNIT I
CISC PRINCIPLES: Classic CISC microprocessors, Intel x86 Family: Architecture - register set – Data formats - Addressing modes - Instruction set - Assembler directives – Interrupts Segmentation, Paging, Real and Virtual mode execution – Protection mechanism, Task management 80186, 286, 386 and 486 architectures.

UNIT II
PENTIUM PROCESSORS: Introduction to Pentium microprocessor – Special Pentium Registers – Pentium Memory Management – New Pentium instructions – Introduction to Pentium Pro and its special features – Architecture of Pentium-II, Pentium-III and Pentium4 microprocessors.

UNIT III
RISC PRINCIPLES: RISC Vs CISC – RISC properties and evaluation – On- chip register File Vs Cache evaluation – Study of typical RISC processor – The PowerPC – Architecture & special features – Power PC 601 – IBM RS/6000, Sun SPARC Family – Architecture – Super SPARC.

UNIT IV
RISC PROCESSOR
: MIPS Rx000 family – Architecture – Special features – MIPS R4000 and R4400 – Motorola 88000 Family – Architecture – MC 88110 – MC 88100 and MC 88200.

UNIT V
SPECIAL PURPOSE PROCESSORS: EPIC Architecture – ASIPs – Network Processors –DSPs – Graphics / Image Processors.

TEXT AND REFERENCE BOOKS:

1. Daniel Tabak, “Advanced Microprocessors”, Tata McGraw-Hill, 1995, 2nd Edition.
2. The 80x86 family John Uffenbeck-Design, Programming and Interfacing, III edition.

COURSE RESULTS: Students can understand the need of microprocessors and their features.

M.Sc. Electronics and Communication / Semester -I / Ppr.no.4/ Elective - 1

Elective - 1A: QUANTUM OPTICAL COMMUNICATION

OBJECTIVES: To understand the quantum nature of information and to learn how to formulate, manipulate, and process it using physical systems that operate on quantum mechanical principles.

UNIT I

QUANTUM THEORY OF LIGHT& INRORMATION PROCESSING: Quantization of the electromagnetic field, evolution of the field operators, quantum states of the electromagnetic field. Quantum information processing: quantum information, quantum communication, quantum computation with qubits, quantum computation with continuous variables. Density operators and super operators, fidelity, entropy, information and entanglement measures, correlation functions and interference of light, photon correlation measurements.

UNIT II

PHOTON SOURCES AND DETECTORS: Mathematical model of photodetectors, physical implementations of photodetectors, single-photon sources, entangled photon sources, quantum non-demolition photon detectors.

UNIT III

QUANTUM COMMUNICATION WITH SINGLE PHOTONS: Photons as information carriers, quantum teleportation and entanglement swapping, decoherence-free subspaces for communication, quantum cryptography. Quantum computation with single photons.

UNIT IV

QUANTUM COMMUNICATION WITH CONTINUOUS VARIABLES: phase space in quantum optics, continuous-variable entanglement, teleportation and entanglement swapping, entanglement distillation, quantum cryptography. Quantum computation with continuous variables. An ensemble of identical two-level atoms, electromagnetically induced transparency, quantum memories and quantum repeaters, the atomic ensemble of a single qubit, photon-photon interactions via atomic ensembles

UNIT V

SOLID-STATE QUANTUM INFORMATION CARRIERS: Definition and optical manipulation of solid-state qubits, interactions in solid-state qubit systems, entangling two qubit operations, scalability of solid-state devices.

TEXT AND REFERENCE BOOKS:

1. P. Kok and B. W. Lovett, Introduction to Optical Quantum Information Processing, Cambridge university press.
2. L. Mandel, and E. Wolf. Optical Coherence and Quantum Optics, Cambridge University Press.
3. W. H. Louisell, Quantum Statistical Properties of Radiation, McGraw-Hill.
4. D. Bouwmeester, A. K. Ekert, and A. Zeilinger, eds. The Physics of Quantum Information, Springer

COURSE RESULTS

Students can able to understand quantum information and theory

Elective -1B :COMPUTER NETWORKS

OBJECTIVES :

Learn the concepts of N/W communication network protocols, different communication layer structure and security mechanism fdata communication .

UNIT - I

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP models – Example networks: Internet, 3G Mobile phone networks, Wireless LANs –RFID and sensor networks - Physical layer – Theoretical basis for data communication - guided transmission media

UNIT - II

Wireless transmission – Communication Satellites – Digital modulation and multiplexing - Telephones network structure – local loop, trunks and multiplexing, switching. Data link layer: Design issues – error detection and correction.

UNIT - III

Elementary data link protocols – sliding window protocols – Example Data Link protocols – Packet over SONET, ADSL - Medium Access Layer–Channel Allocation Problem– Multiple Access Protocols.

UNIT - IV

Network layer - design issues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol – IP Address – Internet Control Protocol.

UNIT - V

Transport layer – transport service- Elements of transport protocol - Addressing, Establishing & Releasing a connection– Error control, flow control, multiplexing and crash recovery - Internet Transport Protocol – TCP- Network Security: Cryptography.

TEXT BOOKS:

1. S. Tanenbaum, 2011, Computer Networks, Fifth Edition, Pearson Education,Inc.
2. References Books:
3. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, NewDelhi.
4. F.Halsall,1995, Data Communications, Computer Networks and Open Systems, Addison Wessley.
5. Bertsekas and R. Gallagher, 1992, Data Networks, Prentice hall of India, NewDelhi.
6. Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi.
7. TeresaC.Piliouras,"Network Design Managementand Technical Perspectives, Second Edition", Auerbach Publishers, 2015.

COURSE RESULTS : Students will be able to master in the concepts of protocols,network interfaces, and designing performance issues in local area networks and wide area networks .

M.Sc. Electronics and Communication / Semester -I / Ppr.no.5/ Elective – 2

Elective – 2A:MATHEMATICAL METHODS AND NETWORK ANALYSIS

OBJECTIVES: This course is to familiarize students with a range of mathematical methods and networks and these are essential for solving problems in electronics.

UNIT I

MATRIX: Elementary transformation – finding inverse and rank using elementary transformation – solution of linear equations using elementary transformations – eigenvalues and eigenvectors – application of Cayley-Hamilton theorem – Diagonalization – Reduction of quadratic form into sum of squares using orthogonal transformation – nature of quadraticform.

UNIT II

EQUATIONS, INTEGRALS AND SOLUTIONS: Differential equations and their solutions, Double integrals in cartesian and polar co-ordinates – application in finding area and volume using double integrals – change of variables using Jacobian - Introduction to Signals and Systems, Bessel functions of first and second kind.

UNIT III

STATISTICS AND TRANSFORM FUNCTIONS: Introduction to Statistics, Population and Sample, Types of Data, Measures of Central Tendency, Measures of Dispersion and Discrete Probability Distribution, Laplace transform and its applications, Analysis of LTI Continuous Time System using Laplace Transform, Z-Transform.

UNIT IV

NETWORK ANALYSIS: Network elements, Network Graphs, Nodal and Mesh analysis, Zero and Poles, Bode Plots, Laplace transforms, Two-port Network Parameters, Transfer functions, Signal representation. State variable method of circuit analysis. AC circuit analysis, Transient analysis

UNIT V

FOURIER SERIES: Dirichlet conditions – Fourier series with period π and 2π – Half range sine and cosine series – simple problems – RMS value.

TEXT AND REFERENCE BOOKS:

1. Advanced Engg. Mathematics, Erwin Kreyszig, Willey Publication, 10th Edition
2. Higher Engg. Mathematics Grewal B.S., Khanna Publishers
3. Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
4. Miller and Fruend: Modern Elementary Statistics. PEARSON publication.
5. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.
6. Engg. Mathematics: N.P.Bali
7. Laplace and Fourier Transforms, Goyal and Gupta
8. Advanced Mathematics for Engineers: E.S.Sokolinokoff
9. Methods of Applied Mathematics: F.B.Hilderbrand 10.Mathematical methods for Physics: Arfken, A.G. Academic Press.

COURSE RESULTS: The students will be able to solve various differential equations, functions, signals, networks, Fourier series and integral transformations, etc.,

Elective -2B: BIOMEDICAL INSTRUMENTATION

OBJELECTIVES: To understand the basics of bio medical instrumentation system , amplifiers ,sensorand medical scanning system.

UNIT1

Physiology and transducers: Man instrument system, Cell and its structure, resting and action potential, propagation of action potentials, the heart and cardiovascular system, electrophysiology of cardiovascular system, physiology of the respiratory system, nervous system, Electrode theory, bio potential electrodes

UNIT II

Electrophysiological measurement: Lead system, recording methods and typical waveforms of ECG, Vector cardiograph, EEG Lead system, recording and methods and typical waveforms of EMG,ERG,EOG

UNIT III

Non electrical parameter measurements:Measurement of blood pressure, blood flow and cardiac output, plethysmo graphy Measurement of heartsounds, Gas Analyzers, Blood gas analyzer

UNIT IV

Medical Imaging and Telemetry:X-ray machine, Echocardiography, computertomography, MRI, Diagnosticultrasound, PET, SPECT, Electrical impedance tomography, thermography, biotelemetry

UNIT V

Assisting and therapeutic device: Pacemakers, Defibrillators, Ventilator, Heart lung machine, Kidney machine, Diathermy, endoscopes,Lasers applications in biomedicine.

