COEP Technological University Pune

(A Unitary Public University of Govt. of Maharashtra)

NEP 2020 Compliant

Proposed Curriculum Structure

M. Tech.
Electronics and Telecommunication – Wired and Wireless Communication

(Effective from: A.Y. 2024-25)

PG Program [M. Tech. Electronics and Telecommunication – Wired and Wireless Communication]
Proposed Curriculum Structure
W.e.f AY 2024-25

List of Abbreviations

Abbreviation	Title	No of courses	Credits	% of Credits
PSMC	Program Specific Mathematics Course	1	4	5.88 %
PSBC	Program Specific Bridge Course	1	3	4.41 %
PCC	Program Core Course	5	15	22.06 %
PEC	Program Specific Elective Course	3	9	13.24 %
LC	Laboratory Course	5	8	11.76 %
VSEC	Vocational and Skill Enhancement Course	2	18	26.47 %
OE	Open Elective	1	3	4.41 %
SLC	Self-Learning Course	2	6	8.82 %
AEC	Ability Enhancement Course	1	1	1.47 %
MLC	Mandatory Learning Course	2	--	--
CCA	Co-curricular & Extra-curricular Activities	1	1	1.47 %
	Total	**24**	**68**	**100%**

PG Program [M. Tech. M. Tech. Electronics and Telecommunication – Wired and Wireless Communication]

Proposed Curriculum Structure

Semester I

Sr. No.	Course Category	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	PSMC	PSMC-01	Linear Algebra and Probability Theory	3	1	--	1	4
2.	PSBC	PSBC-01	Voice and Data Networks	3	--	2	2	4
3.	PCC	PCC-01	Advances in Digital communication	3	--	--	--	3
4.	PCC	PCC-02	5G and Wireless Communication	3	--	--	--	3
5.	LC	LC-01	Advances in Digital Communication Lab	--	--	3	2	2
6.	LC	LC-02	5G and Wireless Communication Lab	--	--	3	2	2
7.	AEC	AEC-01	Seminar	--	--	2	2	1
8.	PEC	PEC-01	Program Specific Elective –I a) Cognitive Radio b) Advanced Digital Signal and Image Processing c) RF and Microwave Circuit Design	3	--	--	1	3
9.	MLC	MLC-01	Research Methodology and Intellectual Property Rights	--	--	--	2	--
10.	MLC	MLC-02	Effective Technical Communication Skills	--	--	--	1	--
			Total	**15**	**01**	**10**	**13**	**22**

PG Program [M. Tech. Electronics and Telecommunication – Wired and Wireless Communication]
Proposed Curriculum Structure

Semester II

Sr. No.	Course Category	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	OE	OE-01	Open Elective Interdisciplinary Open Course	3	--	--	1	3
2.	PCC	PCC-03	Broadband Networks	3	--	--	--	3
3.	PCC	PCC-04	Advanced Antenna Theory	3	--	--	--	3
4.	PCC	PCC-05	Software Defined Networks	2	1	--	--	3
5.	LC	LC-03	Broadband Networks Lab	--	--	2	2	1
6.	LC	LC-04	Advanced Antenna Theory Lab	--	--	2	2	1
7.	LC	LC-05	Software Defined Networks Lab	--	--	2	2	1
8.	PEC	PEC-02	Program Specific Elective –II a) Wireless Sensor Network b) AI-ML c) Radar and Satellite Communication	3	--	--	1	3
9.	PEC	PEC-03	Program Specific Elective –III (a) Internet of Things (b) MIMO System (c) Advanced Optical Networks	3	--	--	1	3
10.	CCA	CCA-01	Liberal Learning Course	--	--	2	2	1
			Total	**17**	**01**	**08**	**11**	**22**

- Exit option to qualify for **PG Diploma in Wired and Wireless Communication**:
  - Eight weeks domain specific industrial internship in the month of June-July after successfully completing first year of the program.

PG Program [M. Tech. M. Tech. Electronics and Telecommunication – Wired and Wireless Communication]

Proposed Curriculum Structure

Semester-III

Sr. No.	Course Category	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	VSEC	VSEC-01	Dissertation Phase – I	--	--	18	12	9
2.	SLC	SLC-01	Massive Open Online Course –I	3	--	--	3	3
			Total	**3**	**--**	**18**	**15**	**12**

Semester-IV

Sr. No.	Course Category	Course Code	Course Name	Teaching Scheme				Credits
				L	T	P	S	
1.	VSEC	VSEC-02	Dissertation Phase – II	--	--	18	12	9
2.	SLC	SLC-02	Massive Open Online Course –II	3	--	--	3	3
			Total	**3**	**--**	**18**	**15**	**12**

- **MOOC Courses Identified:**
  - Advanced IoT Applications
  - Evolution of Air Interface towards 5G
  - Machine Learning
  - Scientific Computing
  - Modelling, Simulation and Optimization Techniques

SEMESTER - I

(PSMC) [ETC-19005] Linear Algebra and Probability Theory

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits: 04

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Solve linear system of equations having numbers of unknowns equal to, less or more than number of equations.
2. Factorize matrix into components such as LU, QR, SVD etc.
3. Characterize random variables and its functions with probability distributions and cumulative distributions
4. Specify and apply standard distributions to various applications in engineering

Syllabus Contents:

Linear Algebra:

