BoM 1.2.1 (3)

New Courry Adelad

ELS-1.6 (c): NETWORK ANALYSIS

52 Hours

UNIT I

18 hours

Introduction:

Kirchoff's laws: Node voltage analysis and mesh voltage analysis, network solutions using first order differential equation, initial conditions in networks.

Analysis of networks using Laplace transformation: Basic theorems of Laplace transformation, examples of solutions of networks using Laplace transformation. Transforms of signal waveform: the shifted unit step function, the ramp and impulse functions. Waveform synthesis, the initial and final value theorems, convolution integral, convolution as summation.

UNIT II

10 hours

Impedance functions and network theorems: Concept of complex frequency, transform impedance and transform circuits, series and parallel combinations of elements, superposition and reciprocity, Thevenin's, Norton's, maximum power transfer and Tellegen's theorem.

UNIT III

10 hours

Two–port parameters: Relationship of two-port variable, the open circuit impedance parameters, short- circuit admittance parameters, transmission parameters, inverse transmission parameters, the hybrid parameters, inverse hybrid parameters, relationships between parameter sets, series, parallel and cascade connection of two-port networks.

UNIT IV

14 hours

Network functions, poles and zeros: Terminal pairs or ports, network functions for one port and two port networks, the calculation of network functions, poles and zeros of network functions, restriction on pole and zero locations for driving – point functions and transfer functions, time domain behaviour from the pole and zero plot, stability of active networks, transient response, sinusoidal steady state analysis.

Frequency response plots: Network response due to sinusoidal input functions, plots from s-plane phasors, magnitude and phase plots.

References:

1. Network Analysis: Van Valkenburg, PHI, 2003
2. Network Analysis and Synthesis: Bakshi A V, Bakshi U A, Technical Publications, 2009.
3. Electric circuits: Joseph Edminister, Schaum's series-Mc Graw Hill, 1997
4. Network analysis and synthesis: Franklin F Kuo, John Wiley and sons, 2nd Ed, 1966.
5. Networks and systems: Roy Choudhury D, New Age International, 2004.

ELS-2.6 (a): COMPUTER NETWORKS

UNIT I **52 Hours**

14 Hours

Introduction to Networks, Categories of Networks, Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Switching, Telephone and cable networks for data transmission,

Telephone networks, Dial up modem, DSL, Cable TV for data transmission.

UNIT II

10 Hours

Data Link Control-Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, Data link protocols-HDLC, Multiple Accesses- Random access, Controlled access, Channelization.

UNIT III

14 Hours

Wired LAN, Ethernet, IEEE standards, Standard Ethernet, Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Connecting LANs, Backbone and Virtual LANs, Connecting devices, Back bone Networks, Virtual LANs, Virtual circuit networks-Architecture and Layers of Frame Relay and ATM.

UNIT IV

14 Hours

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6, Address mapping – ARP, RARP, BOOTP, DHCP, ICMP, IGMP. Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols. Transport layer process to process Delivery, UDP, TCP, Domain Name System, Resolution, Congestion Control – Quality of Services (QoS),techniques to improve QoS.

References:

1. Data Communication and Networking- B Forouzan, 4thEdtion, TMH, 2006.
2. Computer Networks- Andrew S. Tanenbaum, David J. Wetherall, Prentice hall, 5th Ed.

ELS-2.6 (b): POWER ELECTRONICS AND CIRCUITS

UNIT I **52 Hours**

15 hours

Introduction to power electronics.

Power Semiconductor Devices: power diodes, thyristors, power MOSFETs, power transistors, IGBT, MCT, LTT, smart power devices.

Thyristor firing circuits: limitations of di/dt and dv/dt ratings, main features of firing circuits, R and RC firing circuits, UJT firing circuit.

Commutation Techniques: Class A to Class F commutation methods, series and parallel operation of thyristors.

Diode circuits: Diode circuits with DC source – R, L, C, RL, RC, RLC load, recovery of trapped energy, RL load with freewheeling diode.

Diode rectifiers: Half-wave rectifiers with R, L, C, RL, RC load, RL load with freewheeling diode, load with electromotive force.

