Prof. Ram Meghe Institute Of Technology And Research Badnera -444701

An Autonomus College Affiliated to Sant Gadge Baba Amravati University, Amravati, Maharashtra (India)

PROGRAMME SCHEME & SYLLABI

2023-2024

M. Tech.

(Electronics and Telecommunication Engineering)

Published By
Dr. G.R. Bamnote
Principal
Prof. Ram Meghe Institute Of Technology And Research, Badnera - Amravati.

Department Vision :

"To become a leading center of excellence in a futuristic national scenario that caters to the academic and research needs of the society at large in the field of Electronics and Telecommunication engineering".

Department Mission :

1. To impart students with valuable knowledge through excellence in teaching, research and creative activities.
2. To inculcate ethical practices amongst students.
3. To mould students into highly competent Electronics and Telecommunication technocrats to address the techno-social engineering challenges with innovative solutions.

Program Educational Objectives :

1. **Preparation**: To prepare the students to solve socio-engineering problems so as to steer the organization towards excellence through systematic thinking, excel in higher studies and be a successful technical professional through rigorous education/ training.
2. **Core competence**: To provide students with solid foundation in Mathematics and Fundamentals of Engineering Sciences, Electronic circuit design, Telecommunication Engineering and Signal processing so as to solve engineering problems and also pursue higher studies.
3. **Breadth**: To impart students with such skills that enable them to comprehend, analyze, design and implement so as to provide multidisciplinary solutions to real world social and technical problems with innovative ideas.
4. **Professionalism**: To inculcate in students social awareness, value based systems, leadership qualities, professional and ethical attitude, good communication skills to bring holistic development of personality and ability to relate engineering issues in social context.
5. **Learning Environment**: To provide students with excellent academic and social environment aware of leadership, ethical codes, team spirit, lifelong

learning, to build a sound professional career with stimulated innovative thinking.

Program Outcomes :

Engineering Graduate will be able to :

1) **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2) **Problem Analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3) **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4) **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6) **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7) **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9) **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11) **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a

member and leader in a team, to manage projects and in multidisciplinary environments.

12) **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes :

Engineering Graduates will be able to:

1. Develop ability to analyze, simulate, design and implement analog as well as digital circuits, communication systems, microcomputer system, instrumentation and control system and power system.
2. Utilize probability and statistics transform methods, engineering mathematics in support of electronics and telecommunication systems.

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati
(An Autonomous Institute)
Two Year Post Graduate Degree Program in Master of Technology
Choice Based Credit System (Semester Pattern)
Branch : Electronics & Telecommunication Engineering

SEMESTER: I																		
Sr. No.	Subject Code	Subject	Teaching Scheme					Examination Scheme										
			Hours/ Week			Total Hours/ Week	Credits	THEORY							PRACTICAL			
			Lecture	Tutorial	P/D			Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal Marks		Total	Min. Passing Marks in ESE/ ESSE	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
										Max. Marks MSE/ MSIE	Max. Marks TA				Int.	Ext.		
Theory																		
01	1SMTE01	Advanced Digital Signal Processing	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--
02	1SMTE02	Digital Communication Technique	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--
03	1SMTE03	Professional Elective 1	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--
04	1SMTE04	Professional Elective 2	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--
05	1SMTE05	Research Methodology and IPR	2	--	--	2	2	--	--	--	50 #	50	--	25	--	--	--	--
06	1SMTE06	Audit Course 1 **	2	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--
Practicals																		
07	1SMTE07	Lab 1 Advanced Digital Signal Processing Laboratory (ADSP Lab)	--	--	2	2	1	--	--	--	--	--	--	--	25	25	50	25
08	1SMTE08	Lab 2 Digital Communication Technique Laboratory (DCT Lab)	--	--	2	2	1	--	--	--	--	--	--	--	25	25	50	25
09	1SMTE09	Seminar1	--	2	..	2	2	--	--	--	--	--	--	--	50	--	50	25
		Total	**16**		**6**	**22**	**18**	--	--	--	--	**450**	--	--			**150**	
																Total	**600**	

Seminar1: It will be based on Recent Trends in Technology/ Research Methodology related to the program

Elective I: i) Random Processes ii) Real Time Embedded System iii) Wireless Sensor Networks