1. Vectors and Linear Combinations, Dot Products
2. Solving Linear Equations: Elimination, Elimination Matrices, Inverse Matrices, LU Factorization
3. Vector Spaces and Subspaces: Solving A.x= 0, Null space of A, Rank, Row Reduced Form, Complete solution of A.x = b, Independence, Basis and Dimension, Dimensions of Four subspaces
4. Orthogonality: Orthogonality of Four Subspaces, Projections, Least Squares Approximations, Orthogonal bases, Gram-Schmidt – QR Factorization
5. Eigenvalues and Eigenvectors: Diagonalizing a Matrix, Symmetric Matrices, Positive Definite Matrices, Singular Value Decomposition

Probability and Statistics:

1. Definitions, conditional probability, Bayes Theorem and independence.
2. Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function, Chebyshev inequality.
3. Special Distributions: Discrete uniform, Binomial, Geometric, Poisson, Exponential, Gamma, Normal distributions.
4. Pseudo random sequence generation with given distribution, Functions of a Random Variable
5. Joint Distributions: Joint, marginal and conditional distributions, product moments, correlation, independence of random variables, bi-variate normal distribution. Stochastic Processes: Definition and classification of stochastic processes, Poisson process.

References:

1. Gilbert Strang, “Introduction to Linear Algebra”, Wellesley Cambridge Press, 4th Edition
2. William W. Hines, Douglas C. Montgomery, David M. Goldsman, Connie M. Borror, “Probability and Statistics in Engineering”, Wiley, 4th Edition
3. Henry Stark, John W. Woods, “Probability and Random Process with Applications to Signal Processing”, Pearson Education, 3rd Edition
4. B. A. Ogunnaike, “Random Phenomena: Fundamentals of Probability and Statistics for

Engineers", CRC Press, 2010.

(PSBC) [EWW-19001] Voice and Data Networks

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits: 03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand the functionalities, concepts, standards and technologies involved with voice and data network services and voice/data integration.
2. Understand the concepts of Networking and TCP/IP Protocol Suit.
3. Understand circuit & packet switching technologies and their deployments in public network.
4. Analyze the concepts of Congestion control, Link Level Error Control and Flow Control.

Syllabus Contents:

Introduction: Principle of cross-bar switching, Electronic switching, Space division switching, Time division switching – digital: space and time and combination, Two, Three and N stage networks, Traffic engineering – Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, Incoming traffic and service time characterization, blocking models and loss estimates, delay systems.

Telephone Networks: Subscribe loop systems, switching Hierarchy and Routing, Transmission plan, Transmissions systems, Numbering plan, Charging plan, Signaling techniques, In -channel signaling, common signaling. Internet Telephony and voice over IP (VoIP) - RTP and RTCP.

Data Networks: Types of data networks, topologies, centralized and distributed networks, LAN, WAN, MAN, overview of wireless networks, Overview of network models: ISO-OSI and TCP/IP, Physical Layer, Transmission media-guided and unguided, Multiplexing techniques; Circuit switching, Message Switching, Packet switching networks, Data link layer, LLC and MAC sub layer, Error control, Flow control, Sliding Window Protocols, Static and Dynamic Channel Allocation in LAN, CSMA/CD Protocols, Collision free protocols, IEEE 802 standards for Ethernet, High speed LANs, Network Layer and Transport Layer, Routers and Routing Protocols, Congestion Control and Algorithm, Transport layer services and principles, Connectionless v/s connection oriented services, UDP and TCP, Application Layer, Domain Name System, Electronic mail, World Wide Web, Security issues for Intranet and Internet, Quality of Service issues, Analysis of Losses and delay, Reliability.

References:

1. Viswanathan, Thiagarajan, and Manav Bhatnagar, "Telecommunication switching systems and networks". PHI Learning Pvt. Ltd., 2015.
2. William Stallings, "Data and computer communications", Prentice Hall, 10th edition, 2017.
3. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2007
4. J.F. Kurose and K. W. Ross, "Computer Networking – A top-down approach featuring the Internet", Pearson Education, 5th Edition, 2012
5. L. Peterson and B. Davie, "Computer Networks – A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5th Edition, 2011.

(DEC-I) (a) [EWW (DE)-19001] Cognitive Radio

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Sem Exam – 60
Credits: 03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand the fundamental concepts of cognitive radio networks.
2. Develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.
3. Understand technologies to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.
4. Understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimisation techniques for better spectrum exploitation.

Syllabus Contents:

Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

Optimization Techniques of DSA: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.

Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Research Challenges in Cognitive Radio: Network layer and transport layer issues, cross-layer design for cognitive radio networks.

References:

1. Ekram Hossain, Dusit Niyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press, 2009.
2. Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd., 2009.
3. Bruce Fette, “Cognitive radio technology”, Elsevier, 2nd edition, 2009.
4. Huseyin Arslan, “Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems”, Springer.
5. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, “Optimizing Wireless Communication Systems” Springer, 2009.
6. Linda Doyle, “Essentials of Cognitive Radio”, Cambridge University Press, 2009.

(DEC-I) (b) [ETC (DE)-19009] Digital Signal and Image Processing

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits: 03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand and apply knowledge of various transforms and probability theory in signal and image processing
2. Understand digital image processing fundamentals like enhancement, encoding, feature extraction, and segmentation.
3. Analyze, apply and critically evaluate various signal/image processing algorithms appropriate for practical applications.

Syllabus Contents:

Review of Discrete Time signals and systems:
Characterization in time and Z and Fourier – domain, Fast Fourier Transform algorithms – In-place computations, Butterfly computations, bit reversals.

