MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI
PG - COURSES – AFFILIATED COLLEGES

Course Structure for M.Sc . Electronics And Communication
(Choice Based Credit System)
(with effect from the academic year 2016- 2017 onwards)
(45th SCAA meeting held on 09.02.2017)

Sem.	Sub. No.	Sub. status	Sub Title	Hrs/ Week	Credits	Marks				
						Maximum			Passing Minimum	
						Int.	Ext.	Tot.	Ext	Tot.
III	12	Core-7	Advanced Power Electronics	6	5	25	75	100	38	50
	13	Core-8	Data Communication	6	5	25	75	100	38	50
	14	Core-9	Optical Communication	6	5	25	75	100	38	50
	15	Core 10	Research Methodology for Electronics	6	5	25	75	100	38	50
	16	Practical – III	Advanced Communication and Microprocessor	6	--	--	--	--	--	--
IV	17	Core -11	Microwave Electronics	6	4	25	75	100	38	50
	18	Core -12	Mobile and Satellite Communication	6	4	25	75	100	38	50
	19	Core -13	Navigation systems	6	4	25	75	100	38	50
	20	Project		6	5	50	50	100	25	50
	21	Practical - III	Optical, Microwave and Power Electronics lab	6	4	50	50	100	25	50
	22	Practical - IV	Advanced Communication and Microprocessor Lab	--	4	50	50	100	25	50

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ADVANCED POWER ELECTRONICS

UNIT I.

DC-DC CONVERTER TOPOLOGIES:

Buck and boost converters - continuous and discontinuous current modes - buck-boost, C'uk converter - operation – control of dc-dc converters –PWM method - Full-bridge with bipolar and unipolar switching – output voltage equations.

UNIT II.

SMPS TOPOLOGIES:

Basic block schematic of SMPS – isolated dc-dc topologies – forward and flyback – principles – (circuit and operation only). Push-pull topology – half bridge Basics of SMPS control methods – voltage-mode and current-mode control (block diagrams and description only).

UNIT III.

RESONANT CONVERTERS:

Advantages of resonant converters over PWM converters – Classification - series and parallel resonant converters – half-bridge operation – discontinuous and continuous current modes (basic modes only, no analysis required) Principles of Zero voltage and Zero current switching (ZVS and ZCS switches only – no analysis required) comparison with hard switching, switching locus diagrams, working principle

UNIT IV.

PWM INVERTERS:

Need for PWM techniques – various PWM techniques – principle of sinusoidal PWM – bipolar and unipolar PWM - modulation index – application to single phase bridges - disadvantages of SPWM – brief introduction to other PWM methods – current-mode control schemes (tolerance band control and fixed frequency control – description with block diagram only)

UNIT V.

APPLICATIONS:

Power factor correction – Actual power factor – Displacement factor and distortion factor – principles of input line current shaping using boost rectifiers. UPS – Different topologies–block Schematics. Electronic ballast – block schematics. High frequency inductor and transformers: Design principles, definitions, comparison with conventional design and problems

REFERENCES

1. Power Electronics: Converters, Applications and Design – Mohan, Undeland and Robbins, John Wiley and Sons, 2nd ed.
2. Power Electronic Systems: Theory and Design – Jai P. Agrawal , Pearson Education Asia, LPE
3. Modern Power Electronics – P.C Sen, Wheeler Publ.
4. Rashid M.H. "Power electronics-Circuits, Devices, Applications", 3rd Edition, Prentice Hall India, 2008.
5. Bose B.K., Power electronics and A.C Drives, Prentice Hail 1986.
6. Muhammad Rashid. "Digital power electronics and applications" first edition, 2005, Elsevier.

DATA COMMUNICATION

UNIT I

Digital Transmission fundamentals: Definition of information. Digital Representation of Information, Block-Oriented information, Stream information. Why digital communication, comparison of Analog and digital transmission, Basic Properties of Digital transmission Systems; Digital Representation of Analog Signals: Bandwidth of Analog Signals, sampling of an Analog signal, digital Transmission of Analog Signals. Characteristics of communications channels: frequency domain characterization. Time Domain characterization. Fundamental limits in digital Transmission, The Nyquist signaling rate, The Shannon channel capacity.

UNIT II

Line coding Modems and digital modulation: binary phase Modulation QAM and Signal constellations, telephone modem standards, properties of media and Digital transmission systems: twisted pair, coaxial cable, optical fiber, radio transmission, Infrared light. Error detection and correction: Error Detection, Two-dimensional parity Checks, Internet checksum, polynomial codes, Standardized polynomial codes, Error detecting capability of a polynomial code.