Elective II: i) Advanced Optical Communication ii) Advance Computer Architecture iii) Data Compression

Audit Course 1: i) Solving Problems with Creative and Critical Thinking ii) Sustainable Development iii) Economics, Management and Entrepreneurship

**** Audit Course can be taken from any university and it could also be online course like NPTEL, coursera, Sakai, Moodle**

 # Internal Assessment based on assignments/Term Work

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SEMESTER: II

Sr. No.	Subject Code	Subject	Teaching Scheme					Examination Scheme											
			Hours/ Week			Total Hours/ Week	Credits	THEORY							PRACTICAL				
			Lecture	Tutorial	P/D			Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal Marks		Total	Min. Passing Marks in ESE/ ESSE	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks	
										Max. Marks MSE/ MSIE	Max. Marks TA				Int.	Ext.			
Theory																			
01	2SMTE01	Advanced Computer Networks & Programming	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--	
02	2SMTE02	Adaptive Signal Processing	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--	
03	2SMTE03	Advanced Wireless Comm.	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--	
04	2SMTE04	Professional Elective 3	3	--	--	3	3	3	60	30	10	100	24	50	--	--	--	--	
05	2SMTE05	Audit Course 2 **	2	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	
Practicals																			
06	2SMTE06	Lab 3 Advanced Computer Networks & Programming Laboratory (ACNP Lab)	--	--	2	2	1	--	--	--	--	--	--	--	25	25	50	25	
07	2SMTE07	Lab 4 Adaptive Signal Processing Laboratory (ASP Lab)	--	--	2	2	1	--	--	--	--	--	--	--	25	25	50	25	
08	2SMTE08	Lab 5Advanced Wireless Communication Laboratory (AWC Lab)	--	--	2	2	1	--	--	--	--	--	--	--	25	25	50	25	
09	2SMTE09	Mini- Project	--	--	4	4	6	--	--	--	--	--	--	--	50	50	100	50	
		Total	**14**	--	**10**	**24**	**21**	--	--	--	--	**400**	--	--	--	--	**250**		
																Total	**650**		

Mini-Project: Project should be relevant to current technology and must include innovative element
Elective III: i) DIP & Applications ii) CMOS & VLSI Design iii)Cognitive Radio
Audit Course 2: i) Media Ethics and Social Change. ii) Psychology of Kindness & Well being at Work.
iii) Forming Funding & Launching startup
**** Audit Course can be taken from any university and it could also be online course like NPTEL, coursera, Sakai, Moodle**
Exit Policy :- Industrial Internship of Minimum 120 Hours in related Field (Total Credit: 8)

Summary of Marks & Credits for Exit Policy

Year	Sem	Sem Marks	YearlyMarks	Sem Credits	Yrly Credits
First Year	I	600	1250	18	39
	II	650		21	
Exit				**8**	**8**
Total		**1250**			**47**

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SEMESTER: III

Sr. No.	Subject Code	Subject	Teaching Scheme					Examination Scheme											
			Hours/ Week			Total Hours/ Week	Credits	THEORY							PRACTICAL				
			Lecture	Tutorial	P/D			Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal Marks		Total	Min. Passing Marks in ESE/ ESSE	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
										Max. Marks MSE/ MSIE	Max. Marks TA				Int.	Ext.		
Theory																			
01	3SMTE01	Professional Elective 4	3	--	--	3	3	3	60	30	10	100	24	50					
Practicals																			
02	3SMTE02	Seminar 2	--	--	2	2	2	--	--	--	--	--	--	--	50	--	50	25	
03	3SMTE03	Dissertation Phase-1	--	--	4	4	6	--	--	--	--	--	--	--	100	--	100	50	
		Total	**3**	**0**	**6**	**9**	**11**	--	--	--	--	**100**	--	--	--	--	**150**		
																Total	**250**		

Seminar2: It will be based on Literature Survey of any Current technology

Dissertation Phase-1: It will be based on Research/ Dissertation Topic selected for the Major Project(Includes Literature Survey, Methodology, Problem Definition etc.)