Digital Filter design:
FIR and IIR filters–Impulse invariance, bilinear transformation.

Representation of Signal Processing Algorithms:
Signal flow, Data flow and Dependence Graphs. Iteration Bound, algorithms for computing iteration bound, Pipelining, Parallel processing.

Introduction to Image Processing:
Applications and fields of image processing, Fundamental steps in Digital image processing, Elements of visual perception, Image sensing and acquisition, Basic Concepts in Sampling and Quantization, representing digital images.

Image Enhancement:
Some basic gray level transformations, Histogram Processing, Sharpening Spatial filters, Image Enhancement in the spatial and Frequency domain, Pseudo-colouring.

Segmentation:
Some Basic Relationships between pixels, point, Edge based segmentation, Boundary detection, extraction and representation, Threshold based segmentation, Region based segmentation, Texture based segmentation. Morphological operations.

Image Compression:
Data redundancies Variable-length coding, Predictive coding, Transform coding, Image compression standards.

Case studies:
VLSI architectures for implementation of Image Processing algorithms.

References:

1. J.G. Proakis, Manolakis “Digital Signal Processing”, Pearson, 4th Edition
2. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson , 4rd Edition
3. Keshab Parhi, “VLSI Digital Signal Processing Systems – Design and Implementation”, Wiley India

(DEC-I) (c) [EWW (DE)-19002] RF and Microwave Circuit Design

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits: 03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand the behaviour of RF passive components and model active components.
2. Perform transmission line analysis.
3. Demonstrate use of Smith Chart for high frequency circuit design.
4. Justify the choice/selection of components from the design aspects.
5. Contribute in the areas of RF circuit design.

Syllabus Contents:

Transmission Line Theory: Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.

Microwave Network Analysis: Impedance and equivalent voltage and current, Impedance and admittance matrix, The scattering matrix, transmission matrix, Signal flow graph.

Microwave Components: Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components. Nonlinearity And Time VarianceInter-symbol interference, random process & noise, definition of sensitivity and dynamic range, conversion gain and distortion.

Microwave Semiconductor Devices And Modelling: PIN diode, Tunnel diodes, varactor diode, schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FETs, MESFET, MOSFET and HEMT.

Amplifiers Design: Power gain equations, stability, impedance matching, constant gain and noise figure circles, small signal, low noise, high power and broadband amplifier, oscillators, Mixers design.

References:

1. Matthew M. Radmanesh, “Advanced RF & Microwave Circuit Design: The Ultimate Guide to Superior Design”, Author House, 2009.
2. D.M.Pozar, “Microwave engineering”, Wiley, 3rd edition. 2012.
3. R.Ludwig and P.Bretchko, “R. F. Circuit Design”, Pearson Education Inc., 2000.
4. G.D. Vendelin, A.M. Pavoi, U. L. Rohde, “Microwave Circuit Design Using Linear and Non Linear Techniques”, John Wiley & Sons, 2005.
5. S.Y. Liao, “Microwave circuit Analysis and Amplifier Design”, Prentice Hall 1987.
6. Matthew M. Radmanesh, “Radio frequency and microwave electronics illustrated”, New Jersey: Prentice Hall, 2001.

(MLC) [ML-19011] Research Methodology and Intellectual Property Rights

Teaching Scheme
Lectures: 2 hrs/week

Examination Scheme
Continuous evaluation
Assignments/Presentation/Quiz/Test

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand research problem formulation and approaches of investigation of solutions for research problems
2. Learn ethical practices to be followed in research and apply research methodology in case studies and acquire skills required for presentation of research outcomes
3. Discover how IPR is regarded as a source of national wealth and mark of an economic leadership in context of global market scenario
4. Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social benefits

Syllabus Contents:

Unit 1:
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.
Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations.

Unit 2:
Effective literature studies approaches, analysis
Use Design of Experiments /Taguchi Method to plan a set of experiments or simulations or build prototype. Analyze your results and draw conclusions or Build Prototype, Test and Redesign.

Unit 3:
Plagiarism, Research ethics, Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit 4 :
Introduction to the concepts Property and Intellectual Property, Nature and Importance of Intellectual Property Rights, Objectives and Importance of understanding Intellectual Property Rights.

Unit 5 :
Understanding the types of Intellectual Property Rights: -Patents-Indian Patent Office and its Administration, Administration of Patent System – Patenting under Indian Patent Act , Patent Rights and its Scope, Licensing and transfer of technology, Patent information and database. Provisional and Non Provisional Patent Application and Specification, Plant Patenting, Idea Patenting, Integrated Circuits, Industrial Designs, Trademarks (Registered and unregistered trademarks), Copyrights, Traditional Knowledge, Geographical Indications, Trade Secrets, Case Studies.

Unit 6 :
New Developments in IPR, Process of Patenting and Development: technological research, innovation, patenting, development, International Scenario: WIPO, TRIPs, Patenting under PCT.