UNIT II **12 hours**

Phase controlled rectifiers:
Single phase half wave rectifiers: with R load, RL load, RL load with freewheeling diode.
Single phase full wave converters: single phase semi converters, single phase two pulse converters with continuous and discontinuous current.
Three-phase converter: systems using diodes and thyristors, three-phase full converters, three-phase semi converters, dual converters.

UNIT III **12 hours**

AC voltage controllers: types of AC voltage controllers, integral cycle control, single phase voltage controllers with R and RL loads, single-phase transformer tap changers, single-phase sinusoidal voltage controllers. Working of three-phase controllers with star & delta loads.
Cycloconverters: Principle of cycloconverter operation, single-phase to single-phase circuit step-up and step-down cycloconverter, three-phase half wave cycloconverter, output voltage equation of a cycloconverter, load commutated cycloconverter.

UNIT IV **13 hours**

Inverters: Principle of operation, single-phase voltage source inverters, basic series and parallel inverter circuits, types of inverters, three-phase bridge inverters, voltage control in single-phase inverters, pulse-width modulated inverters, current source inverters.
Choppers: Basic principle, control strategies, step-up and step-down choppers, types of chopper circuits, forced and load commutated chopper circuits.

References:

1. Power Electronics: Bimbhra P S, Khanna publishers, 2003.
2. Power Electronics Circuit, Devices and Applications: Rashid M H, PHI, 2009
3. Thyristor Engineering: Berde M S, Khanna publishers, 2009
4. Power Electronics: VedamSubrahmanyam, New Age International, 2002
5. Modern Power Electronics and AC Drives: BimalK.Bose, Pearson education, 2002.
6. Power Electronics: Mohan, Undeland, Robbins, John Wiley, 2003

ELS-2.6 (c): MULTIMEDIA COMMUNICATIONS

52 Hours

UNIT I **14 Hours**

Multimedia communications: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS, application QoS. Multimedia information representation-Introduction, digital principles, text, images, audio, video

UNIT II **13 Hours**

Text and image compression: Introduction, compression principles, text compression, image compression. Audio and Video compression-Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

UNIT III **13 Hours**

Multimedia information networks: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol. The internet-Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8.

UNIT IV **12 Hours**

Broadband ATM networks: Introduction, Cell format, Protocol Architecture ATM LANs.
Transport protocol: Introduction, TCP/IP, TCP, UDP, RTP and RTCP.

References:

1. Multimedia communications: Applications, Networks, Protocols and Standards, Fred Halsall, pearson education, Asia, 2nd Indian reprint 2002.
2. Multimedia information networking- Nalin K. Sharda, PHI, 2009.
3. Multimedia fundamentals: Volume 1 - media coding and content processing, Ralf Steinmetz, KlaraNarstedt, Pearson education, 2004.
4. Multimedia Systems Design, PrabhatK. Andleigh, KiranThakrar, PHI,2015

ELS-3.5 (b): IMAGE PROCESSING

52 Hours

UNIT I **10 Hours**

Digital Image Fundamental: Elements of Visual Perception, Digital Image Processing, Fundamental Steps in Digital Image Processing, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

UNIT II **14 Hours**

Image Enhancement:
Image Enhancement in the Spatial Domain, Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing and Shaping using Spatial Filtering.
Image Enhancement in the Frequency Domain, Introduction to the Fourier Transform and the Frequency Domain, Smoothing and shaping using Frequency Domain Filtering, Homomorphic Filtering.

UNIT III **14 Hours**

Color Image Processing: Color Fundamentals, Color Models, Pseudo-color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images.
Image Restoration: Model of the Image Degradation/Restoration Process, Restoration in the Presence of Noise Only–Spatial Filtering, Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.

UNIT IV **14 Hours**

Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation, Basic Morphological Algorithm, Extensions to Gray-Scale Images.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds.

References:

1. Digital Image Processing-Rafael C. Gonzalez and Richard E.Woods, Pearson Education, 2nd Edition, 2001.
2. Fundamental of Digital Image Processing- Anil K. Jain, Pearson Education, 2001.
3. Digital Image processing and Analysis- B.Chanda and D. Dutta Majumbar, PHI, 2006

ELS-3.5 (c): ARM PROCESSORS AND REAL-TIME OPERATING SYSTEMS

52 Hours

UNIT I **12 Hours**

Introduction: Introduction to embedded systems, ARM embedded system, ARM processor fundamentals-Registers, Current program status register, pipeline, exceptions, Interrupts, the Vectortable, Core extensions, ARM processor families.