Elective V: i) RF & Microwave Ckt Design ii) Internet of Things and Applications iii) Artificial Intelligent System

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Choice Based Credit System (Semester Pattern)
Branch : Electronics & Telecommunication Engineering

SEMESTER: IV																			
Sr. No.	Subject Code	Subject	Teaching Scheme					Examination Scheme											
			Hours/ Week			Total Hours/ Week	Credits	THEORY							PRACTICAL				
			Lecture	Tutorial	P/D			Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal Marks		Total	Min. Passing Marks in ESE/ ESSE	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks	
										Max. Marks MSE/ MSIE	Max. Marks TA				Int.	Ext.			
Practicals																			
01	4SMTE01	Dissertation Phase-2	--	--	10	10	15	--	--	--	--	--	--	--	100	200	300	150	
		Total	--	--	**10**	**10**	**15**	--	--	--	--	--	--	--	--	--	**300**		
																Total	**300**		

Summary of Marks & Credits					
Year	**Semester**	**Sem Marks**	**Yearly Marks**	**Sem Credits**	**Yearly Credits**
First Year	**I**	600	**1250**	18	**39**
	II	650		21	
Second Year	**III**	250	**550**	11	**26**
	IV	300		15	
Total		**1800**		**65**	

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

(An Autonomous Institute)

Two Year Post Graduate Degree Program in Master of Technology,

Branch: Electronics & Telecommunication Engineering

Semester Pattern (Choice Based Credit Grade System) As Per NEP 2020

1SMTE01 – ADVANCED DIGITAL SIGNAL PROCESSING Max. Marks: 60

Semester: I Sem

Name of Subject (TH): ADVANCED DIGITAL SIGNAL PROCESSING

Course Objectives:

1. Understand the basic concepts of signals.
2. Understand theory of different filters and algorithms.
3. Understand theory of multirate DSP, solve numerical problems and write algorithms
4. To know applications of DSP at block level.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Apply the fundamental concept of DSP and perform various operations on discrete signals.
2. Design digital filters.
3. Describe Multirate DSP and its applications.
4. Explain 2D transform and its application.
5. Describe DSP processor & its applications in signal processing.

	Subject: ADVANCED DIGITAL SIGNAL PROCESSING	L
Unit-1	**Overview of discrete time signal and systems:** Convolution, correlation, Time bandwidth relationship, DFT and its properties, use of DFT in linear filtering, Algorithm for convolution and DIT-FFT and DIF-FFT algorithm.	06
Unit-2	**Filter Design :** Analog filter design, Discrete time IIR filter from analog filter, IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives, Structures of FIR filter, Filter design using windowing techniques.	06
Unit-3	**Introduction to Multi-rate Digital Signal Processing:** Sample rate reduction, decimation by integer factors, sampling rate increase, interpolation by integer facto, Design of practical sampling rate converters, Filter Specification, filter requirement for individual stages, Determining the number of stages and decimation factors, Sampling rate conversion using poly-phase filter structure, poly-phase implementation of interpreters.	06

Unit-4	**Introduction to two dimensional signal and Systems**: 2D Discrete Fourier Transforms, Properties and applications, Discrete Hilbert Transform and Discrete Cosine Transform, Properties and Applications, Gabor Transform, Properties and Applications.	06
Unit-5	**General and special purpose DSP Processors**: Computer Architecture for signal processing processor, Havard Architecture, Pipelining, Hardware Multiply and Accumulate, Special Instructions, Replication, On-chip Memory Cache, Extended Parallelism, SIMD, Architecture and programming of TMS320 C67XX, Application of DSP to biomedical Signal Processing.	06
Unit-6	**Wavelets:** Time-Frequency Analysis and Continuous Wavelet Transform, an introduction to Hilbert Space Theory, Wavelet Properties, Discrete Wavelets, Scaling Function, Subband Coding, Discrete Wavelet Transform.	06
	Total	**36**

Text Book:

1. “Digital Signal Processing": Principles, Algorithms & Applications”, John G. Proakis & Dimitris G.Manolakis, Fourth edition, Pearson education / Prentice Hall, 2007.