TEXT BOOKS

1. Leslie Cromwell, Fred, J.Weibell and Erich A. Pleiffer,"Biomedical Instrumentation and Measurements" 2nd Edition, Prentice Hall of India, 2014
2. Kandpur, R.S. " Handbook of Biomedical Instrumentation" 2nd Edition, Tata Mc Graw Hill,2011
3. K.S.Fu,R.C. Gonazlez, CSG, Lee Robotics, Control sensing vision and intelligence,Tata McGraw Hill 2008
4. M.Arumugam, " Biomedical Instrumentation" Anuradha Publications, 2015

REFERENCE BOOKS

1. .John G.Webster, Editor, " Medical Instrumentation, Application and Design" John Wiley and Sons Inc. 2009
2. Morelli S Salerno S , Ahmed H, Piscioneri A, DeBartolo L, " Recent strategies combining
3. biomaterials and Stem cells for bone, liver and skin Regenerations" Current stem cell Research & therapy, 2016

M.Sc. Electronics and Communication / Semester -I / Ppr.no.6/ Core Practical - 1

ANALOG ELECTRONIC DESIGN LAB
(ANY 10 USING HARDWARE /SOFTWARE)

OBJECTIVES: To get the practical training in analog electronic circuit design.
List of experiments consists of:
Waveform generators: Multivibrators

1. Astable
2. Monostable
3. Bistable
4. Triangular wave generator(Using op-amp),
5. Wave shaping circuits,
6. S.M.P.S
7. Voltage controlled oscillator
8. Amplifiers: RC coupled amplifier/FET amplifier.
9. Filters: Butter worth filters, Low pass filter - High pass filters - Band pass filters –Band reject filters)
10. IGMF filters, Low pass filters-High pass filters- Band pass filters -Band reject filters Universal filters Communication:
11. Frequency modulation using PLL
12. PAM using OP AMP
13. Amplitude modulation using OP AMP
14. Frequency shift keying by PLL
15. Simulation of inductance using OPAMP
16. Negative impedance converter
17. Frequency multiplication by using PLL

COURSE RESULTS: Students can able to troubleshoot the analog electronic circuit designexperiments with various applications.

M.Sc. Electronics and Communication / Semester -I / Ppr.no.7/ Practical - 2

DIGITAL ELECTRONIC DESIGN LAB
(ANY 10 USING HARDWARE /SOFTWARE)

OBJECTIVES: To get the practical training in Digital electronic circuit design

Timer experiments using 555 timer.

1. Astable multivibrator
2. Monostable multivibrator
3. Astable multivibrator using logic gates.
4. monostable multivibrator using logic gates

Study of combinational, sequential & CMOS circuits (Using SPICE)

5. Combinational Circuits
6. Adder
7. Subtractor.
8 Comparators
9. Encoder
10. Decoder.
11. MUX
12. DEMUX.

Sequential Circuits

13. Flip-Flops.(RS,T,JK)
14. Shift Registers.
15. Binary Counters
16. Ring counters

Sequence Generations.

17. Universal Gates.
18. Boolean Expressions.

COURSE RESULTS: Students can able to troubleshoot digital electronic circuit design experiments with bread boards as well as SPICE software.

M.Sc. Electronics and Communication / Semester -II / Ppr.no.8/ Core - 4

ELECTROMAGNETICS, MICROWAVE AND ANTENNA

OBJECTIVES: It is intended as a resource for understanding electromagnetics required in current, emerging and future broadband communications systems.

UNIT I

Maxwell's equations, correspondence of field and circuit equations, characteristic impedance and admittance, S-matrix, lossless and lossy Transmission lines, standing wave and standing wave ratio, impedance matching techniques like λ/4 transformer, single and double stubs use of Smith's chart. Skin depth.

UNIT II

Waveguides: propagation modes, types of waveguides, waveguide components- E andH plane T, Magic 'T' microwave couplers, matched terminations, directional couplers, circulators and isolators, Phase shifters, cables, connectors and Adapters

UNIT III

Microwave: Klystron and Magnetron, travelling wave tube, Microwave switches, Microwave transistors, microwave diodes: Varactor, GUNN diode, PIN diode, IMPATT, TRAPATT, GaAs FET. Power Thermistor, diode, short key diode.

UNIT IV

Antennas: Types of antennas: short dipole antennas, antenna arrays, isotropic, dipole, broadside and end fire arrays, Yagi-Uda, log periodic and rhombic antenna, Reflector antennas, Reconfigurable antennas, Phased array antennas, Cognitive radio, MicrostripAntennas.

UNIT V

Antenna parameters: S parameter, VSWR, Gain, Radiation resistance, Radiation pattern, beam width, bandwidth, efficiency, Polarization. Friis Transmission equation,Radar-cross equation

TEXT AND REFERENCE BOOKS:

1. Electromagnetic: J.D. Kraus, McGraw Hill.
2. Microwave devices and circuits: S.Y. Liao, Prentice Hall.;
3. Solid State Electronic Devices: Ben G. Streetman, Pearson Publication, seventhedition.
4. Antenna Theory: Analysis and Design: ConstantineA.Balanis, WileyPublication.4th edition.
5. Antenna theory and design: Robert S. Elliott, Prentice-Hall publication.
6. Broadband Microstrip Antennas: Girish Kumar, K. P. Ray,Artech Housepublication.
7. Microwave and Radar Engineering: M. Kulkarni, Umesh Publication.

COURSE RESULTS: It’s a foundation of electronic communication systems.

M.Sc. Electronics and Communication / Semester -II / Ppr.no.9/ Core – 5

MICROCONTROLLERS, EMBEDDED SYSTEM AND IOT APPLICATIONS

OBJECTIVES: To familiarize the students in microcontrollers, embedded conceptsand Internet of Things (IOT) applications.

UNIT 1

8051 MICROCONTROLLERS: Microcontrollers and Embedded Processors - Overview of the 8051 Family -8051Architecture - Pin Configuration of 8051 - Instruction Set - Addressing Modes. 8051 Assembly Language Programming - Assembling and Running an 8051 Program - Program Counter and ROM Space on 8051 - Data Types and Directives - 8051 Flag - Bits and the PSW Register - Register Banks and Stack - Timer and Counter – Interrupts.

UNIT II

PIC MICROCONTROLLERS: Hardware Architecture and Pipelining - Program Memory - Register Pile Structure and Addressing Modes - CPU Register - Instruction Set - Simple Programs. MP-ASM Assembler and its use.

UNIT III

TIMER & INTERRUPTS: Timer 2 use - Interrupt Logic - Timer 2 Sealer Initialization - Interrupt Service Routine- Loop Time Subroutine - Code Template - Interrupt Constrains - Improved Interrupt Servicing - External Interrupts and Timers - Timers0 - Compare Mode - Capture Mode.

UNIT IV

I/O PORT EXPANSION AND PERIPHERAL INTERFACING: Synchronous Serial Port Module - Serial Peripheral Interface - Output Port and Input Port Expansion - DAC Output - Temperature Sensor - Serial EEPROM.

UNIT V

APPLICATIONS OF IOT: Introduction to Arduino IDE – writing code in sketch, compiling-debugging, uploading the file to Arduino board, role of serial monitor. Embedded ‘C’ Language basics - Interfacing sensors – The working of digital versus analog pins in Arduino platform, interfacing LED, Button, Sensors-DHT, LDR, MQ135, IR. Display the data on Liquid Crystal Display (LCD), interfacing keypad serial communication – interfacing HC-05(Bluetooth module)- Control/handle 220V AC supply – interfacing relay module.

TEXT AND REFERENCE BOOKS:

1. Muhammad Ali Mazidi, Jarrice Gillispie Mazidi & Rolin D. Mckinlay - The 8051 Microcontroller and Embedded Systems 2nd Edition-Prentice Hall India Private Ltd.
2. John Pickamn - Microcontroller Based Embedded System - Pearson education
3. The 8051 microcontroller & embedded systems using assembly and C –Kennth. J Ayala, Dhananjay V.Gadre.

COURSE RESULTS: The students shall be able to develop embedded application.

M.Sc. Electronics and Communication / Semester -II / Ppr.no.10/ Core - 6

DIGTAL COMMUNICATION SYSTEM

OBJECTIVES:
To understand information theory and coding
To familiarize various coding techniques and methods
To understand convolutional codes and cryptography
To get the knowledge on digital modulation techniques and their comparison

UNIT I
INTRODUCTION: Information, Entropy, Information rate, Classification of codes, Kraft McMillan inequality, source coding theorem, Shanon-Fano coding, Huffmann coding, Extended Huffmann coding, Shanon's channel capacity theorem, joint and conditional entropy, mutual information, discrete memory-less channel, BSC, BEC

UNIT II
CODING AND DECODING-1: Hamming weight, Hamming distance, Types of codes, Linear Block codes, Repetition codes, Syndrome decoding, Syndrome property, minimum distance decoding, Cyclic codes, Syndrome calculation, encoder and decoder, important cyclic codes.

UNIT III
CODING AND DECODING-2: Convolutional codes- Quad tree Trellis state diagram, encoding-decoding, time domain approach and transform domain approach, Sequential search and Viterbi algorithm, Principle of turbo coding, Cryptography, Secret key cryptography, block and stream ciphers, DES, data encryption standard, public key cryptography, digital signatures

UNIT IV
DIGITAL MODULATION TECHNIQUES: Phase Shift Keying, Amplitude Shift Keying, Frequency Shift Keying, Coherent Detection of PSK and FSK, Non-Coherent Detection of Differential Phase Shift Keying, Binary Differential Phase Shift Keying and FSK, QPSK, Minimum Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK), M-ary Signaling, Probability of Error in each Scheme, Comparison of Digital Modulation Techniques.

UNIT V:
SPREAD SPECTRUM TECHNIQUES: Overview of Spread Spectrum Techniques, Pseudo-noise (PN) Sequences, Properties of Pseudo-noise, Sequences, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital Communication System, Direct-Sequence Spread Spectrum (DSSS) Systems: Generation and Detection, Example of Direct Sequencing, Processing Gain and Performance, Frequency Hopping Spread-Spectrum (FHSS) Systems: Example, Robustness, Frequency Hopping with Diversity, Fast Hopping versus Slow Hopping, FFH/MFSK Demodulator, Processing Gain, Synchronization: Acquisition and Tracking.