ARM Instruction Set: Introduction to ARM instruction set- Data processing instructions, Branchinstructions, load-store instructions, software interrupt instructions, program status registerinstructions, and Coprocessor instructions.

UNIT II **12 Hours**

Thumb Instruction Set and Programming: Introduction to thumb instruction set, Thumbprogrammer's model, Thumb branch instructions, data processing instructions, Single register loadstoreInstructions, Multiple-Register load-store instruction, Stack instruction, Software interruptsinstruction, ARM assembly language Programming.

Architectural Support for High-Level languages: Data types, Floating-point data types, TheARM floating point architecture, Expressions, Conditional statements, Loops, functions andprocedures.

UNIT III **13 Hours**

Real-Time Operating Systems: Real-time concepts, Hard Real-time and Soft Real-time, Differences between General Purpose OS & RTOS, Basic architecture of an RTOS,Scheduling Systems, Inter-process communication, Performance Metric in scheduling models,Interrupt management in RTOS environment, Memory management, File systems, I/O Systems,Advantage and disadvantage of RTOS. POSIX standards. RTOS Issues - Selecting a Real Time Operating System, RTOS comparative study.

VxWorks Memory Management: Vx Works and Tornodo, Features of IDE – Host Target Architecture, Project Management, Thread Scheduling algorithm, Inter task Communication using shared memory – Pipes, Message, Queues, Semaphores, Mutual exclusion.

UNIT IV **15 Hours**

File Formats of VxWorks: Hardware and software interrupt handling, RAM Disk File systems, Using DOS file systems on RAM disks, I/O systems, Memory Management WDT, Message logging, Overview of networking on Vx Works, Managing host table, Managing IP

Socket Programming: Address, Sockets, Accessing remote files using FTP, TFTP,

RSH and NSF, configuring Vx Works as FTP server and FTP client, TFTP server and client, NFS server and NFS client, NFS Client Rlogin, Using Crosswind for Debugging, Using WindView as a Runtime Analyzer, Using Browser and Winds, Using Integrated Simulator, BuildingVx Works image, Creating a Boot image, Download and Booting Vx Works on the Target system.

References:

1. ARM system developer's guide- Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008.
2. Embedded Real-Time Systems: Concepts, Design and Programming The Ultimate Reference- Prasad K.V.K.K, DREAMTECH PRESS, NEW DELHI,2003
3. VxWorks Programmers Gide and VxWorks Reference Manual
4. Real-Time Systems Design and Analysis- Phillip. A. Laplante, 2nd Edition, PHI, 2005

ELS-4.3 (c): WAVELET TRANSFORMS

UNIT I **52 hours**

13 Hours

Continuous Wavelet Transform: Introduction, C-T wavelets, Definition of CWT, The CWT as a correlation. Constant Q-Factor Filtering Interpolation and time frequency resolution, the CWT as an operator, inverse CWT.

Introduction to Discrete Wavelet Transform and Orthogonal Wavelet Decomposition: Introduction, Approximation of vectors in nested linear vector spaces, (i) example of approximating vectors in nested subspaces of a finite dimensional linear vector space, (ii)Example of approximating vectors in nested subspaces of an infinite dimensional linear vector space. Example MRA. (i) Bases for the approximations subspaces and Harr scaling function, (ii) Bases for detail subspaces and Haar wavelet.

UNIT II

13 Hours

MRA, Orthonormal Wavelets and their Relationship to Filter Banks: Introduction, Formal definition of an MRA. Construction of a general orthonormal MRA, (i) scaling function and subspaces, (ii) Implication of dilation equation and orthogonality, a wavelet basis for MRA. (i) Two scale relations for (t), (ii) Basis for the detail subspace (iii) Direct sum decomposition, Digital filtering interpolation (i) Decomposition filters, (ii) reconstruction.

Examples of Wavelets: Examples of orthogonal basis generating wavelets, (i) Daubechies D_4 scaling function and wavelet. (ii) band limited wavelets, Interpreting orthonormal MRAs for Discrete time MRA, (iii) Basis functions for DTWT.