References:

1. Aswani Kumar Bansal : Law of Trademarks in India
2. B L Wadehra : Law Relating to Patents, Trademarks, Copyright, Designs and Geographical Indications.
3. G.V.G Krishnamurthy, "The Law of Trademarks, Copyright, Patents and Design"
4. Satyawrat Ponkse, "The Management of Intellectual Property"
5. S K Roy Chaudhary & H K Saharay, " The Law of Trademarks, Copyright, Patents"
6. T. Ramappa, S. Chand, "Intellectual Property Rights under WTO"
7. Manual of "Patent Office Practice and Procedure"
8. WIPO: "WIPO Guide To Using Patent Information"
9. Halbert ,Taylor & Francis, "Resisting Intellectual Property"
10. Mayall, "Industrial Design", Mc Graw Hill
11. Niebel, "Product Design", Mc Graw Hill
12. Asimov, "Introduction to Design", Prentice Hall
13. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age"

(MLC) [ML-19012] Effective Technical Communication

Teaching Scheme
Lectures: 1 hr/week

Examination Scheme
Marks: 100M (4 Assignments – 25 Marks each)

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Produce effective dialogue for business related situations
2. Use listening, speaking, reading and writing skills for communication purposes and attempt tasks by using functional grammar and vocabulary effectively
3. Analyze critically different concepts / principles of communication skills
4. Demonstrate productive skills and have a knack for structured conversations
5. Appreciate, analyze, evaluate business reports and research papers

Syllabus Contents:

Unit 1: Fundamentals of Communication
7 Cs of communication, common errors in English, enriching vocabulary, styles and registers

Unit 2: Aural-Oral Communication
The art of listening, stress and intonation, group discussion, oral presentation skills

Unit 3: Reading and Writing
Types of reading, effective writing, business correspondence, interpretation of technical reports and research papers

References:

1. Raman Sharma, “Technical Communication”, Oxford University Press.
2. Raymond Murphy “Essential English Grammar” (Elementary & Intermediate) Cambridge University Press.
3. Mark Hancock “English Pronunciation in Use” Cambridge University Press.
4. Shirley Taylor, “Model Business Letters, Emails and Other Business Documents” (seventh edition), Prentise Hall
5. Thomas Huckin, Leslie Olsen “Technical writing and Professional Communications for Non-native speakers of English”, McGraw Hill.

(PCC) [EWW-19002] Advances in Digital Communication

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/week	T1, T2 – 20 marks each, End-Semester Exam – 60 Credits: 03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand and visualize the different Digital modulation and spread spectrum techniques.
2. Apply different types of coding techniques to design the optimum receiver for different channels.
3. Design and develop the different types of modulation techniques, equalizer to improve the performance under fading channels for various applications.

Syllabus Contents:

Overview of digital communication: principles, base-band and band-pass digital modulation-demodulation schemes. Information measures, Coding techniques for discrete and analog sources. Channel capacity, error detection and correction codes - Linear block codes, cyclic convolutional codes.

Communication through band limited linear filter channels: Optimum receiver for channels with ISI and AWGN, Linear equalization, Decision feedback equalization, Iterative equalization and decoding, Adaptive equalization.

MIMO: Introduction to MIMO, Multiple Antenna technology, Technique of MIMO:EIGEN-Beam forming, space time coding, spatial multiplexing, MIMO formats, multiuser MIMO, Massive MIMO.

Digital communication through fading multi-path channels: Characterization of fading multipath channels, The effect of signal characteristics on the choice of a channel model, Frequency nonselective, Slowly fading channel, Diversity techniques for fading multipath channels, Digital signals over a frequency selective, Slowly fading channel.
OFDM in 5G Communication: Basics, OFDM transmission over fading channels, Multichannel and Multicarrier systems, Examples of OFDM in EEE 802.11 and IEEE802.16A(WIMAX).

References:

1. John G. Proakis and Masoud Salehi, “Digital Communications”, Tata McGraw Hill, 5th Edition.
2. Bernard Sklar and Pabitra Kumar Ray, “Digital Communications: Fundamentals and Applications”, Pearson Education Asia, 2nd Edition.
3. John R. Barry, Edward A. Lee and David G. Messerschmitt, “Digital Communication”,

Springer 2003, 3rd edition.
4. Andrew J. Viterbi, “CDMA: Principles of Spread Spectrum Communications”, Prentice Hall, USA.
5. R. G. Gallager, " Principles of Digital Communication", Cambridge Univ.Press , 2008
6. A. Lapidoth," A Foundation in Digital Communication", Cambridge Univ.Press,2009

(LC) [EWW-19005] Advances in Digital Communication Laboratory

Teaching Scheme
Practical: 2 hrs/week
Tutorials: 1hr/week

Examination Scheme
Term work – 50 marks, Oral – 50
Credits: 02

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand concepts in Digital Communication by simulating and computing numerically.
2. Use MATLAB or C/C++ tools to verify the concepts.

List of Assignments:

1. Study and Plot of Useful Distributions in Communication
2. Numerical/Problems Based on Theory Covered
3. Computation and Plot of Autocorrelation and Power Spectrum, Linear Filtering of Random Processes
4. Generation of Band-pass and Low-pass Processes
5. Binary Antipodal Simulation
6. Noise Effect on Different Constellations
7. Monte Carlo Simulation of a Binary Communication System
8. Match Filtering of Signal Waveforms

(LC) [EWW-19007] Seminar

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Marks – 100
Credits: 01

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Identify contemporary topics/concepts pertaining to Wired and Wireless Systems and prepare documentation with improved substance.
2. Present the selected topic with superiority demonstrating good communication.

Syllabus Contents:

The students are required to search / gather the material / information on a specific topic, comprehend it and present / discuss in the class.