TEXT BOOKS:
1. Digital Communications - Simon Haykin, 4th Edition, John Wiley & Sons, Inc.
2. Taub's Principles of Communication Systems by H Taub, D L Schilling and G Saha, ThirdEdition 2008, TMH Education Pvt Ltd, New Delhi.
3. Analog and Digital Communications by Hwei P. Hsu, Schaum'sOutline Series, McGraw HillEducation Pvt. Ltd.
4. Digital Communication Fundamentals and Applications byBernardSklar and Pabitra

KumarRay, Pearson Education, 2006
5. Advanced Electronic Communication Systems by Wayne Thomasi, Sixth Edition, PHI.Modern Digital and Analog Communication Systems by B. P. Lathi, Oxford UniversityPress, Fourth Edition.
6. Digital and Analog Communication Systems by K Sam Shanmugam, John Wiley and SonsPvt. Ltd.

COURSE RESULTS: Students can understand about various coding, methods and techniques

M.Sc. Electronics and Communication / Semester -II / Ppr.no.11/ Elective-3

Elective -3A:NANO-ELECTRONICS

OBJECTIVES:
Students need to understand about "NANO" and their requirements of modern society in a focused area to solve the all-world problems.

UNIT I

INTRODUCTION: Region of nanostructures, scaling of devices in silicon technology, estimation of technology limits, Uncertainty principle, Experiments on duality, Schrodinger's equation and its applications to square well potential, square potential barrier (1D). Infinite array of potential wells, Barrier penetration, applications to tunnel diode, Josephson effect, Perturbation theory and its applications, Scattering. Binomial and related distributions, Phase space, Statistical ensembles, applications of classical statistical mechanics, Quantum statistics, Brownian motion, Random walk problem.

UNIT II

CARBON NANOTUBES: Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of carbon nanotube nanoelectronics.

UNIT III

QUANTUM ELECTRONIC DEVICES: Concept of Chemical potential, partition function and its applications in computing thermodynamic quantities. Quantum electronic devices, electrons in mesoscopic structures, short channel MOSFET, split-gate transistor, electron wave transistor, electron spin transistor, quantum cellular automata

UNIT IV

QUANTUM BASED RTDS: Quantum transport devices based on resonant tunnelling: - Electron tunnelling – resonant tunnelling diodes (RTDs)- three terminal RTDS, RTD based memory, Single electron devices for logic applications: - Single electron devices – applicationsof single electron devices to logic circuits.

UNIT V

NANO-BIO DEVICES: Bioelectronics, molecular processor, DNA analyser as biochip, Molecular electronics, Fullerenes, nanotubes, switches based on Fullerenes and nanotubes, basic logic gates and dynamic logic gates, principle of single electron transistor, Coulomb blockade.

TEXT AND REFERENCE BOOKS:

1. 1.Nanoelectronics and Nano systems: K.Goser, P. Glosekotter, J. Dienstuhl, Springer (2005)2.Quantum Mechanics: Schiff L.I.
2. Fundamentals of Statistical Mechanics and Thermal Physics: Reif
3. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
4. T.Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
5. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

COURSE RESULTS: Students must be capable of addressing problems that require interdisciplinary skills.

Elective -3B : SMART MANUFACTURING

Objectives:To introduce the fundamentals of Manufacturing,To familiarize with selection of sensors for various application, and to learn the basics of agent-based manufacturing and Understand Cyber physical Manufacturing systems.

Unit I

Introduction – Role of sensors in manufacturing automation – operation principles of different sensors – electrical, optical, acoustic, pneumatic, magnetic, electro-optical and vision sensors. Condition monitoring of manufacturing systems – principles – sensors for monitoring force, vibration and noise, selection of sensors and monitoring techniques. Automatic identification techniques for shop floor control – optical character and machine vision sensors – smart /intelligent sensors – integrated sensors, Robot sensors, Micro sensors, Nano sensors

Unit II

Data Analytics:Introduction to Data and Analytics in a Digital Context (Internet of Things), Product Data Management for Design and Manufacturing (PLM Tools), Typical data challenges (data quality, enrichment, integration of ERP & PLM data), Preparing data for analytics (techniques to improve data quality, integration - ETL) Advances in data visualization & related tools- Statistical Techniques for Analytics, Descriptive Statistics ,Inferential statistics, Regression and ANOVA

Unit III

Cyber Physical Systems: Concept of Cyber Physical Systems (CPS) and Cyber Physical Production System (CPPS),System Architecture for implementation of CPPS,Components for CPPS, Communication for CPPS. .

Unit III

Cyber Physical Systems:Concept of Cyber Physical Systems (CPS) and Cyber Physical Production System (CPPS),System Architecture for implementation of CPPS, Components for CPPS,Communication for CPPS **.**

Unit IV

E- Manufacturing: Introduction of Agent based manufacturing- agent based Supply basedManufacturing, CloudBased Manufacturing Information technology-chain, Concept of agile manufacturing andE-manufacturing

Unit V

Industry 5.0: Evaluation of industries, Introduction to Industry 5.0, Challenges in industry 5.0, Impact of Industry 5.0, Case studies on industry 5.0, Introduction to Internet of Things (IoT) and its applications, Smart supply chain and Case studies.

TEXT BOOK(S)

1. Bahga and V. Madisetti, Internet of Things, A hands-on approach, Create Space
2. Independent Publishing Platform, 1st edition, 2014, ISBN: 978-0996025515
3. Bahga and V. Madisetti, Cloud Computing, A hands-on approach, Create Space
4. Independent Publishing Platform, 1st edition, 2013, ISBN: 978-1494435141
5. M. Skilton and F. Hovsepian, The 4th Industrial Revolution: Responding to the Impactof Artificial Intelligence on Business, Springer Nature, 2017, ISBN: 978-3-319-62479-2

REFERENCE BOOKS

1. Gilchirst, Industry 4.0: The Industrial Internet of Things, Apress (Springer), 1st2. Edition, 2016, ISBN: 978-1-4842-2046-7
2. S. Jeschke, C. Brecher, H. Song, and D. B. Rawat, Industrial Internet of Things:Cyber
3. manufacturing Systems, Springer, 1st edition, 2017, ISBN: 978-3319425580
4. T. Erl, Z. Mahmood, and R. Puttini, Cloud Computing: Concepts,Technology & Architecture, Prentice Hall, 1st edition, 2013, ISBN: 978-
5. 0133387520.
6. N.Viswanandham,Y. Narhari "Performance Modeling ofAutomated Manufacturing.Systems" Prentice-Hall, 1st Edition, 1994, ISBN: 978-8120308701

7. S. K. Saha, Introduction to Robotics, Tata Mcgraw Hill Education PrivateLimited, 2nd Edition, ISBN: 978-9332902800

M.Sc. Electronics and Communication / Semester -II / Ppr.no.12/ Elective -4

Elective -4A: OPTOELECTRONICS AND OPTICAL FIBER COMMUNICATION

OBJECTIVES:
Understand the basic operating principles of light sources, detectors..Understand basic principles of light propagation and modal analyses of optical fiber andsystem modulation.

UNIT I

OPTOELECTRONICS-I: Lamps and illumination systems, LEDs – working principle and applications, LED lighting, Display devices, indicators, numeric, alphanumeric and special function displays, Liquid Crystal Display elements, Plasma Displays, Multimedia projectors, Semiconductor lasers, - Fabry-Perot lasers, Distributed Feedback, (DFB) lasers, Distributed Bragg Reflection (DBR) lasers

UNIT II

OPTOELECTRONICS-II: Photodetectors types and applications, PN and PIN Photodiodes, Avalanche Photodiodes (APD), Optocouplers, Opto-interrupters, LASER used in safety interlocks, power isolators, rotary and linear encoders and remote control. Intrinsic and Extrinsic Fiber optic sensors.

UNIT III

OPTICAL FIBER-1: Optical Fiber Theory, Parameters of Optical Fibers, Types of Optical Fibers-Single Mode and Multi-Mode Fibers, Step Index & Graded Index Fibers. Modal Properties-Waveguide Parameter (V Number), Cut-off wavelength, Dispersion-Intermodal and Intramodal dispersion. Loss Mechanism in Optical Fibers-Adsorption and Scattering, Fresnel Reflection, Micro bending & Macro bending, Connector types and Splices, Misalignment and Mismatch losses.

UNIT IV

OPTICAL FIBER-II: Fiber-Optic transmitters and receivers, Direct Modulators, External Modulators-Electro-Optic Modulators, Electro-Absorption Modulators, Noise in detection process, Noise Equivalent Power (NEP).

UNIT V

OPTICAL FIBER-III: Single Channel System Design, Power budgeting, Transmission Capacity Budgeting, Dispersion Compensation, Nonlinear effects in optical fibers-Stimulated Brillouin Scattering (SBS), Self-Phase Modulation (SPM), Cross-Phase Modulation (XPM), Four-Wave Mixing (FWM).

TEXT AND REFERENCE BOOKS:

1. Optical Engineering Fundamentals B.H. Walker, PHI
2. Electro-Optical Instrumentation Sensing and Measuring with Lasers: SilvanoDonati, Pearson
3. Fiber optics and Optoelectronics: R.P. Khare, Oxford Press.
4. Optical Fiber Communication Principles and Systems A. Selvarajan, S.Kar and Srinivas, TMH
5. Optical Fiber Communications G. Keiser, TMH

COURSE RESULTS: Students can get awareness about optical sources, fiber optics andoptical communication through fibers.

Elective -4B: ARTIFICIAL INTELLIGENCE USING MACHINE LEARNING

OBJECTIVES: Artificial Intelligence and machine learning techniques and make the students tounderstand Machine Learning Models and Enrich the student skill in suggesting machine learningstrategy applicable to the given problems.

UNIT I

Introduction: AI Problems – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

UNIT - II

Heuristic Search techniques: Generate and Test – Hill Climbing – Best-Fist, Problem Reduction, Constraint Satisfaction, Means-end analysis.