UNIT III

Circuit switching networks: Multiplexing: FDM, TDM, WDM, SONET, SONET multiplexing, SONET frame structure. Transport networks: SONET networks, optical Transport networks, circuit switches, space division switches, Time division switches, the telephone network, transmission facilities, end to end digital services.

UNIT IV

Communication Networks and Services: Evolution of Network architecture and Services: Telegraph Networks and Message Switching, Telephone Networks and Circuit Switching, The Internet, Computer Networks and Packet Switching.

UNIT V

Medium access control protocols and LAN: The Medium Access Control Protocols, Multiple Access Communications, Random Access: ALOHA, Slotted ALOHA, CSMA, CAMA-CD, Scheduling Approaches to Medium Access Control: Reservation Systems, Polling, Token-Passing Rings; Channelization, FDMA, TDMA, CDMA. High speed Digital Access & connecting Devices. DSL: DSL Technology, cable modems, connecting devices: Repeaters, Hubs, Bridges, Two-layer switch, router and three layer switches.

TEXT BOOKS

1. Alberto Leon- Garcia and India Widjaja, Communication Networks Fundamental And Key Architectures, Tata McGraw-Hill 2nd edition.
2. Behrouz A. Forouzan; Data Communications and Networking, Tata McGraw-Hill, 3rd Edition.

REFERENCE BOOKS

1. William Stallings, Data and Computer Communication, Fifth Edition, Pearson Education/ Prentice Hall India.
2. William A. Shay, Understanding Data Communications and Networks, 2nd Edition, Thomson.
3. Codbole, data Communications and Networks, Tata McGraw-Hill 2002.

4. Micael A Gallo & William M. Handcock, Computer Communications and Networking Technologies, 2003 Edition, Thomson

OPTICAL COMMUNICATION

UNIT I

INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes – Single Mode Fibers-Graded Index fiber structure.

UNIT II

SIGNAL DEGRADATION OPTICAL FIBERS

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination –Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III

FIBER OPTICAL SOURCES AND COUPLING

Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations – External Quantum efficiency –Resonant frequencies –Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fibre –to- Fibre joints, Fibre splicing.

UNIT IV

FIBER OPTICAL RECEIVERS

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources – Receiver Configuration – Probability of Error – Quantum Limit.

UNIT V

DIGITAL TRANSMISSION SYSTEM

Point-to-Point links System considerations –Link Power budget –Rise - time budget –Noise Effects on System Performance-Operational Principles of WDM, Solitons-Erbium-doped Amplifiers. Basic on concepts of SONET/SDH Network.

TEXT BOOK

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed.,2000

REFERENCES

1. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

RESEARCH METHODOLOGY FOR ELECTRONICS

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

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, Sources in Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques.

UNIT III

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, Measures of Skewness, Regression Analysis, Correlation.

UNIT IV

Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses. Chisquare Test, Comparing Variance, As a nonparametric Test, Conversion of Chi to Phi, Caution inusing Chisquare test.

UNIT V

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, Rtype Q Type factor Analysis, Path Analysis.

REFERENCE BOOKS

1. “Research Methodology”, C.R. Kothari, Wiley Eastern.
2. “Formulation of Hypothesis”, Willkinson K.P, L Bhandarkar, Hymalaya 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 MethodologyIntegration of principles, methods and Techniques”, K.N. Krishna swami and others, Pearson Education.

ADVANCED COMMUNICATION AND MICROPROCESSOR LAB

Perform all Experiments

ADVANCED COMMUNICATION

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. PLLand Frequency synthesizer
13. Frequency multiplier
14. P.R.B.S. Generator

Matlab Experiments

15. Digital Modulation and Demodulation ASK,PSK,QPSK,FSK
16.Generation of Signals
17.Sampling and Effect of aliasing
18.Error Control Coding.

ADVANCED MICROPROCESSOR

1. Programs for 16 bit Arithmetic operations (Using 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Interfacing ADC and DAC.
6. Parallel Communication between two μP Kits using Mode 1 and Mode 2 of 8255.
7. Interfacing and Programming 8279, 8259, and 8253.
8. Serial Communication between two μP Kits using 8251.
9. Interfacing and Programming of Stepper Motor and DC Motor

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MICROWAVE ELECTRONICS

UNIT l:

Introduction, definition of microwave, characteristic features, application of microwave Generation of microwave by vacuum tube - limitation of conventional tubes klystron amplifier-reflex klystron oscillator, magnetrons-traveling wave tubes

UNIT II:

Generation of microwave by solid state devices, bipolar transistor field effect transistors, gunn oscillator, avalanche diode, oscillator, IMPATT & TRPATT mode of operation parametric amplifiers.