UNIT III

8 Hours

Alternative Wavelet Representations: Introduction, Bi-orthogonal wavelet bases, Filtering relationship for bi-orthogonal filters, Examples of bi-orthogonal scaling functions and wavelets, 2-D wavelets.

UNIT IV

18 Hours

Non-separable multidimensional wavelets, wavelet packets, Wavelets Transform and Data Compression: Introduction, transform coding, DTWT for image compression (i) Image

compression using DTWT and run-length encoding.(i) embedded tree image coding (ii) compression with JPEG audio compression (iii) audio masking, (iv) wavelet based audio coding.

Construction of Simple Wavelets: Construction of simple wavelets like Harr and DB1.

Other Applications of Wavelet Transforms: Introduction, wavelet de-noising, speckle removal, edge detection and object isolation, Image fusions, Object detection by wavelet transforms of projections.

References:

1. Wavelet transforms- Introduction to theory and applications-Raghuveer M. Rao and Ajit S. Bapardikar, Pearson Education, 2000.
2. Wavelet transforms- Prasad and Iyengar, Wiley estern, 2001.
3. Wave-let and filter banks- Gilbert Strang and Nguyen Wellesley Cambridge press

PHDEL1: Research Methodology

52 hours

Objectives: To understand basic concepts of research and its methodologies. To identify appropriate research topics and processes of doing research. Preparing presentation and report on research. To acquaint students with elementary statistical methods of analysis of data.

Unit I **13 Hrs**

Fundamentals of Research: Definition, importance and meaning of research, characteristics of research, types of research, exploring research issues in Electronics, browsing periodical section of library, finding journals on internet.

Tools of research: General Tools of Research, library and its resources, computer and its software as tool of research, measurement as a tool of research, human mind as a tool of research, language as a tool of research.

Unit II **13 Hrs**

Focusing research efforts: Identifying a problem, stating a research problem, evaluating a research problem, identifying sub problems and its characteristics, stating the hypothesis of research question.

Review of related literature: role of review, locating related literature, using library catalogue, indexes, abstracts and other references, using online database, organising information collected, evaluating and synthesizing the literature.

Unit III **13 Hrs**

Planning a research proposal: Basic format of research, research planning and methodology, general criteria for research project, role of data in research, linking data in research methodology, writing research proposal, strengthening research proposal

Preparing the research report: planning research report, description of problem, description of method, presentation and interpretation of data, preliminary pages and notes, foot notes, reference list, appendix, organising the research report.

Unit IV **13 Hrs**

Statistical Techniques: Attributes, Primary data, Secondary data. Cross-sectional data, time series data, Notion of a statistical population, Notion of sample, random sample and non-random sample.

Measures of Central Tendency, Measures of Dispersion, Moments, Skewness and Kurtosis, Correlation, Regression.

Sampling distributions (Chi-Square, t, F, z). Test of Hypothesis- Testing for Attributes – Mean of Normal Population – One-tailed and two-tailed tests, F-test and Chi-Square test - Analysis of variance ANOVA – One way and two way classifications.

References:

1. C. R. Kothari: Research Methodology, New Age International Publishers, New Delhi
2. Paul D. Leedy and Jeanne Ellis Ormrod, Practical Research PLANNING AND DESIGN, Pearson, 2010.
3. Ronald E. Walpole, Sharon L. Myers and Keying Ye: Probability and Statistics for Engineers and Scientists, Pearson
4. Kishor S. Trivedi: Probability and Statistic with Reliability, Queuing and Computer Science Applications, Prentice-Hall of India
5. Gun, Gupta and Dasgupta: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
6. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.
7. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

PHDEL2.1: MEMS Technology

52 hours

Objectives: The objective of this course is to make students to gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques. To understand design, analysis, fabrication and testing of MEMS based components.

Unit I **13 Hrs**

Introduction to MEMS Technology: Basic definitions, history and evolution of MEMS. Feynman vision Microelectrotronics and MEMS, Scaling issues in Microsystems, Microsensors microactuators and Microsystems, Types of MEMS Applications of MEMS in various disciplines. Commercial MEMS products

Multiphysics-Multiengineering aspects of MEMS: Introduction to design modeling and simulation optimization, fabrication, reliability packaging of MEMS

Unit II **11 Hrs**

Microfabrication/ Micromaching: Introduction to microfabrication materials used in MEMS lithography thin film deposition, diffusion, oxidation, doping, cvd, pvd, etching, bonding.surface, bulk and liga micromaching technique.