UNIT - III

Machine Learning - Machine Learning Foundations –Overview – applications - Types of machine learning - basic concepts in machine learning- Examples of Machine Learning - Applications

UNIT - IV

Linear Models: Linear classification – univariate linear regression – multivariate linear regression

– regularized regression – Logistic regression – perceptions – multilayer neural networks learning neural networks structures – support vector machines – soft margin SVM – generalization and over fitting – regularization – validation

UNIT - V

Distance-Based Models : Nearest neighbor models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k- d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta learning.

TEXT BOOKs:

1. Elain Rich & Kevin Kaight – Artificial Intelligence - Tata McGraw Hill – Second Edition,

REFERENCES BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", FourthEdition, Pearson Education, 2021.
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
3. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PearsonEducation,2007
4. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
5. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
6. Deepak Khemani, "Artificial Intelligence", Tata McGrawHill Education, 2013
7. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition,1997.
8. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014
9. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of MachineLearning", MIT Press, 2012.
10. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

M.**Sc. Electronics and Communication / Semester -II /Ppr.no.13 / Practical - 3**

MICROCONTROLLER'S LAB
(ANY 10 USING HARDWARE /SOFTWARE)

OBJECTIVES:

To get an in-depth knowledge on 8051 Microcontroller programming and itsinterfacing
To understand the programming and interfacing of AVR microcontroller

PART I: 8051 Micro controller Programming

Familiarize an Integrated Development Environment to create a project, Compiling anEmbedded C program, Assembling and Simulation/Debugging IN MCU 8051 IDE

1. Write 8051 Programs in Assembly Language to verify arithmetic and logicaloperations.
2. Write 8051 Programs in C/ Assembly Language find the largest/smallest number.
3. Write 8051 Programs in C/ Assembly Language for sorting numbers in ascending/descending order.
4. LED Interfacing and Delay Programming.
5. Square wave, Triangular and Sawtooth wave form generation.
6. Interfacing alphanumeric Liquid Crystal Display.
7. Interfacing 4x4 keypad.
8. Interfacing seven segment display.

PART II: AVR Experiments

1. Basic AVR Programming using Assembly OR C (using AVR Studio/any compatible IDE)
2. Addition, Subtraction, Multiplication, Ascending Order, Descending Order, Code Conversion, Memory Swapping.
3. LED Interfacing and Delay Programming.
4. Interfacing 16x2 alphanumeric Liquid Crystal Display.
5. Interfacing 4x4 keypad.
6. Interfacing stepper motor.
7. Interfacing seven segment display.
8. DC motor speed control.
9. Interfacing serial devices such as GSM modem/GPS systems etc.
10. Timer programming10.Serial programming11.Interrupt handling 12.PWM Generation

REFERENCE BOOKS:

1. Mazidi, The 8051 Microcontrollers & Embedded Systems, Pearson Education.
2. The 8051 Microcontroller Architecture, programming and applications by Kenneth
3. J. Ayala, West publishing company
4. The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, SarmadNaimi and SepehrNaimi, Pearson Education.
5. Programming and customizing the AVR Micro controller, By Dhananjay Gadre,McGraw Hill Education
6. AVR ATmega32 data sheet

7. ARM System Developer's Guide -Designing and Optimizing System Software by Andrew N Sloss, Dominic Symes and ChrisWright; Morgan Kaufman publishers, an imprint of Elsevier
8. The Definitive Guide to the ARM Cortex -M3 - Second Edition, by Joseph yiu Newnes publishers an imprint of Elsevier
9. ARM System-on-Chip Architecture, 2/e, Steve Furber, Pearson

COURSE RESULTS: Students can get an in-depth knowledge of 8051 and AVR microcontrollers programming and their interfacing.

M.Sc. Electronics and Communication / Semester -II /Ppr.no.14 / Practical - 4

EMBEDDED SYSTEM DESIGN AND IOT LAB
(ANY 10 USING HARDWARE /SOFTWARE)

OBJECTIVES:

To provide a hands-on experience with PIC, ARM microcontrollersprograming and interfacing.
To provide Wireless IOT applications

List of Experiments:

PART I: PIC 16F87X BASED EMBEDDED SYSTEMS & RTOS

1. Arithmetic and Logical programs
2. Square wave generation using ports
3. Matrix Key Board & LED interfacing
4. Single digit timer using seven segment displays
5. DC motor driving via H Bridge
6. DAC interface
7. ADC INTERFACE
8. LCD interface
9. Stepper motor control
10. PWM generation
11. Compare and capture operation program
12. Serial communication using RS232C
13. PIC to PIC communication using I2 C bus

PART II: IOT APPLICATIONS

WIRELESS DATA ACQUISITION USING SENSOR NODES

1. Setting up a WSN for smart home like applications
2. Implement and simulate network topologies using tools.
3. Connecting devices at the edge and to the cloud.
4. Processing data offline and in the cloud.

VARIOUS CONCEPTS OF EMBEDDED SYSTEM DESIGN

1. IDE's. Simulation and development tools
2. Implementing simple systems using ARM Cortex M devices
3. Design and implement interfaces for various applications
4. Design and realize application systems

COURSE RESULTS: Students can receive assembly level programming skills forfuture robotic and IoT applications.

M.Sc. Electronics and Communication / Semester -II /Ppr.no.15 / NME-1

PCB DESIGNING TOOLS

OBJECTIVES: To understand the basic concepts of power electronic devices and virtual instrumentation with paradigm of programming languages.

UNIT-I

Fabricating Printed Circuit Boards:Schematic Capture-Schematic symbols-symbol properties-schematic generations-Generating a Netlist-Circuit Board placement and Routing basics - placement and routing guidelines-general placement considerations-General routing considerations.

UNIT –II

ALTIUM DESIGNER-1:Creating a New PCB Project-Creating a New Schematic Sheet-Adding Schematic Sheets to a Project Setting the Schematic Options-Drawing the Schematic-Locating the Component and Loading the Libraries-Placing the Components on Your Schematic-Wiring up the Circuit-Nets and Net Labels- Setting Up Project Options-Checking the Electrical Properties of Your Schematic -Compiling theProject.

UNIT-III

ALTIUM DESIGNER-2: Creating a New PCB Document-Transferring the Design- Updating the PCB-Designing the PCB- Setting Up the PCB Workspace-Defining the Layer Stack and Other Non-electrical Layers in a View Configuration -Setting Up New Design Rules-Positioning the Components on the PCB-Manually Routing the Board-Automatically Routing the Board-Viewing Your Board Design in 3D Mode- Creating and Importing 3D Bodies for Component Footprints-Verifying Your Board Design-Output Documentation.

UNIT-IV

KiCad -1:KiCad Workflow-KiCad Workflow overview-Forward and backward annotation-Draw electronic schematics-Using Eeschema-Bus connections in KiCad-Layout printed circuit boards-Using Pcbnew- Generate Gerber files- Using GerbView-Automatically route with FreeRouter-Forward annotation in KiCad

UNIT-V

KiCad -2: Make schematic components in KiCad-Using Component Library Editor- Export, import and modifylibrary components-Make schematic components with quicklib-Make a high pin count schematic component-Make component footprints-Using Footprint Editor

TEXT AND REFERENCE BOOKS

1.Varteresian J.-Fabricating Printed Circuit Boards-ewnes (2002) Altium_Getting Started with PCB Design Getting Started in KiCad

COURSE RESULTS: The outcome of the students will be expertise theoretically and designing ofPCB circuits using tool.

M.Sc. Electronics and Communication / Semester -II /Ppr.no.16/ HR
M.Sc. Electronics and Communication / Semester -III /Ppr.no.17 / Core - 7

ADVANCED POWER ELECTRONICS AND VIRTUALINSTRUMENTATION

OBJECTIVES
To understand the basic concepts of power electronic devices and virtual instrumentation with paradigm of programming languages.

UNIT I
POWER ELECTRONIC DEVICES: Thyristor- characteristics - Turn-on methods-characteristics-PUT-TRIAC-UJT- Phase controlled rectifier-Single phase half wave with RL load-Full wave-controlled converters-Commutation Techniques-Load-Resonant-pulse-Complementary-Impulse-External pulse- Line commutation. Chopper-Operation-Step Up-Types-Inverter-single phase bridge inverter-AC voltage controller-single phase voltage controller with R & RL load-Cycloconverter-single phase-step-up-step-down-Cycloconverter.

UNIT II
INTRODUCTION OF VI: Evolutions of VI, advantages, block diagram and architecture ofa virtual instrument, data-flow techniques, Graphical programming, and comparison with conventional programming. Advantages of Virtual Instruments over conventional instruments – Hardware and software.

UNIT III
GUI PROGRAMMING: Graphical user interfaces – Controls and indicators – 'G' programming – Labels and Text –Shape, size and color – Owned and free labels – Data type, Format, Precision and representation – Data types – Data flow programming – Editing – Debugging and Running a Virtual Instrument – Graphical programming palettes and tools – Front panel objects – Functions and libraries.

U**NIT IV**
FILE STATEMENTS: Loops, WHILE Loops, CASE Structure, Formula nodes, Sequence structures – Arrays and Clusters– Array Operations – Bundle – Bundle/Unbundle by name, graphs and charts – String and file I/O – High-level and Low-level file I/O's – Attribute modes Local and Global variables.

UNIT V
MULTI-PARADIGM PROGRAMMING: Introduction to multi-paradigm programming- basic features, creating variables, mathematical functions, basic plotting - overview, creating simple plots, adding titles, axis labels, and annotations, multiple data sets in one plot, specifying line styles and colours. Matrix generation - Entering a vector, entering a matrix, Matrix indexing, Colon operator, Linear spacing, Colon operator in a matrix, creating a sub-matrix, deleting row or column, Dimension, Transposing a matrix, Concatenating matrices in MATLAB, GNU Octave or Python.