Guidelines:

Selection of Topic:

- Select a topic relevant to the stream of study with content suitable for M. Tech. level presentation. For selection topics refer internationally reputed journals. The primary reference should be published during the last two or three years.
- Some of the journals/publications suitable for reference are: IEEE/the IET/IETE/Springer/Science Direct/ACM journals in the areas of wireless communications, optical and satellite communication, networking, Signal Processing and Analysis and any other related domain.
- Get the topic approved by the seminar guide well in advance.

Preparation of Presentation and Report:

- In slides, list out key point only. You may include figures, charts equations tables etc. but not running paragraphs. Font size used should be at least 20.
- Figures should be very clear and possibly drawn by you using suitable software tools. There should be a slide on "Conclusion".
- A report of the seminar should be prepared which should contain the following.
  1. Title of the seminar.
  2. Name and other details of presenter and the guide.
  3. Abstract of the topic.
  4. Contents such as Introduction, Theory to elaborate the concept, Implementation if carried out by the presenter/or fellow researcher/s, Comparison with other relevant techniques, Conclusion etc.
  5. List of references strictly in IEEE format.

Oral Presentation:

Student needs to orally present the topic for 20 minutes with good voice projection and with modest pace

Answering Queries:

Student needs to answer queries raised by the audience and evaluators. This session shall be restricted to 5 minutes. In case of more queries, student is supposed to solve the queries offline.

SEMESTER - II

(IOC) [ETC-19006] Broadband Communication

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Distinguish Cellular Communication Systems from 2G to 5G
2. Compare Optical Fiber Communication and Wireless Communication on the basis of Bandwidth, Cost, Security, and Durability requirements.
3. Understand the operating principles of Wi-Fi and Wi-MAX systems, fixed wireless systems and Quality of services in broadband.
4. Evaluate the parameters related to orbital motion and link budget for the satellite.

Syllabus Contents:

Mobile Communication: Introduction, Concepts of coverage area and dead zones, Cellular system design, Frequency reuse, Co channel and adjacent channel interference, Interference reduction techniques, Fixed and Dynamic Channel Assignment Strategies, concepts of cell splitting, Handoff Process, Factors affecting Handoff Process, Handoff Strategies, Microcell Zone concept, GSM architecture, Call Flows in GSM, Multiple access techniques.

Satellite Communication: Introduction, Kepler laws, apogee and perigee heights, Orbital equations, LEO, MEO, GEO satellites, Orbit perturbations, Satellite Sub-Systems, Solar eclipse on satellite, Sun transit outage phenomena, Doppler frequency shift, Satellite Link Budget- Flux density, EIPR and received signal power equations, Calculation of system noise temperature for satellite receiver, noise power calculation, C/N ratio calculations in clear air and rainy conditions.

Fixed Wireless Systems: Microwave links, Private unlicensed links (Spread spectrum), MMDS (Multi-channel Multi-point Distribution Service), LMDS (Local Multipoint Distribution Service).

Wi-Fi and Wi-MAX Technologies: Introduction to Wi-Fi and Wi-MAX, Principles and parameters for Wireless LAN (IEEE 802.11 standards), Operating principles for Wi-MAX (IEEE 802.16 standard), Comparison of Wi-Fi and Wi-MAX.

Optical Fiber Communication: Principles of optical fiber communication, advantages and disadvantages of optical fiber communication, Optical Spectral bands, Basic optical laws and definitions, Single-mode fiber, Graded-index fiber, Signal Degradation in optical fiber: Attenuation, Dispersion.

Quality-of-Service (QoS) in Broadband: QoS issues in broadband communication, A case study of broadband service regulations for maintaining QoS by telecom regulatory bodies such as TRAI.

References:

1. Theodore S. Rappaport, “Wireless Communications-Principles and Practice”, 2nd edition, PHI, 2010
2. Louis E. Frenzel, “Principles of Electronic Communication Systems”, 3rd edition, Tata McGraw Hill, 2012
3. Timothy Pratt and Others, “Satellite Communications”, Wiley India, 2nd edition, 2002

4. Recent QoS regulations released by TRAI (available on website of TRAI).

(DEC-II) (a) [ETC (DE)-19006] Internet of things

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

1. Understand what IoT technologies are used for today, and what is required in certain scenarios.
2. Understanding of the types of technologies that are available and in use today and can be utilized to implement IoT solutions.
3. Apply these technologies to tackle scenarios in teams of using an experimental platform for implementing prototypes and testing them as running applications.

Syllabus Contents:

Smart cities and IoT revolution, Fractal cities, From IT to IoT, M2M and peer networking concepts, Ipv4 and IPV6.

Software Defined Networks SDN, From Cloud to Fog and MIST networking for IoT communications, Principles of Edge/P2P networking, Protocols to support IoT communications, modular design and abstraction, security and privacy in fog.

Wireless sensor networks: introduction, Edge resource pooling and caching, client side control and configuration.

Smart objects as building blocks for IoT, Embedded systems platforms for IoT, IO drivers, C Programming, multithreading concepts.

Operating systems requirement of IoT environment, study of mbed, RIoT and Contiki operating systems, Introductory concepts of big data for IoT applications.

Applications of IoT, Connected cars IoT Transportation, Smart Grid and Healthcare sectors using IoT, Security and legal consideration, IT Act 2000 and scope for IoT legislation.