References:

1. "Digital Signal Processing" Emmanuel C Ifeachor, Barrie W Jrevis, Pearson Education.
2. "Theory and Applications of DSP", L.R Rabiner and B. Gold
3. "Wavelets and Subband Coding", Valterli & Kovaceric, PHI.
4. "Analog Devices & Texas Instruments", Users Manuel of TMS320C4X and ADSP 2106x.
5. “Digital Signal Processing – A Computer Based Approach” , Sanjit K. Mitra, Tata McGraw Hill, Third Edition, 2007 .
6. “Discrete Time Signal Processing”, Alan V. Oppenheim, Ronald W. Jchafer & Hohn. R. Back, PHI / Pearson Education, Second Edition, 2001.
7. “Digital Signal Processing using Matlab and wavelets”, Michael weeks Infinity Science Press

1SMTE02 – Digital Communication Techniques Max. Marks: 60

Semester: I Sem

Name of Subject (TH): Digital Communication Techniques

Course Objectives:

1. Understand various signal space representation and types of modulation.
2. Learn source coding and channel coding.
3. Understand design of band limited signal for zero and controlled ISI.
4. To know various Spread Spectrum Techniques

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand signal space representation and modulation.
2. Learn coding of discrete and analog sources.
3. Apply and use channel coding and various codes.
4. Design band limited signal for zero and controlled ISI.
5. Understand Linear Equalization Techniques.
6. Differentiate various Spread Spectrum Techniques.

	Subject: Digital Communication Techniques	L
Unit-1	**Characterization of Communication Signal and Optimum Receiver for AWGN Channel:** Signal Space representation, Memory less Modulation methods, Linear Modulation with memory, Non- linear Modulation methods with memory, CPFSK & CPM, Match Filter Demodulator.	06
Unit-2	**Source Coding:** Average mutual information & Entropy, Coding of discrete memory-less sources, Discrete Stationary Sources, Lempel-Ziv algorithm; Coding of analog sources**.**	06
Unit-3	**Channel Coding:** Temporal and Spectral Waveform Coding, BCH codes, Reed Soloman codes, Reed Muller Codes, Convolution Codes, Viterbi decoding algorithm, trellis coded modulation.	06
Unit-4	**Signal Design for Band Limited Channel:** Design of band limited signal for zero ISI, Nyquist Criterion, Design of band limited signal for controlled ISI.	06
Unit-5	**Linear Equalization Techniques :** Peak Distortion Criterion, Mean Square Error (MSE) criterion, Decision Feedback Equalization, Adaptive Linear Equalizer, Zero Forcing Algorithm, LMS Algorithm.	06

Unit-6	**Spread Spectrum Techniques:** Generation of PN sequence, direct sequence spread spectrum system, processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal.	06
	Total	**36**

Text Book:

1. "Digital Communication Fundamentals and Applications", Bernard Sklar, 2nd Ed, Pearson Education Asia
2. "Digital Communication", J.G. Proakis, Fourth Ed, Mc Graw Hill
3. “Error Control Coding: Fundamentals & Applications”, Shu Lin & Costell , Addison Wessley Pub.

References:

1. "Digital Communication Techniques", Simon Haykin, John Wiley & Sons.
2. "Advanced Digital Communication System and Signal Processing Techniques", Dr. Kemilo Feher Prentice Hall International.
3. K S Shanmugan; “ Digital & Analog Communication System” John Wiley & Sons

1SMTE03-i Random Process Max. Marks: 60

Semester: I Sem

Name of Subject (TH): **Random Processes** Professional Elective I(i)

Course Objectives:

1. Understand the concept of Probability and Random Variables.
2. Learn the Multi-dimensional Random Variables.
3. Explain the Random Processes and Characterization.
4. Explain Power Spectral Density

Course Outcomes:

After successfully completing the course, students will be able to-

1. Apply the concept of Probability and Random Variables.
2. Analyze the different types of Standard Distributions.
3. Learn the Multi-dimensional Random Variables.
4. Explain the Random Processes and Characterization.
5. Analyze the properties of correlation.
6. Explain Power Spectral Density

	Subject: Random Process	L
Unit-1	Probability and Random Variables: Axioms of probability, Conditional probability, Total probability, Baye's theorem, Concept of random variable, Discrete random variable, Continuous random variable, CDF & PDF, Expectations & Moments, Characteristics functions, Moment generation function.	06
Unit-2	Standard Distributions: Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties, Functions of a random variable, Central Limit Theorem (CLT), Generation of random numbers.	06
Unit-3	Multi-dimensional Random Variables: Joint distribution function, Joint density function, Marginal distribution function, Conditional distribution, Covariance & Covariance matrix, Expectations & Moments, Mean and Variance of weighted sum of Random Variables, Joint Gaussian Random Variables.	06
Unit-4	Random Processes and Characterization: Concept of random process, Characterization and Classification, Gaussian Random Processes. Poision Process, Wiener Process, Stationery Process, Introduction to White noise, Random Walks, Brownian motion.	06
Unit-5	Correlation of Random Processes: Correlation function, Properties of Auto Correlation function, Relationship between two Random Processes, Properties of Cross Correlation function.	06