TEXT BOOKS:
1. Power Electronics - Dr.P.S. BIMBHRA
2. Gary Johnson, Richard Jennings, "Lab VIEW Graphical Programming", Third Edition, McGraw Hill, New York, 2006.
3. Sanjay Gupta and Joseph John, "Virtual Instrumentation using Lab VIEW", Tata

McGraw-Hill, First Edition, 2005.
4. "MATLAB A Practical Approach" by StormyAttaway.

REFERENCE BOOKS

1. Power Electronics –MUHAMMAD H RASHID
2. "Virtual Instrumentation using LabVIEW" byJovitha Jerome second edition 2010.PHI Publishers, New Delhi.
3. Octave/Matlab Primer and Applications: EZ Guide to Commands and Graphics (GNU Octave Matlab Tutorial Series) by Dr S. Nakamura, Published by CreateSpace Independent Publishing Platform
4. GNU Octave Beginner's Guide by Jesper Schmidt Hansen, Packt Publishing.
5. Python Tricks: A Buffet of Awesome Python Features by Dan Bader, Publisher: Dan Bader
6. Python for Everybody: Exploring Data in Python 3by Dr. Charles Russell Severance (Author), Sue Blumenberg (Editor), Elliott Hauser (Editor). Publisher: CreateSpace Independent Publishing Platform.

COURSE RESULTS: The outcome of the students will be expertise theoretically with a virtual instrumentation by LABVIEW programming.

M.Sc. Electronics and Communication / Semester -III /Ppr.no.18 / Core - 8

MOBILE, OPTICAL AND DATA COMMUNICATION SYSTEMS

OBJECTIVES: Expanding use of mobile, optical, and digital communication systems will benefit significantly to the students.

UNIT I

MOBILE COMMUNICATION: Mobile communication systems, cellular concepts, role of base station and mobile switching centers, Hands-off considerations, frequency reuse, roaming, SMS, GSM, GPRS, CDMA and EDGE architecture.

UNIT II

TELECOMMUNICATION NETWORKS: Telecommunication Network management overview, Wireless Network fundamentals, OSI model layers, architecture, broadband systems. Introduction to Emerging technologies IP multimedia systems, GSM/CDMA, Wi-Fi, Wi-Max, Blue Tooth, 3G/4G &5G Next Gen. Networks(NGN), IP/ mobile TV

UNIT III

OPTICAL FIBERS: Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theoryof Circular Wave guides-Overview of Modes-Key Modal concepts- Linearly Polarized Modes – Single Mode Fibers-Graded Index fiber structure. Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination.

UNIT IV

DATA COMMUNICATION: Data communication networks and services, application and layered architecture, OSI model, IEEE 802.3 and IEEE 802.11, Network topologies, LAN and MAC, Data link control, Bridging, switching, addressing, Transmission systems, circuit switching networks, routing, signaling and traffic management

UNIT V

DATA NETWORKING: Packet switching networks, Internetworking – Repeaters, bridges, routers and gateways. Introduction to Routing protocols TCP/IP and Internetworking, TCP/IP protocol suite TCP/IP Sockets Client-Server, computing, Name Service, Application protocols over TCP/IP, IPV6, network architectures and protocols, network security, ATM Networks, High speed LANs – Fast and Gigabit Ethernet, FDDI. Wireless LANs. Bluetooth, Wi-Fi WLAN, WAP and Mobile computing.

TEXT AND REFERENCE BOOKS:

1. Telecommunication T.Vishwanathan, PHI
2. Mobile Cellular Telecommunications, W.C.Y. Lee, McGraw Hill
3. Future Developments in Telecommunication, J. Martin, PrenticeHall
4. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International,Singapore, 3rd ed.,2000
5. Data Networks D. Bertsekas, R. Gallagher
6. Computer Networking Tanenbaum, PHI
7. Computer Networks U.Black, PHI

COURSE RESULTS: Students can understand the growing importance of mobile, optical and data communication system.

M.Sc. Electronics and Communication / Semester -III /Ppr.no.19/ Core - 9

DIGITAL SIGNAL AND IMAGE PROCESSING

OBJECTIVE:
It gives the knowledge to transform an image into digital form and performs someprocess of it.
To understand the operations, analysis and applications of image processing.
To study about discrete time systems and to learn about FFT algorithms.

UNIT I
REVIEW OF SIGNALS AND SYSTEMS: Introduction - advantages and limitations of Digital Signal Processing. Infinite Impulse Response (IIR) Filters - Signal Flowgraph- Basic Network structure for IIR filter- Direct- Cascade- Parallel Forms. Design of IIR Digital filters from analog filters- Butterworth design- Chebyshev design- design based on numerical solutions of differential equations- Impulse Invariant Transformation.

UNIT II
FINITE IMPULSE RESPONSE (FIR) FILTERS: Linear phase FIR filters- Frequency response of linear phase FIR filters - Location of the zeros of linear phase FIR filters.Realization of FIR- cascade - lattice design-Fourier Series method- using windows-rectangular-triangular or Barlett windows- Hanning- Hamming- Blackman- Kaiser windows.

UNIT III
DISCRETE FOURIER TRANSFORM: Properties-Circular convolution- Linear Convolution using DFT- relation between Z- Transform and DFT- Fast Fourier Transform; decimation – in time and Frequency - FFT algorithms – General Computation using Radix 2 algorithm.

UNIT IV
FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS: Introduction- Number Representation - Fixed Point- Sign-Magnitude - One's- complement- Two's - complement forms -Addition of two fixed point numbers- Multiplication in Fixed Point arithmetic - Floating point numbers- Block floating point numbers- quantization - truncation- rounding - effects due to truncation and rounding- Input quantization error - Product quantization error - Co-efficient quantization error- zero-input limit cycle Oscillations - Overflow limit cycle Oscillations - Scaling- Quantization in Floating Point realization IIR digital filters - Finite Word Length Effects in FIR Digital Filters- Quantization effects in the Computation of the DFT- quantization errors in FFT algorithms.

UNIT V
IMAGE AND DIGITAL PROCESSING: Image acquisition, Image representations, Image digitalization, Sampling, Quantization, Histograms, Image Quality, Noise in Images, Basic operations on images, Image Enhancement, Pixel intensity transformations, Histogram equalization and matching, noise removal, Edge sharpening, Spatial Filtering, Image smoothing, Morphological operations: erosion, dilation. Image processing applications, Machine Vision, Blob analysis, Metrology, Feature extraction, Pattern Matching. Speech Processing- speech analysis.

TEXT AND REFERENCE BOOKS:

1. Digital signal processing: Ifechor- Pearson edn.

2. Desecrate time signal processing: Oppenhiem- Pearson edn.
3. Digital signal processing: Oppenhiem and Sheffer- PHI
4. Introduction to Digital signal processing: Johny R Johnson
5. Digital signal processing: Proakis and Manolakis.
6. Digital signal processing: P Ramesh Babu- Scitech Pub
7. Digital Image Processing Rafael C. Gonzalez, Richard E. Woods, Prentice Hall
8. Fundamentals of Digital Image Processing, A.K. Jain, Prentice Hall

COURSE RESULTS: Students can able to understand the properties of the random signals and images and how to process it.

M.Sc. Electronics and Communication / Semester -IV /Ppr.no.20 / Core – 10

RF CIRCUIT AND SATELLITE COMMUNICATION

OBJECTIVES:
To understand the basic RF frequency, filter design, amplifier design and circuitdesign process.
To understand the fundamentals of satellite communication system.

UNIT I
RF TRANSCEIVER ARCHITECTURES: Receiver front end general design philosophy, Intermodulation, 3rd order intercept point (IP3), Noise Figure, sensitivity, selectivity.

UNIT II
RF FILTER DESIGN: Ideal and approximate filter types, Transfer function and basic filter concepts, filter design issues, RF filter design.

UNIT III
AMPLIFIER DESIGN: Stability consideration, Amplifier design for maximum gain, constant gain circles, constant noise figure circles, Low noise amplifier, RF Power amplifier.
Other RF circuits: Power combiner/divider, directional couplers, hybrid coupler, isolator.

UNIT IV
SATELLITE COMMUNICATION: Fundamentals: concepts, history, developments. Orbital mechanics and launching: Keplers law, perturbation, orbital effects, types of orbits, launching satellite, launch vehicle technology.

UNIT V
SATELLITE SUBSYSTEM: Attitude and orbit control, thermal control, Power supply, propulsion, telemetry, tracking and command, transponder and antennas. Satellite link design. Applications of satellites and advances in satellite communication.

TEXT AND REFERENCE BOOKS:

1. Analog Communication Kennedy and Davies
2. Microwave devices, circuits & Subsystems for Communication Engineering, Glover, Pennock, and Shepherd
3. RF circuit design, by Chris Bowick
4. RF circuit design by R. Ludwig and P.Bretchko
5. RF Circuit Design, Reinhold Ludwig, Pavel Bretchko, Pearson
6. Satellite communications: Dennis Roddy

COURSE RESULTS: The student will be able to understand the RF design and distinguish between the oscillators and amplifiers. Application of satellite communication will also be essential for signals and modern communication system

M.Sc. Electronics and Communication / Semester -III /Ppr.no.21 /Elective-5

Elective-5A: RESEARCH METHODOLOGY

OBJECTIVE

It is a way to systematically solve a research problem.
It is a science of studying how research is done scientifically
It aims to give the work plan of research

UNIT I

RESEARCH METHODOLOGY: An Introduction Objectives of Research, Types of Research, Research Methods and Methodology, defining a Research Problem, Techniques involved in Defining a Problem. Research Design Need for Research Design, Features of Good Design, Different Research Designs, Basic Principles of Experimental Designs.

UNIT II

SAMPLES: Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sampling Fundamentals, Estimation, Sample size Determination, Random sampling. Measurement and Scaling Techniques Measurement in Research, Measurement Scales, Sourcesin Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques.

UNIT III

DATA ACQUISITION AND ANALYSIS: Methods of Data Collection and Analysis Collection of Primary and Secondary Data, Selection of appropriate method Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measuresof Skewness, Regression Analysis, Correlation.