UNIT III:

Microwave integrated circuit design, introduction, hybrid microwave integrated circuits (HMIC), monolithic microwave integrated circuit (MMIC), MIC materials, substrate material, conductor material, dielectric materials, resistive films, types of mics, microwave monolithic integrated circuits (MMIC'S).

UNIT IV:

Waveguide and waveguide component, concept of waveguide, advantage of hollow wave guide, reflection from a metal surface, field pattern obtained by oblique reflection, higher order modes, waveguide dimensions, impedance matching elements, waveguide short circuit, tees and magic tee, phase shiftless, attenuators, matched terminators, waveguide slotted section, f'1N diodes, P1N diode switches

UNIT V:

Microwave measurement techniques, standing wave measurements, impedance measurement, cavity resonator, cavity a. frequency measurements and calibration techniques, dielectric measurements.

TEXT BOOKS

l .Microwave Devices and circuits - S. Y. Liao, PH I
2. Introduction to microwave theory and experiments L.A. Lance TMH
3. Radio frequency and microwave measurements- M.M.Radmanesh Pearson Education
4. Microwave and Radar Engineering M.Kulkarni – Umesh Publications

MOBILE AND SATELLITE COMMUNICATION

UNIT- I

CELLULAR CONCEPT AND SYSTEM FUNDAMENTALS

Evolution of mobile communications, mobile radio systems-Examples, trends in cellular radio and personal communications.: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems. Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models,

UNIT II

MODULATION CODING AND MULTIPLE ACCESS TECHNIQUES

Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels ,Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT III

SATELLITE SYSTEMS

Orbits: Introduction, Kepler laws, definitions, orbital element, apogee and perigee heights, orbit perturbations, limits of visibility, earth eclipse of satellite, sun transit outage Propagation impairments and space link: Introduction, atmospheric loss, ionospheric effects, rain attenuation, and other impairments. Space link: Introduction, EIRP, transmission losses, system noise, CNR, uplink, down link, effects of rain, Combined CNR.

UNIT IV

SATELLITE ACCESS

Space Segment: Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, transponders, antenna subsystem.Earth Segment: Introduction, receive only home TV system, out door unit, indoor unit, Tx – Rx earth station. Satellite access: satellite access, single access, pre-assigned FDMA, SCPC (spade system), TDMA, pre-assigned TDMA, demand assigned TDMA, down link analysis, comparison of uplink power requirements for TDMA & FDMA

UNIT V

SATELLITE SERVICES

DBS, Introduction, orbital spacing, power ratio, frequency and polarization, transponder capacity, bit rates for digital TV,HDTV, satellite mobile services, VSAT, RadarSat, GPS, orb communication and iridium.

TEXT BOOK

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
2 Dennis Roddy, Satellite Communications, 4th Edition, McGraw-Hill International edition, 2006

REFERENCES

1. R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003.
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition,McGraw-Hill International, 1998.
3. Stephen G. Wilson, " Digital Modulation and Coding", Pearson Education, 2003.
4. Timothy Pratt, Charles Bostian and Jeremy Allnutt, Satellite Communications, 2nd Edition, John Wiley & Sons, 2003
5.W.L. Pitchand, H.L. Suyderhoud, R.A. Nelson, Satellite Communication Systems engineering, 2nd Ed., Pearson Education., 2007

NAVIGATION SYSTEMS

UNIT I

Four basic methods of navigation. Radio direction finding-loop antenna-loop input circuits. Aural-null direction finder, Goniometer Errors. Adcock direction finders, Direction finding at very high frequencies, Automatic direction finders, Radio compass, VHF phase comparison, Automatic direction finder, Commutated aerial direction finder, Range and accuracy of direction finders

UNIT II

Hyperbolic systems of navigation-LORAN A equipment ,range and precision, LORAN C Decca navigation systems, Decca receivers, range and accuracy- Omega system, DME system transmission, Airborne interrogator, Beacons ,TACAN system