Unit III **14Hrs**

Working Principles of MEMS: Mechanical sensors and actuators beams and cantilevers, accelerometers Electrostatic sensors and actuators parallel plate capacitors, comb drive sensor and actuator. Piezoelectric sensors and actuators, cantilever based piezoelelectitric sensor and actuator. Thermal actuators – single and bimorph thermal actuators. Optical MEMS – DLP mirror: construction and working Bio/Chemical Sensors – DNA sensor

Unit IV **14 Hrs**

Modeling and Simulation of MEMS: MEMS system modeling, need for simulation tools, fem mems design and realization tools – ansys/multiphysics, coventorware, comsol afm as a measurement tool in Microsystems

Case studies: microcantilver based sensor, electro thermal actuator, electrtrostatic actuator.

References:

1. MEMS and Microsystems: Design and Manufacture – Tai, Ran Hsu, TMH, 2002.
2. Micro and Smart Systems – G K Ananthasuresh , K J Vinoy, S Gospalkrishanan, Knbhat V H Arte(Wiley India, 2010)
3. Foundations of MEMS – Chang Liu, Pearson Education International, 2007
4. MEMS – N.P.Mahalik, Tata McGraw Hill, 2007
5. Micro Electro Mechanical System Design – James J. Allen, CRC Press, Taylor & Francis Group, 2005
6. Microsystem Design – Stephen D. Senturia, Springer International Edition, 2001

PHDEL2.2: Fuzzy Logic

52 hours

Objectives: To understand the fuzzy set theory. CO4. To perform arithmetic operations on fuzzy sets and understand fuzzy relation equations. To construct to perform various operations on Fuzzy sets.

Unit I **13 Hrs**

From Classical (crisp) Sets to Fuzzy Sets: A Grand Paradigm Shift: Introduction, crisp sets: an overview, fuzzy sets basic concepts, characteristics and signification of the paradigm shift. **Fuzzy Sets Versus Crisp Sets:** Additional properties of alpha – cutes, representations of fuzzy sets, extension principle for fuzzy sets. **Operations on Fuzzy Sets:** Types of operations, fuzzy complements, fuzzy intersections: t-norms, fuzzy unions: t – conforms, combinations of operations, aggregation operations

Unit II **13 Hrs**

Fuzzy Arithmetic: Fuzzy numbers linguistic variables arithmetic operations on intervals, arithmetic operations on fuzzy numbers, lattice of fuzzy numbers, fuzzy equations.

Fuzzy Relations: Crisp versus fuzzy relations, projections and cylindrical extensions, binary fuzzy relations, binary relations on a single set, fuzzy equivalence relations, fuzzy compatibility relations, fuzzy ordering relations, fuzzy morphemes, sup –i compositions of fuzzy relations, in wi compositions of fuzzy relations.

Unit III **13 Hrs**

Fuzzy Relations Equations: General discussion, problem partitioning, solution method, fuzzy relation equations based on sup – i compositions fuzzy relation equations based on inf – wi compositions, approximate solutions, the use of neural networks. **Fuzzy Logic:** Classical logic: an overview, multivolume logics, fuzzy propositions, fuzzy quantifiers, linguistic hedges, interfencence from conditional fuzzy propositions, interfencence from conditional and qualified propositions, interference from quantified propositions.

Unit IV **13 Hrs**

Constructing Fuzzy Sets and Operations on Fuzzy Sets: General discussion, methods of construction: an overview, direct methods with one expert, direct methods with multiple experts, indirect, methods with one expert, indirect methods with multiple experts, constructions from sample data.