UNIT IV

RESEARCH TECHNIQUES: Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses. Chi-square Test, Comparing Variance, As a nonparametric Test, Conversion of Chi to Phi, Caution in using Chi-square test.

UNIT V

ANOVA TECHNIQUES: Analysis of Variance and Covariance ANOVA, One way ANOVA, Two Way ANOVA, ANOCOVA Assumptions in ANOCOVA, Multivariate Analysis Technique Classification of Multivariate Analysis, factor Analysis, R-type Q Type Factor Analysis, Path Analysis.

TEXT AND REFERENCE BOOKS:

1. “Research Methodology”, C.R. Kothari, Wiley Eastern.
2. “Formulation of Hypothesis”, Wilkinson K.P, L Bhandarkar, Himalaya Publication, Bombay.
3. “Research in Education”, John W Best and V. Kahn, PHI Publication.
4. “Research Methodology A step by step guide for beginners”, Ranjit Kumar, Pearson Education
5. “Management Research Methodology Integration of principles, methods and Techniques”, K.N. Krishna swami and others, Pearson Education.

COURSE RESULTS: Students get an idea about research and research methodologies

Elective-5B : SOLAR ENERGY SYSTEMS

OBJECTIVES:

To learn the concept of various materials using for photovoltaic cells And get exposure of latest developments in PV technology

UNIT I

SOLAR ENERGY FUNDAMENTALS:Nature of solar energy, conversion of solar energy, photochemical conversionof solar energy, photovoltaic conversion, photo-physics of semiconductors and semiconductor particles, photo-catalysis.

UNIT II

FUNDAMENTALS OF SOLAR CELLS:Basic of Semiconductor Physics- the p-n junction, charge carriers in semiconductors, optical properties of semiconductors, Hetero- junctions,

UNIT III

SOLAR CELL: Different types of materials – Availability – Advantages – Disadvantages - applications. Spectral response of solar cells - Dark conductivity - I-V characterization - Introduction to physics of semiconductor devices.

UNIT IV

TYPES OF SOLAR CELLS:High efficiency solar cells - PERL Si solar cell - LGBC solar cell - III-V, II-VI high efficiency solar cells - thin film technology - GaAs solar cells - tandem and multi junction solar cells - solar PV concentrator cells and systems.

UNIT V

DIFFERENT MATERIALS USED FOR SOLAR CELLS:Nano - micro and poly crystalline Si for solar cells - Mono micro silicon composite structure - Silicon and non silicon thin film deposition techniques Advanced solar cell concepts and technologies – Amorphous siliconthin film technologies - Multi junction solar cells – CDTE – CIGS - Quantum dots Peroskvite.

TEXT BOOKS

1. Solar cells: Operating principles, technology and system applications by Martin A Green,Prentice Hall Inc, Englewood Cliffs, NJ, USA, 1981.
2. Semiconductors for solar cells, HJ Moller, Artech House Inc, MA, USA, 1993.
3. Solid State electronic devices, Ben G Streetman, Prentice Hall of India Pvt Ltd., New Delhi1995.
4. Carbon nanotubes and related structures: New material for twenty first century, PJF Harris,Cambridge University Press, 1999.
5. Think Film crystalline silicon solar cells: Physics and technology, R. Brendel, Wiley VCH,Weinheim, 2003.

REFERENCE BOOKS

1. Clean Electricity from photovoltaics, M. D. Archer, R. Hill, Imperial college press, 2001.
2. Organic photovoltaics:Concepts and realization, V Barbec, V.Dyak
3. Fuel cell and their applications, K. Kordesch, G. Simader, VCH, Weinheim, Germany, 1996.
4. Battery technology handbook, H. A. Kiehne, Marcel Dekker, New York, 1989.

M.Sc. Electronics and Communication / Semester -III /Ppr.no.22 / Core Practical – 5

ADVANCED COMMUNICATION LAB
(ANY -10 USING HARDWARE /SOFTWARE)

OBJECTIVES:
The students can familiarize with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theorycourse.

List of Experiments:

1. Verification of sampling theorem
2. Pulse position modulation
3. Pulse amplitude modulation and demodulation
4. Pulse width modulation
5. Amplitude shift keying modulation and demodulation
6. Frequency shift keying modulation and demodulation
7. Phase shift keying modulation and demodulation
8. Mixer
9. Automatic gain control
10. P.C.M system using codec
11. Delta Modulation, Adaptive Delta Modulation
12. PLL and Frequency synthesizer
13. Frequency multiplier
14. P.R.B.S. Generator

MATLAB Experiments

15. Digital Modulation and Demodulation ASK
16. FSK
17. PSK
18. QPSK
19. Generation of Signals 20`Samplinand Effect of aliasing

COURSE RESULTS: Students acquired the knowledge of different types of communication signals, modulation, demodulation, mixing and so on.

M.Sc. Electronics and Communication / Semester -III /Ppr.no.23 / Core Practical – 6

DSP MATLAB AND LABVIEW INSTRUMENTATION LAB
(ANY -10 USING HARDWARE /SOFTWARE)

OBJECTIVES:
To familiarize MATLAB programming and its applications in DSP.The students familiarize with DSP AND LABVIEW software's. Integrate theory with experiments using these software's so that the students receive knowledge from the theory course.

Experiments should be completed at least 50% of the both labs.
PART -1: DSP MATLAB experiments:
1.Verification of sampling theorem. 2.Impulse response of a given system 3.Linear convolution of two given sequences.4.Circular convolution of two given sequences 5.Autocorrelation of a given sequence and verification of its properties. 6.Cross correlation of given sequences and verification of its properties.7.Solving a given difference equation.
Computation of N point DFT of a given sequence and to plot magnitude and phaseSpectrum.
Linear convolution of two sequences using DFT and IDFT. 10.Circular convolution of two given sequences using DFT and IDFT 11.Design and implementation of FIR filter to meet given specifications. 12.Design and implementation of IIR filter to meet given specifications. 13.Implementation of FFT of a given sequence.
14.Generation of DTMF signals. 15.Implementation of Decimation Process. 16.Implementation of Interpolation Process.
PART -2: Virtual Instrumentation by LABVIEW:

1. Create a VI for performing addition/subtraction/multiplication/division of given numbers. If answer is above 100 indicate it using LED.
2. Design a display for the basic calculator keypad. (Event structure) 3.Creating a VI for waveform generation and manipulations.
3. Design a water level control system. (Shift register)
4. Create a VI to acquire waveform data from signal generator and store the waveform data in array. (Accuracy of stored data)
5. Create a VI to acquire and plot temperature sensor data. (Sampling parameter variations)

TEXT AND REFERENCE BOOKS:

1. Analog electronics with LabVIEW- Kenneth L. Ashley
2. Virtual-Instrumentation-Using-LabVIEW- Jovitha Jerome, PHI Learning Private Limited (2010)
3. PC Interfacing for Data Acquisition and Process Control- Gupta, S. and Gupta,
4. J. P. Instrument Society of America (1988).
5. Ashok Ambardar. 'Analog and Digital Signal Processing'
6. MATLAB: An Introduction with Applications, 4ed Paperback – 2012by Amos Gila-Wiley

COURSE RESULTS: Students will be well-versed with MATLAB and LABVIEW programming.

M.Sc. Electronics and Communication / Semester -III / Ppr.no.24/ NME-2

CYBER SECURITY

OBJECTIVES:

To learn cybercrime and cyber law, understand the cyber attacks and tools for mitigating them, understand information gathering and learn how to detect a cyber attack, learn how to prevent a cyber attack.

UNIT I

INTRODUCTION: Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes A Global Perspective on Cyber Crimes; Cyber Laws,The Indian IT Act – Cybercrime and Punishment.

UNIT II

ATTACKS AND COUNTERMEASURES:OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security BreachTypes of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineeringAttack – Wireless Network Attack – Web Application Attack –Attack Tools – Countermeasures.

UNIT III

RECONNAISSANCE:Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – NetworkScanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – NmapCommand Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbingand OS Finger printing Techniques.

UNIT IV

INTRUSION DETECTION: Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT V

INTRUSION PREVENTION:Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TEXT BOOKS:

Anand Shinde, "Introduction to Cyber Security Guide to the World of CyberSecurity",Notion Press, 2021 (Unit 1)

Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, ComputerForensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)

https://owasp.org/www-project-top-ten/

REFERENCES BOOKS:

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones &Bartlett Learning Publishers, 2013 (Unit 2)
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking

andPenetration Testing Made easy", Elsevier, 2011 (Unit 3)
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers,2007 (Unit 3)
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice",Third Edition,Pearson Education, 2015 (Units 4 and 5)
5. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No StarchPress, 2014 (Lab)

COURSE RESULTS: Students can update the skills in cyber security andthreads handling methods.

M.Sc. Electronics and Communication / Semester -III / Ppr.no.25 /MOOC Course (OR) Internship

ONLINE MOOC COURSES(4 or 8 WEEKS)

Students can participate at least any one of the subject oriented (Electronics and or Electronics and Communication) technical online programs or courses (i.e., skill developmentcourses) from **SWAYAM, NPTEL, UGC and** MHRD approved courses.

Massive Open Online Courses (MOOCs) will provide an affordable and flexible way tolearn new skills, advance your career and deliver quality educational experiences at various scale. The objective of this course is to take the best teaching learning resources to all, includingthe most disadvantaged students. The courses may be included with
video lecture,
specially prepared reading material that can be downloaded/printed
self-assessment tests through tests and quizzes and
an online discussion forum for clearing the doubts.

Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.
Teachers should provide wonderful opportunities and environments for all students byproviding numerous online platforms to enhance their online education. Final examination may be conducted by their own teaching staffs similar to Field Work.

Field Work(15 days)

OBJECTIVES:

To develop skills by visiting nearby industries / organizations.Acquire the knowledge and receive guidance from other various tasks or sources of theirfield visits or survey or study.