UNIT III

Aids to approach and landing-Instrument landing system, Localizer, Glide-Slope system-receiving equipments-Site effects-Marker beacons ,Ground controlled approach systems-surveillance radar-Precision approach radar-Microwave landing system (MLS) Antenna system for MLS

UNIT IV

Doppler navigation-Doppler effect-Beam configuration-Doppler frequency equations, Track stabilization-Doppler spectrum-Components of the Doppler navigation system-Doppler Radar equipment-Continuous wave Doppler Radar, FMCW Doppler Radar Frequency Trackers, Doppler range Equation, Inertial navigation-Principles of operation-Navigation over the earth-Components of inertial navigation system, Accelerometers-Gyros and stabilized platforms-Earth-Coordinate mechanization strapped down systems-accuracy of inertial Navigation systems.

UNIT V

Satellite Navigation system-The transit system, Navstar Global Positioning System (GPS) -Basic principles of operation-Signal structure-Data message-velocity determination Accuracy of position determination-Differential navigation-Navstar Receivers Integration of GPS with inertial Navigation systems, GPS transmitters-Russian Glonass system

TEXT BOOKS

1 .Elements of Electronic Navigation N.S Nagaraja II Edn TMH

2.Global Positioning Systems, Inertial Navigation and Integration Mohinder Grewal II Edn Wiley and sons.

REFERENCE BOOKS

1 .Basic Coastal Navigation-An introduction to piloting- Frank.J.Larkin-Sheridan press

2.Duttons Navigation and Piloting - Elbert .S. Maloney, Naval Institute press I Edn

3.Marine navigation – Piloting, Celestial and Electronic Navigation - Richard Hobbs, II Edn

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PROJECT WORK

The objective of the project work is to motivate the students for doing research and to inculcate in them the self confidence to work independently. each student should do an individual project and they can freely choose their own topic of experimental nature. the project should be of investigative type not a hobby project one.

Students are encouraged to take the project work as a challenge so that their project will boost up their industrial career.

Periodic Seminars should be conducted to assess the students. The students should present the progress of the project to their respective guides and get the required assistance from them

At the completion of the project .The student will submit Project Report in the form of Dissertation which will be examined by the examiners.

The examination shall consist of i) evaluation of the dissertation and ii) comprehensive viva-voce

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ADVANCED COMMUNICATION AND MICROPROCESSOR LAB

Perform all Experiments

ADVANCED COMMUNICATION

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9. Automatic gain control
10. P.C.M system using codec
11. Delta Modulation, Adaptive Delta Modulation
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Matlab Experiments

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8. Serial Communication between two µP Kits using 8251.
9. Interfacing and Programming of Stepper Motor and DC Motor

OPTICAL- MICROWAVE AND POWER ELECTRONICS LAB

Conduct any 20 Experiments

Experiments pertaining to Fiber optics, Optical Communication and Fiber optic sensors:

1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
2. Mode Characteristics of Fibers – SM Fibers.
3. Coupling Fibers to Semi-Conductor Sources – Connectors & Splices.
4. Fiber optic communication links. Digital and Analog
5. L.E.D & Photo Diode Characteristics.

Microwave experiments

1. Reflex klystron Repeller mode characteristics
2. Characteristics of Gunn diode Oscillator
3. VSWR Measurements
4. Impedance measurement using Microwave test bench
5. Determination of guide wavelength, frequency
6. Radiation Pattern of Horns, Paraboloids.
7. Measurement of coupling and directivity of a directional coupler
8. Measurement of isolation and power division of E&H plane TEEs

Power Electronics Lab

1. R, RC and UJT firing circuits for the control of SCRS.
2. Design and implementation of Ramp-Comparator and digital firing scheme for simple SCR circuits.
3. Automatic lighting control with SCRs and optoelectronic components.
4. AC phase control using SCR and Triac.
5. Speed control of DC motor using choppers and converters.
6. Generation and study the PWM control signal for Single phase dc to ac inverter.
7. Study and use of the single phase half controlled & fully controlled AC to DC Converter and effect of firing angle control on load voltage & wave Forms.
8. Study and use of back to back connected SCR/ triac Controlled AC Voltage controller and its wave forms with Variation of firing angle.
9. Study & use chopper circuit for the control of DC Voltage using (1) Pulse width control (2) Frequency Control.
10. Study of Single Phase inverter and its wave form.
11. Study of Three Phase firing circuit with synchronisation, and testing with three phase AC to DC bridge converter. Testing of wave forms of digital firing modules.
12. Study and Testing of a Three Phase bridge inverter with different types of loads.