Unit-6	Power Spectral Density (PSD): - Concept of Power Spectral Density, Properties of PSD, Power Spectral Estimation, Cross Spectral Density, Power Spectrum in Laplace Domain	06
	Total	**36**

Text Book:

1. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis

References:

1. "Probabilistic Random Signals and Statistics", X Rong Li, CRC Press
2. "Random Signals and Systems, Bernard Picnicbono, PHI.
3. A First Course in Probability, Shelabo Ross, Pearson Education.

1SMTE04-i Advanced Optical Communication Max. Marks: 60

Semester: I Sem

Name of Subject (TH): **Advanced Optical Communication** Professional Elective 2(i)

Course Objectives:

1. Describe and analyze different optical fiber based systems and networks.
2. Explain network management aspects.
3. Understand different optical fiber based systems and networks.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand fiber modes, configuration and structure
2. Analyze WDM optical network
3. Understand Wavelength Convertible Networks
4. Design Virtual Topology
5. Explain network management aspects.
6. Understand different optical fiber based systems and networks.

	Subject: Advanced Optical Communication	L
Unit-1	Introduction: Light propagation in wave guides, Basic optical laws and definitions, Optical fiber modes and configurations, Step index fibers, Graded index fibers, numerical aperture, Cutoff wavelength, fiber material, fiber fabrication	06
Unit-2	WDM optical networks: WDM networks architectures, issues in wavelength routed networks, Wavelength routing algorithms: Introduction, Classification of RWA algorithms, RWA algorithms, fairness and admission control, distributed control protocols, Homodyne of Heterodyne receiver derivation, BER, Q factor	06
Unit-3	Wavelength Convertible Networks: Need for wavelength conversion, wavelength convertible node architectures, converter placement and allocation problems, Wavelength rerouting algorithms, Benefits of wavelength rerouting-issues in wavelength rerouting, light path migration, rerouting schemes, rerouting in networks with sparse wavelength conversion, rerouting in multifiber networks.	06
Unit-4	Virtual Topology Design: Virtual topology design problems, virtual topology design heuristics, need for virtual topology design reconfiguration, Optical multicasting: Introduction to multicast routing multicasting node architectures, multicast tree generation-source based tree generation-Steiner tree based generation H.264/65 for colour channel transmission, comparison of AWGN with optical channel.	06
Unit-5	Control and Management: Network management functions, management frame work and protocols, configuration management and adaptation management, Network survivability: failures and recovery, protection in SONET, benefits of optical layer protection-restoration schemes in WDM networks-multiplexing schemes-Traffic grooming in WDM, SONET/SDH.	06

Unit-6	Optical Burst Switching OBS Node Architecture: Burst switching protocols, wavelength channel scheduling, Optical packet switching and access networks: Introduction, optical packet switching node architecture, contention resolution protocols, Enhanced HFCFTTC, PON architectures.	06
	Total	**36**

Text Book:

1. Gerd Kaiser, "Optical fiber Communication Systems", John Wiley, New York, 1997.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.
3. Rajiv Ramswami and K. N. Sivarajan, "Optical Networks", Morgon Kauffman Publishers, 2000.

References:

1. P. E. Green, "Optical Networks", Prentice Hall, 1994
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

1SMTE05 Research Methodology and IPR **Max. Marks: 50**

Semester: I Sem

Name of Subject (TH): Research Methodology and IPR

Course Objectives:

1. Understand the research ethics.
2. Learn how to properly formulate the research problem.
3. Learn how to write research proposal.
4. Understand the Patent Rights and new development in IPR.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand research problem formulation.
2. Analyze research related information.
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right tobe promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