Formulate and identify the real-world problem, practical difficulties, identify therequirement and develop the solutions according to their field work or internship study.
Identify technical ideas, strategies and methodologies.
Utilize the new tools, algorithms, techniques that contribute to obtain the solution ofthe work.
Explain the acquired knowledge through preparation of report and oral presentations.
This can be an individual work for PG students. Students are advised to select their own field work or study as per the expert guidance receive from the teaching faculties of their own institution. Periodical assessment may be done to evaluate their skills. Students will bepermitted to visit nearby industries without affecting their regular theory and practical subjects.

Scheme of evaluation- PG-MOOCs courses(Semester-III, Core MOOCs-1)

Internal - 25 marks
Attendance -5 marks
Performance & content discussion with teachers - 10 marks
Class tests (or) Presentation - 10 marks

First Quadrant duration:
Assignments - Audio and Video of engagements of the MOOCs according to the concerned subjects (Electronics and (or) Electronics and Communication). Online video and audio contents in an organized form, Animation, Simulations, video demonstrations, virtual Labs, etc.,
Second Quadrant duration:
It may contain text material, e-books, objectives, summary, glossary, case studies, FAQs, and other learning material. Shall contain self-instructional material, e-Books, illustrations, case studies, presentations, web resources such as further references, related links, open-source content on Internet, video, case studies, books including e-books

Third Quadrant duration:
It may contain references and web links. Please provide the reference list as a word document give specific links that are viable and direct to appropriate pages. Specify the links to other learning sites. Do not give www.wikipedia.org (or) www.google.com, discussion forum for rising of doubts and clarifying them on a near real time basis by the Course Coordinator or his/her team.

Fourth Quadrant duration:
Assessments may include: 1. Quizzes- self graded and 2. The assignments may contain from200 words to 500 words depending on the course requirements. 3. Multiple Choice Questions (MCQs) may be conducted per module comprise of Quiz.

Total engagement time should be in the range of one semester per module. It may contain problems and solutions, which could be in the form of MCQs, fill in the blanks, matching questions, short answer questions, long answer questions, quizzes, assignments and solutions, discussion forum topics and setting up the FAQs, clarifications on general misconceptions.

External – 50 marks
Overall module Performance - 25 marks
Report and Outcome based -35 marks
Presentation or viva-voce - 15 marks

This course must be outcome perspective. i.e., Audio and or Video or online course outputs, e-materials, web resources with reference links, open-source of internet content, development of online output creations, Depends upon the structure and organization of the MOOCS course in electronics subjects, by the process perspective and by the self-assessment.

M.Sc. Electronics and Communication / Semester -IV /Ppr.no.26 / Core – 11

INTRODUCTION OF PYTHON AND ANDROID APPLICATION TOOLS DEVELOPMENT

OBJECTIVES:

- Understand the Python programming basics including functions, variables, and datatypes, classes and objects, etc.,Manipulate and output data using arrays, loops, and operators
- Have a solid understanding of Python syntax
- Understand the Android programming basics with developing application tools

UNIT I

PYTHON INTRODUCTION: Introduction to Python – Features of Python, Python Virtual Machine (PVM), Memory management in Python, Comparison between C and Python. Writing and execution of a Python program, Input & Output statements. Datatypes – Built-in type, Bool datatype, Sequences, Sets, Literals, Constants, Identifiers and Reserved words, Naming conventions in Python. Strings and Characters – Creating Strings, Escape Characters, String formatting operators, String formatting functions.

Operators - Arithmetic, Assignment, Unary minus, Relational, Logical, Boolean, Bitwise, Membership and Identity Operators, Mathematical functions. Lists – creating lists, updating the elements in a list, Built in list operators - concatenation, repetition & membership, Built-in List Methods. Tuples – creating tuples, accessing tuple elements, basic operations on tuples,functions to process tuples. Dictionaries – creating dictionaries, Operations on Dictionaries, Dictionary Methods, Datatype conversions.

UNIT II

STATEMENTS AND FUNCTIONS: Control statements – Conditional Statements: if statement, if…else statement, nested if statement, Looping: while loop, for loop, infinite loops, nested loops, Control Statements: break statement, continue statement, pass statement, assert statement, return statement.

Arrays- creating an array, Importing the array module, Indexing and Slicing on arrays, Types of arrays, working with arrays using numpy, Mathematical operations on arrays.

Functions – Function definition, Function call, returning from a function, returning multiple values, Function arguments- formal & actual, positional, keyword, default, variable length arguments, Local & Global variables, passing a group of elements to a function, Recursive functions, Anonymous functions or Lambada's.

UNIT III

CLASSES AND OBJECTS: Creating a Class, the self-variable, Constructor, Types of variables, Namespaces, Types of Methods, passing members of one class to another class, Inner classes, Inheritance and Polymorphism- Constructors in Inheritance, Overriding super class constructors and Methods, the super () Method, Types of Inheritance. Polymorphism- Operator overloading, Method overloading, Method overriding.

UNIT IV

EXCEPTIONS: Errors in Python Programing, Exceptions, Exception handling, Types of Exceptions, the except block, the assert statement, user defined exceptions, logging the Exceptions.

Files- Types, Opening and Closing a file, working with text and binary files, knowing whethera file exist or not, the with statement, Pickles, seek () and tell methods, Working withDirectories,

Regular expressions, Sequence characters, Quantifiers and Special Characters in regular expressions, using regular expressions on files.

UNIT V

DEVELOPING FOR ANDROID: Downloading and Installing the Android SDK – Developing with Eclipse – Using the Android Developer tools Plug-In for Eclipse – Support Package. First Android Application: New Android Project – Android Virtual Device – LaunchConfigurations – Running and Debugging Android Application – Types of Android applications – Android Development Tools.

TEXT AND REFERENCE BOOKS:

1. Core Python Programming – Dr. Nageswara Rao, 2017 edition, Dreamtech Press.
2. Introduction to Computing and Problem-Solving Using Python – E Balaguruswamy, 1e/ Mc Graw Hill.
3. Reto Meier. 2012. Professional Android 4 Application Development. Wiley India Pvt Ltd.
4. Charlie Collins and Michael Galpin. 2012. Android in Practice. Manning Publications Co.
5. Zigurd Mednieks and Laird Dornin. 2011. Programming Android. O'Reilly Media, Inc, New York.

COURSE RESULTS: Students can able to Identify/characterize/define a problem to solve problems by design a program

M.Sc. Electronics and Communication / Semester -IV /Ppr.no.27 / Core – 12

VLSI DESIGN AND VHDL PROGRAMMING

OBJECTIVES:

To study HDL based design approach and to learn digital CMOS logic design.

UNIT I:

CMOS TECHNOLOGY: MOS TRANSISTOR – Switches – CMOS Logics – Inverter – Combinational logic – NANDgate – NOR gate Compound gates – Multiplexer – Physical design of NAND, NOR gates –SI semiconductor technology overview – wafer processing – oxidation – epitaxy deposition – Ion Implantation – Diffusion – SI gate insulator process – CMOS technology - n-well process – p well process – Twin-Tub process – silicon on insulator– CMOS process enhancements

UNIT II:

INTRODUCTION OF VHDL: History of VHDL – capabilities of VHDL – hardware abstraction – basic terminology –entity declaration - architecture body declaration – Basic language elements –identifiers – Data objects– Data type operators.

UNIT III:

MODELING TECHNIQUES OF VHDL: Behavioral modeling: Entity declaration – architecture declaration – process statements- variable assignment statements – signal assignments statements – Wait statement – IF statement – Case statement – Null statement – Loop statement – Exit statement – Next statement – Assertion statement – Report statements – More on signal assignment statement – multiple process – postponed process – Data flow styleof modeling

UNIT IV

VHDL STATEMENTS: Concurrent signal assignment statement versus signal assignment – Delta delay revisited – Multiple drivers – Conditional signal assignment statement – Selected signal assignment statement – The unaffected value – Block statement- Concurrent assertion statement – Value of the signal. Structural modeling: Component declaration – Component instantiation – Resolving signal value – examples – Half adder – Full adder – Fourto one multiplexer – Decoders and encoders.

UNIT V:

ADVANCED FEATURES IN VHDL: Generics – configuration – configuration specification – Configuration declaration –Default rules – Conversion functions – Direct instantiation – Incremental binding -Sub programs – Sub program overloading - operator overloading - signatures – default value of parameters –package declaration - package body – design file – design libraries – order of analysis – implicit Visibility – explicit visibility – attributes in VHDL.

TEXT BOOKS:

1. Neil H.E. West Kamaran Eshraghin, " PRINCIPLES OF CMOS VLSI DESIGN"
2. J.Bhasker, "VHDL PRIMER", Low price Edition, 2001 PHI 3.Charles H.Roth, and Jr. DIGITAL SYSTEM DESIGN USING VHDL, Brooks/Cole Thomson Learning PWS Publishing, ISBN-981-240-052-4

COURSE RESULTS: Students have to realize importance of testability in logic circuit design.

.M.Sc. Electronics and Communication / Semester -IV /Ppr.no.28 / Elective-6

ROBOTICS AND AUTOMATION

OBJECTIVES :

- Study the various parts of robots and fields of robotics.
- Study the various kinematics and inverse kinematics of robots.
- Study the Euler, Lagrangian formulation and trajectory planning of Robot dynamics.
- Study the control of robots for some specific applications.

educate on various path planning techniques and dynamics and control of manipulators

Unit:I

Basic Concept : Definition and origin of robotics – different types of robotics – various generations of robots –degrees of freedom – Robot classifications and specifications-Asimov's laws of robotics –dynamic stabilization of robots

Unit:II

Power Sources, **Sensors and Actuators**:Hydraulic, pneumatic and electric drives: Design and control issues – determination of HP ofmotor and gearing ratio – variable speed arrangements – path determination – micro machinesin
robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

Unit:III

Manipulators and Grippers Differential Motion: Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

Unit:IV

Kinematics and Path Planning:Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist andarm singularity - Static analysis - Force and moment Balance Solution kinematics problem – robot programming languages.