References:

1. A Bahaga, V. Madisetti, “Internet of Things- Hands on approach”, VPT publisher, 2014.
2. A. McEwen, H. Cassimally, “Designing the Internet of Things”, Wiley, 2013.
3. Cuno Pfister, “Getting started with Internet of Things”, Maker Media, 1st edition, 2011.
4. Samuel Greenguard, “Internet of things”, MIT Press.

Web resources :

1. http://www.datamation.com/open-source/35-open-source-tools-for-the-internet-of-things-1.html
2. https://developer.mbed.org/handbook/AnalogIn
3. http://www.libelium.com/50_sensor_applications/
4. M2MLabs Mainspring http://www.m2mlabs.com/framework
5. Node-RED http://nodered.org/

(DEC-II) (b) [EWW (DE)-19003] MIMO Systems

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand channel modelling and propagation, MIMO Capacity, space-time coding, MIMO receivers, MIMO for multi-carrier systems (e.g. MIMO-OFDM), multi-user communications, multi-user MIMO.
2. Understand cooperative and coordinated multi-cell MIMO, introduction to MIMO in 4G (LTE, LTE-Advanced, WiMAX).
3. Perform Mathematical modelling and analysis of MIMO systems.

Syllabus Contents:

Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems.

Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation, The generic MIMO problem, Singular Value Decomposition, Eigenvalues and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Predistortion in MIMO systems, Disadvantages of predistortion in MIMO systems, Precoding and combining in MIMO systems, Advantages of precoding and combining, Disadvantages of precoding and combining, Channel state information.

Codebooks for MIMO, Beamforming, Beamforming principles, Increased spectrum efficiency, Interference cancellation, Switched beam beamformer, Adaptive beamformer, Narrowband beamformer, Wideband beamformer, Case study: MIMO in LTE, Codewords to layers mapping, Precoding for spatial multiplexing, Precoding for transmit diversity, Beamforming in LTE, Cyclic delay diversity based precoding, Precoding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models, Channel Estimation, Channel estimation techniques, Estimation and tracking, Training based channel estimation, Blind channel estimation, Channel estimation architectures, Iterative channel estimation, MMSE channel estimation, Correlative channel sounding, Channel estimation in single carrier systems, Channel estimation for CDMA, Channel estimation for OFDM.

References:

1. Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications: From Real-world Propagation to Space-time Code Design", Academic Press, 1st edition, 2010.
2. Mohinder Janakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.

(DEC-II) (c) [EWW (DE)-19004] Advance Optical Networks

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand the basic aspects of optical networks
2. Design a WDM optical network.
3. Compare protection schemes for optical networks
4. Deploy the optical networks.

Syllabus Contents:

Introduction to Optical Networks: Telecommunication Network Architecture, Services, Circuit Switching and Packet Switching, Multiplexing Techniques, Second Generation Optical Networks, The Optical Layer, Transparency and All-Optical Networks, Optical Packet Switching, Transmission Basics, Network Evolution.

Client Layers of the Optical Layer: SONET/SDH, Optical Transport Network, Generic Faming Procedure, Ethernet, IP, Multiprotocol Label Switching, Resilient Packet Ring , Storage Area Networks.

WDM Network Elements: Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers, Optical Cross Connects

Network Survivability: Protection of SONET/SDH, Protection of Client Layer, Service classes based on Protection, Optical Layer Protection Schemes.

WDM Network Design: Cost Trade-offs for in a Ring Network, Light Path Topology Design, Routing and Wavelength Assignment, Wavelength Conversion, Dimensioning Wavelength Routing Networks, Statistical Dimensioning Models.

Deployment Consideration: Architectural choices of next generation transport networks, Designing transmission layer using-SDM, TDM, WDM, Unidirectional versus Bidirectional WDM systems, Long Haul Network case study, Metro Ring Network Case study

References:

1. Rajiv Ramaswami, Kumar Sivarajan, Galen Sasaki " Optical Networks A practical Perspective" Elsevier Morgan Kaufmann 3rd Edition 2010
2. C. Siva Ram Murthy and Mohan Guruswamy, " WDM Optical Networks: Concepts, Design and Algorithms" PHI, 2004

(DEC-III) (a) [EWW (DE)-19005] Wireless Sensor Networks

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Learn the basic principles, characteristics, operational challenges and design considerations for sensor network.
2. Understand architecture, hardware details, software, operating systems, programming techniques & simulation platforms for wireless sensor network based systems and applications.
3. Analyze radio standards and concepts of wireless communication, routing protocols for different network layers to be used for wireless sensor network.
4. Study wireless sensor network based systems with special features like energy conservation, topology control, location management, database management, security.
5. Design wireless sensor network system for variety of applications as per user requirement.

Syllabus Contents:

Mobile Ad Hoc Networks (MANET): Introduction, Self-organizing behavior, Co-operation), Types of MANETs, Opportunistic Mobile Networks, UAV networks, Wireless Sensor Networks (WSN)
Introduction and overview of sensor network architecture and its applications, challenges, design considerations for sensor network, comparison with Ad Hoc Networks.Sensor Network architecture, Sensor network scenarios, types of sources and sinks, single hop verses multi hop communication, multiple sources and sinks, mobility issues, need of Gateway.Sensor network associated hardware, software, OS, programming tools, simulation platform details.

Hardware: Types of Sensors like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT,

Software: Operating Systems(OS) requirements, examples: tinyOS, MANTIS, Contiki, and RetOS.