References:

1. Timothy J.Ross: Fuzzy Logic with Engineering Applications, Wiley.
2. Earl Cox:The Fuzzy Systems Handbook: A Practitioner's Guide to Building, Using, and Maintaining Fuzzy Systems, AP Professional
3. Abraham Kandel and Gideon Langholz: Fuzzy Control Systems, CRC Press

PHDEL2.3: Advanced Wireless Protocols and Standards

52 hours

Objectives: To understand the concepts of data and communication networks. To understand mobile radio communication principles and to study the recent trends adopted in cellular systems and wireless standards. To gain insights about IoT and next generation networks.

Unit I **12Hrs**

Data and Communication Networks: Introduction to computer networks, overview of layered architecture- OSI, TCP\IP, switching networks- circuit switched, packet switched, multiplexing and multiple access techniques- FDMA, TDMA, CDMA and OFDMA.

Wireless Communication channel characteristics: Channel gain, fading, channel reinforcing techniques.

Unit –II

IoT Wireless Standards:- What is IoT?, IoT Network Architecture and Design- Drivers behind new network Architectures, Comparing IoT Architectures, M2M architecture, IoT world forum standard, IoT Reference Model, Simplified IoT Architecture. **14Hrs**

Engineering IoT Networks: Things in IoT – Sensors, Actuators, MEMS and smart objects. Sensor networks- WSN, Communication protocols for WSN, Communications Criteria-Range, Frequency bands, power consumption, Topology, Constrained Devices, Constrained Node Networks, IoT Access Technologies- IEEE 802.15.4, Competitive Technologies – Overview only of IEEE 802.15.4g, 4e, IEEE 1901.2a, Standard Alliances – LTE Cat 0, LTE-M, NB-IoT

Unit –III

Introduction to LTE: Introduction to mobile communication systems, evolution of mobile systems before LTE, Necessity for LTE, Standardization process of 3GPP LTE. **14Hrs**

Radio interface architecture of LTE: Overall system architecture- Core Network, Radio Access Network, Radio Protocol Architecture- Radio Link Control, Medium Access Control-Logical Channels and Transport Channels, Transmission Scheme - overall Time–Frequency structure, subframes, frequency-domain location of LTE carriers, duplex schemes-Frequency-Division Duplex (FDD), Time-Division Duplex (TDD), LTE and TD-SCDMA Coexistence.

Unit –IV

Introduction to 5G: Drivers for 5G- Evolution of LTE Technology to Beyond 4G, 5G Roadmap, key features of 5G, 5G architecture, 5G New Radio (NR), 5G Next Generation Core (NG-Core), air interface, protocol architecture. 5G use cases. **12Hrs**

Reference:

1. Andrew S. Tanenbaum: "Computer Networks", fourth edn.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint).
3. Erik Dahlman, Stefan Parkvall and Johan Skold: "4G LTE/LTE- Advanced for Mobile Broadband", Academic Press.
4. Christopher Cox: "An Introduction to LTE", John Wiley & Sons Ltd.
5. Farooq Khan: "LTE for 4G Mobile Broadband", Cambridge University Press.
6. Jonathan Rodriguez: Fundamentals of 5G mobile networks, Wiley.
7. Saro Velrajan: An Introduction to 5G Wireless Networks: Technology, Concepts and Use-cases, Notion Press, 2020

PHDEL3: Literature Review

Review Writing & Seminar on the Published Research Work in the Relevant Field of study:

A minimum of 30 Articles shall be reviewed by the M.Phil./Ph.D. candidate and submit a review report, in two copies, on topic of subject or area of interest in subject, under the supervision of the research guide, and will also give a presentation/seminar of the same during term end Viva-Voce examination before the Doctoral Committee.

PHDEL4: Research and Publication Ethics

30 hours

Objective: The main aim of this course is to provide awareness about the publication ethics and publication misconducts. The course focuses on basics of philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics and plagiarism tools will be introduced.

THEORY

RPE 01: PHILOSOPHY AND ETHICS **3Hrs**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

RPE 02: SCIENTIFIC CONDUCT **5Hrs**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03: PUBLICATION ETHICS **7Hrs**

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

RPE 04: OPEN ACCESS PUBLISHING **4Hrs**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

RPE 05: PUBLICATION MISCONDUCT **4Hrs**

A. Group Discussions (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

RPE 06: DATABASES AND RESEARCH METRICS **7 Hrs**

A. Databases (4 hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP. Cite Score
2 Metrics: h-index, g index, i10 index, altmetrics