Unit:V

D**ynamics and Control and Applications** Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation - Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator. Multiple robots – machine interface – robots in manufacturing and non-manufacturing applications – robot cell design – selection of robot.

TEXT BOOK(S)

1 Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill
Singapore, 2015.

2 Saeed B Niku, Introduction to Robotics, Analysis, Systems, Applications Prentice Hall, 3edition 2104.

REFERENCE BOOKS

1 Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA

1992.

2 Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.

3 Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach,Prentice Hall of India, New Delhi, 1994.

4 R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint,
2005

5 JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson
Education,2009.

6 Issac Asimov I Robot, Ballantine Books, New York, 1986.

COURSE RESULTS: Students can able to Identify ROBOTICS operations and architecture designing procedures.

Elective-6B : e- VEHICLES TECHNOLOGIES

OBJECTIVES:

- Choose a suitable drive scheme for developing an electric of hybrid vehicle depending on resources
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
- Understanding electric car energy resources
- Experience of electric car storage technology
- Learn the electrical vehicle motors and controls

UNIT-I :

INTRODUCTION: The Electric Vehicle Debate, Primary Energy Sources and Alternative Fuels for Transportation, History of electric Vehicles, Electrochemical Power Sources –Secondary Batteries and Fuel Cells

UNIT – II:

SOURCES:Aqueous Electrolyte Batteries –Lead Acid, Nickel – Iron, Nickel – Zinc, Metal – Air Zinc – Halogen - Non-Aqueous Electrolyte Batteries- High Temperature Batteries, Organo Electrolyte and Solid-State Batteries

UNIT– III:

OVERVIEW OF HYBRID ELECTRIC VEHICLES:Combustion Engine Hybrid Electric Vehicles, Laboratory Test of Electric Vehicle Batteries, Vehicle tests with Electric Vehicle Batteries, Future of Electric Vehicles

UNIT– IV

EV PROPULSION- ELECTRIC MOTOR & REQUIRED POWER ELECTRONICS &
CONTROL: Choice of electric propulsion system, block diagram of EV propulsion system oncept of EV Motors, single motor and multi-motor configurations, fixed & variable geare ransmission, In wheel motor configuration, classification of EV motors, Electric motors used i urrent vehicle applications, Recent EV Motors, Comparison of Electric Motors for EV pplications - Basics of Microcontroller & Control Strategies

UNIT– V

EV MOTOR DRIVES: DC Motor: Type of wound-field DC Motor, Torque speed characterist DC-DC Converter, Two quadrant DC Chopper, two quadrant zero voltage transition converter-f lc motor drive, speed control of DC Motor Induction Motor Drive: Three Phase Inverter Bas nduction Motor Drive, Speed Control of Induction Motor, FOC, Adaptive Control, Mo Reference Adaptive Control (MARS), Sliding mode Control.

REFERENCEBOOKS

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., NewYork 2001
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
3. MehrdadEhsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
4. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
5. Hand Book of Batteries and Fuel cells, 3rd Edition, Edited by David Linden and Thomas. B. Reddy,McGraw Hill Book Company, N.Y. 2002.
6. Fuel Cells, Principles and Applications, Viswanathan, B. and Scibioh, Aulice M, Universities Press,2006.
7. The Essential Hybrid Car Handbook: A Buyer's Guide (Paperback)by Nick Yost, The Lyons Press,N.Y. 2006.

COURSE RESULTS: To Be Expert In e- Vehicle And Drives.

***M*.Sc. Electronics and Communication / Semester -IV /Ppr.no.29 / Practical -7**

VLSI AND ANDROID APPLICATION DEVELOPMENT LAB
(ANY 10 USING HARDWARE/SOFTWARE)

OBJECTIVES:

To learn Hardware Descriptive Language (Verilog/VHDL).
To learn the fundamental principles of VLSI circuit design in digital and analog domain.
Have to create a simple Android App (HelloWorld) and be able to manage it within the Android Studio environment Using 8051 microcontroller.

Android Lab:

1.Creating an app to display Hello World
2.Creating an Android Simple Login Application
3.Creating Calculator App in Android.
4.Creating simple Home Screen Widget in Android.
5.Creating Android Chat App in Android.
6.Creating Simple Android Camera Application.
7.Creating Basic List View Demo inAndroid.
8.Creating Google Map in Android.

VHDL Lab:

1.Write a program to Verify the Logic Gates
2.Write a program for Half Adder and Full Adder
3.Write a program for Half Subtractor and Full Subtractor
4.Write a program for Encoder
5.Write a program forDecoder
6.Write a program for Multiplexer
7.Write a program for Demultiplexer.

COURSE RESULTS: Write VHDL code for basic as well as advanced digital ntegrated circuits. Students can learn the Android Studio Application environment.

M.Sc. Electronics and Communication / Semester -IV /Ppr.no.30 / Practical -8

OBJECT ORIENTED PROGRAMMING USING PYTHON LAB (ANY 10 USING HARDWARE/SOFTWARE)

OBJECTIVES:
To acquire programming skills on Object-Oriented Programming concepts inPython
To get a practical knowledge on interfacing Raspberry Pi with Python.

PART I – Basic Programs using Python:

1. Programs based on data types, Input & Output and Control Statements
2. Programs based on Arrays
3. Programs based on Strings
4. Programs based on Functions
5. Programs based on Lists and Tuples
6. Programs based on Dictionaries
7. Programs based on Classes and Objects
8. Programs based on Inheritance
9. Programs based on Polymorphism
10. Programs based on Exceptions
11. Programs based on Files
12. Programs based on Regular Expressions

PART II - Programs for interfacing with Raspberry Pi:

1. Push switch and LED interfacing
2. Buzzer interfacing
3. Speed control of DC motor
4. Direction control of DC motor
5. Keypad interfacing
6. Measurement of Light
7. Measurement of Temperature
8. LCD display interfacing

REFERENCES:

1. Core Python Programming – Dr. Nageswara Rao, 2017 edition, Dreamtech Press.
2. Introduction to Computing and Problem-Solving Using Python – E Balaguruswamy, 1e/ Mc Graw Hill.
3. Raspberry Pi Cookbook – Simon Monk, 1e/ O'ReillyMedia, Inc.
4. https://learn.sparkfun.com/tutorials/python-programming-tutorial-getting-started-with-the-raspberry-pi/all

COURSE RESULTS: Students can learn Python scripting elements and discover how to work with scripts, variables, lists, control flow structures, sequence data and so on. They can learn Python language interfaced with Raspberry Pi kit.

பெரியார் பல்கலைக்கழகம்
PERIYAR UNIVERSITY
SALEM- 636011, TAMIL NADU
NAAC A++ Grade -State University- NIRF Rank 63, ARIIA Rank 10

REGISTRAR (FAC)

PU/CDC/AD-1/BOS MEETING/005266/23F72611/2023, Date:23.05.2023

BOARD OF STUDIES - MEETING NOTICE

I am, by direction, to state that the 2nd meeting of the Board of Studies in **Electronics and Communication – PG (Affiliated College)** is scheduled to be held on **01.06.2023 at 11.00 a.m.** at Auditorium, Periyar University, Salem-11.

AGENDA

1. To Frame the syllabus for **M.Sc. Electronics and Communication** under Choice Based Credit System (CBCS) and to be implemented from the academic year 2023-2024 and thereafter.
2. To Prepare the Scheme of Examination, Question Paper Pattern, Model Question Paper, Eligibility Criteria etc.
3. Any other item.

Members of the Board:

Sl.No.	Name & Address	Designation of the Board
1.	Dr.P.Thirumoorthy Assistant Professor,Dept.of Electronics and Commuication, Govt.Arts College, Dharmapuri-636705.Ph:8610769508	Chairman
2.	Dr.P.Gowrisankar Assistant Professor Dept.of Electronics and Commuication, Muthayammal College of Arts & Science (Autonomous) Rasipuram- 637408. Ph: 964154283	Member
3.	Dr.P.Thamaraiselvan Assistant Professor, Dept.of Electronics and Commuication, Selvam Arts & Science College (Autonomous), Namakkal-637003.Ph: 9597940910	Member
4.	Dr.K.M.Prabusankarlal Assistant Professor, Dept.of Electronics and Commuication, K.S.R. College of Arts & Science (Autonomous) Thiruchengode-637215.Ph: 9842410124	Member
5.	Mr.T.Suresh Assistant Professor, Dept.of Electronics and Commuication, Salem Sowdeswari College, Salem-636010.Ph:9245519021	Member
6.	Dr.K.A.Ramesh Kumar Professor and Head, Dept.of Energy Science and Technology, Periyar University, Salem-11 Ph:9976766000	University Nominee

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7.	Dr. J.Vijayakumar Associate Professor and Head Department of Electronics and Instrumentation, Bharathiar University, Coimbatore Tamil Nadu, India - 641046. Mobile: 9786869929, 7373769929 E-mail:- Vijayakumar@buc.edu.in	External Member
8.	Dr.R.Mahendran Assistant Professor of Electronics Department of Electronics Government Arts College Kulithalai PIN -639120. Mail ID : ishaamahendran@gmail.com Mobile number 9788119099	External Member
9.	Dr. S. R. Sivarasu Managing Partner, Ram Kalam Centre for Energy Consultancy and Training, No.8, VPK Garden, Mylampatti, Coimbatore-641062 Phone No : 9942029372, 8056719372 Email ID : ramkalamcect@gmail.com	Industrial Expert
10.	Mr. A. Gangatharan PCB Design Engineer, INSEMI Technologies PVT LTD Bangalore, Karnataka 560066 Phone No :6382332750 Email ID : raguganga7@gmail.com	Alumni

I request you to make it convenient to attend the above meeting on 01.06.2023. TA/DA and Honorarium will be paid as per Periyar University rules through ECS only.

REGISTRAR 23.5.23