Programming tools: C, nesC, Simulation platforms: Performance comparison of wireless sensor networks based on platforms like open source (ns-2, ns-3) and commercial (QualNet, Opnet)
Routing Challenges, Design Issues, and Performance requirements related to Wireless Sensor Networks Overview of sensor network protocols: Physical, MAC, Routing, Network layer protocols, node discovery protocols, multi-hop and cluster based protocols.

Radio standards: fundamentals of 802.15.4 standard, Bluetooth, and UWB;
Overview of different Localization techniques, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, clustering, time synchronization
Data dissemination and processing; differences compared with other database management systems, data storage; query processing.

Security, security challenges: possible attacks, countermeasures
Emerging technologies and Specialized features for WSN: Energy preservation and energy efficient networks; fault-tolerance. Open issues for future research and Enabling technologies in WSN.

References:

1. H. Karl and A. Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, India, 2012.
2. C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, “Wireless Sensor Networks”, Springer Verlag, 1st Indian reprint, 2010.
3. F. Zhao and L. Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Morgan Kaufmann, 1st Indian reprint, 2013.
4. Yingshu Li, MyT. Thai, Weili Wu, “Wireless sensor Network and Applications”, Springer series on signals and communication technology, 2008.

(PCC) [EWW-19009] Broadband Networks

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand advanced concepts in Communication Networking.
2. Design and develop protocols for communication Networks.
3. Analyze mechanisms to improve Quality of service in Networking.
4. Apply knowledge of mathematics, probability and statistics to model and analyze some networking protocols

Syllabus Contents:

Overview of internet: Concepts, challenges and history, Next Generation Internet-challenges and problems, Multicasting in Internet. TCP/IP congestion and flow control in Internet- Throughput analysis of TCP congestion control. Fairness Issues in TCP.

Real time communication over Internet, Latency and throughput issues, Integrated Services Model (intServ), Resource reservation in Internet. RSVP, Characterization of Traffic by Linearly Bounded arrival Processes (LBAP), Leaky bucket algorithm and its properties.

Packet scheduling Algorithms: requirements and choices, Admission control in internet, Differentiated Services in internet, IP address lookup-challenges. Packet classification algorithms and Flow Identification- Grid of Tries, Cross-producting and controlled prefix expansion algorithms.

Internet Telephony and voice over IP (VoIP): RTP and RTCP, Broadband ISDN and ATM Networks- ATM protocols, IP switching and MPLS- Overview of IP over ATM and its evolution to IP switching.

VPN-Remote-Access VPN, site-to-site VPN, Tunnelling to PPP, Security in VPN. MPLS-operation, Routing, Tunnelling, and use of FEC, Traffic Engineering, MPLS based VPN, Traffic Modeling: Little's theorem, Need for modeling, Poisson modeling, Non-poisson models, Network performance evaluation.

Network Security and Management: Principles of cryptography, Authentication, integrity, key distribution and certification, the internet standard management framework –SMI, MIB, SNMP, Security and administration, ASN.1.

References:

1. Warland J., Varaiya P., "High-Performance Communication Networks", MorganKaufmann, 1996.
2. Stallings W., "High-Speed Networks: TCP/IP and ATM Design Principles", Prentice Hall, 1998.
3. Anurag Kumar, D. Manjunath and Joy Kuri, "Communication Networking: An AnalyticalApproach", organ Kaufman Publishers, 2004.
4. S.Keshav, "An Engineering Approch to Computer Networking: ATM Network, the Internet and theTelephone Network", Pearson, 2007.

(PCC) [EWW-19008] Advanced Antenna Theory

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Compute the far field distance, radiation pattern and gain of an antenna for given current distribution.
2. Estimate the input impedance, efficiency and ease of match for antennas.
3. Compute the array factor for an array of identical antennas.
4. Design antennas and antenna arrays for various desired radiation pattern characteristics.

Syllabus Contents:

Introduction: Types of Antennas - Wire antennas, Aperture antennas, Micro strip antennas, Array antennas Reflector antennas, Lens antennas. Radiation Mechanism, Current distribution on thin wire antenna.

Fundamental Parameters of Antennas: Radiation Pattern, Radiation Power Density, Radiation Intensity, Directivity, Gain, Antenna efficiency, Beam efficiency, Bandwidth, Polarization, Input Impedance, radiation efficiency, Antenna Vector effective length, Friis Transmission equation, Antenna Temperature.

Linear Wire Antennas: Infinitesimal dipole, Small dipole, Region separation, Finite length dipole, half wave dipole, Ground effects.

Loop Antennas: Small Circular loop, Circular Loop of constant current, Circular loop with non uniform current.

Linear Arrays: Two element array, N Element array: Uniform Amplitude and spacing, Broadside and End fire array, Super directivity, Planar array, Design consideration.

Aperture Antennas: Huygen's Field Equivalence principle, radiation equations, Rectangular Aperture, Circular Aperture.

Horn Antennas: E-Plane, H-plane Sectoral horns, Pyramidal and Conical horns.

Micro strip Antennas: Basic Characteristics, Feeding mechanisms, Method of analysis, Rectangular Patch, Circular Patch.

Reflector Antennas: Plane reflector, parabolic reflector, Cassegrain reflectors.

References:

1. Constantine A. Balanis, "Antenna Theory Analysis and Design", John Wiley & Sons, 2nd edition.
2. John D Kraus, Ronald J Marhefka, Ahmad S Khan, "Antennas for All Applications", Tata McGraw-Hill, 2002.
3. R.C.Johnson and H.Jasik, "Antenna Engineering hand book", Mc-Graw Hill, 1984.
4. I.J.Bhal and P.Bhartia, "Micro-strip antennas", Artech house, 1980.

(PCC) [EWW-19010] Software Defined Networks

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each, End-Semester Exam – 60
Credits-03

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Understand advanced concepts in Programmable Networks.
2. Study Software Defined Networking, an emerging Internet architectural framework.
3. Implement the main concepts, architectures, algorithms, protocols and applications in SDN and NFV

Syllabus Contents:

Introduction to Programmable Networks, History and Evolution of Software Defined Networking (SDN), Fundamental Characteristics of SDN, Separation of Control Plane and Data Plane, Active Networking

Control and Data Plane Separation: Concepts, Advantages and Disadvantages, the basics of OpenFlow protocol.

Network Virtualization: Concepts, Applications, Existing Network Virtualization Framework, Mininet A simulation environment for SDN.

Control Plane: Overview, Existing SDN Controllers including Floodlight and Open Daylight projects.

Customization of Control Plane: Switching and Firewall Implementation using SDN Concepts.

Data Plane: Software-based and Hadrware-based; Programmable Network Hardware.

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs. Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.

Data Center Networks: Packet, Optical and Wireless Architectures, Network Topologies. Use Cases of SDNs: Data Centers, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering.

References:

1. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies”, O'Reilly Media, August 2013.
2. Paul Goransson, Chuck Black, Timothy Culver. “Software Defined Networks: A Comprehensive Approach”, Morgan Kaufmann Publishers, 2016.
3. Fei Hu, “Network Innovation through OpenFlow and SDN: Principles and Design”, CRC Press, 2014.
4. Vivek Tiwari, “SDN and OpenFlow for Beginners”, Amazon Digital Services, Inc., ASIN: , 2013.
5. Nick Feamster, Jennifer Rexford and Ellen Zegura, “The Road to SDN: An Intellectual History of Programmable Networks” ACM CCR April 2014.
6. Open Networking Foundation (ONF) Documents, https://www.opennetworking.org, 2015.
7. OpenFlow standards, http://www.openflow.org, 2015.

(LC) [EWW-19011] Broadband Networks Laboratory

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Term work – 50 marks, Oral – 50
Credits-01

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Identify the different types of network devices and their functions within a network.
2. Understand and build the skills of sub-netting and routing mechanisms.
3. Understand basic protocols of computer networks, and how they can be used to assist in network design and implementation.

List of Assignments:

1. Installation and study the features of NS-2. To write a TCL script to create a Network having two nodes and implement UDP protocol. To write a C program to calculate the delay between two nodes.
2. To write a TCL script using NS-2 to create a network having six nodes and implement TCP & UDP protocol. To study and analyze TCP throughput using Perl script and Gnuplot.
3. To write a TCL script using NS-2 to create a network having six nodesand implement the TCP protocol. Analyze the effect of the window parameter by plotting throughput and congestion capture window (WINFILE).
4. To simulate dynamic link failure in ns2 and compare the throughput for a network with routing protocol and without routing protocol.
5. Write a TCL script to create eight node network to study bottleneck in TCP and to plot TCP throughput in NS2
6. Installation and study the features of Wireshark. Capture packets from different network interfaces using Wireshark and analyze them at all the layers of the network.
7. Installation and study the features of GNS3. Create a network topology of routers & configure static routes for IP connectivity (Use ping command for test and analyze captured packets through Wireshark).
8. To create a network topology of routers and Run OSPF routing protocol to configure them (Use ping command for test and analyze captured packets through Wireshark).

(LC) [EWW-19012] Advanced Antenna Theory Laboratory

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Term work – 50 marks, Oral – 50
Credits-01

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Determine specifications, design, construct and test antenna.

2. Explore and use tools for designing, analyzing and testing antennas. These tools include Antenna design and analysis software, network analyzers, spectrum analyzers, and antenna pattern measurement techniques.

List of Assignments:

1. Simulation of half wave dipole antenna.
2. Simulation of change of the radius and length of dipole wire on frequency of resonance of antenna.
3. Simulation of quarter wave, full wave antenna and comparison of their parameters.
4. Simulation of monopole antenna with and without ground plane.
5. Study the effect of the height of the monopole antenna on the radiation characteristics of the antenna.
6. Simulation of a half wave dipole antenna array.
7. Study the effect of change in distance between elements of array on radiation pattern of dipole array.
8. Study the effect of the variation of phase difference 'beta' between the elements of the array on the radiation pattern of the dipole array.
9. Case study.

(LC) [EWW-19013] Software Defined Networks Laboratory

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Term work – 50 marks, Oral – 50
Credits-01

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Implement the main concepts, architectures, algorithms, protocols and applications in SDN and NFV.

List of Assignments:

Based on the theory syllabus contents, eight assignments will be given to students to implement.

(Dissertation) [EWW-20001 and EWW-2003] Dissertation Phase – I and Phase - II

Teaching Scheme
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Examination Scheme
Marks: For both phase I and II
Mid-sem: 30 Marks
End-sem: 70 Marks

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Ability to present the findings of their technical solution in a written report.

4. Presenting the work in International/ National conference or reputed journals.

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II at M. Tech. (Electronics & Telecommunication):

- As per the AICTE directives, the dissertation is a year long activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of wireless communications, optical and satellite communication, networking, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, a record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the phase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be

published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work