	Subject: Research Methodology and IPR	L
Unit-1	Definition of research, Characteristics of research, Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Role of Information, Research Process and Communication Technology (ICT) in research.	04
Unit-2	Literature review, sources of literature, various referencing procedures, Identifying the research areas from the literature review and research database. Defining the Research Problem, Selecting the Problem, Necessity of Defining the Problem	04
Unit-3	Meaning of Research Design, Need for Research Design, Sampling methods, methods of data collection, Basic Concepts concerning testing of hypothesis, procedures of hypothesis testing.	04
Unit-4	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review Committee, bibliography, Referencing, Plagiarism.	04
Unit-5	Nature of Intellectual Property: Patents, Patent Rights, Designs, Trademarks and Copyright, Geographical Indications. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	04
Unit-6	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	04
	Total	**24**

Text Book:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”

References:

1. C.R. Kothari ,"Research Methodology: Methods and Trends", New Age International,2004
2. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
3. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”.
4. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step-by-Step Guide for beginners”.
5. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd, 2007.

6. Mayall, “Industrial Design”, McGraw Hill, 1992.
7. Niebel, “Product Design”, McGraw Hill, 1974.
8. Asimov, “Introduction to Design”, Prentice Hall, 1962.
9. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
10. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008.

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

(An Autonomous Institute)

Two Year Post Graduate Degree Program in Master of Technology,

Branch: Electronics & Telecommunication Engineering Sem -2

Semester Pattern (Choice Based Credit Grade System) As Per NEP 2020

2SMTE01– Advanced Computer Networks & Programming Max. Marks: 60

Semester: II Sem

Name of Subject (TH): Advanced Computer Networks & Programming

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Course Objectives:

1. This course focus on advanced networking concept and focus on Programming
2. Students are expected to gain solid knowledge about fundamental aspects of advanced
3. networking techniques that will facilitate their further.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Apply networking and switching Techniques
2. Apply various types of Protocols.
3. Explain network management
4. Understand Networks and its layers
5. Elaborate advanced archicteture network
6. Undertand network security

	Subject: Advanced Computer Networks & Programming	L
Unit-1	**Review of computer networking:** ISO-OSI reference model, Point to point Protocol, ARQ techniques, Data network switching techniques.	06
Unit-2	**TCP/IP:** TCP/IP architecture, TCP Segments, TCPflow control, IPv4 versus IPv6, UDP, Fragmentation,ARP & RARP , ICMP,IGMP, DHCP, Mobile IP, UnIcast and Multicast Routing protocols	06
Unit-3	**Network management :** Delay models in data networks,Performance measures & architectural Issues, Queuing Model (M/M/1, M/M/C, and M/G/1), Network management and congestion control algorithm .	06

Unit-4	**ATM Networks:** Need for ATM, B-ISDN reference model, ATM Layers, ATM adaptation Layers, ATM Signalling, PNNI routing, QoS in ATM .	06
Unit-5	**Advance Network Architecture:** Overlay model,MPLS, Integrated services, Differentiated services, RSVP.	06
Unit-6	**Network Security :** Ciphers, DES, public key cryptography, RSA algorithm, Digital water marking,Attack and counter measure .	06
	Total	**36**

Text Book:

1. "Communication Networks", Leon Garcia & Wadeja, Tata McGraw Hill Publication.
2. "Data and Computer Communication", William stallings, 8 th edition, Pearson Education

References:

1. “Data Networks” Dimitri Bertisekas & Robert Gallager, PHI.
2. “Local Area Networks”, Gerd E Kieser, Mc-Graw-Hill.
3. “Cryptography and Network Security: Principles and Practice”,William Stallings, Pearson Education.

2SMTE02 – Adaptive Signal Processing Max. Marks: 60

Semester: II Sem

Name of Subject (TH): Adaptive Signal Processing

Course Objectives:

1. Understand concept of Eigen Value and Eigen Vector
2. Learn Wiener Filters.
3. Understand LMS Algorithm
4. Understand RLS Algorithm and its Application

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand Eigen Value and Eigen Vector.
2. Learn Wiener Filters.
3. Apply and use LMS Algorithm for Applications
4. Design Kalman Filter and its Applications.
5. Understand RLS Algorithm and its Application.
6. Design various application of Adaptive Signal Processing.

	Subject: Adaptive Signal Processing	L
Unit-1	**Introduction to Random Signals:** Random variables, Sequences and Stochastic Process, Random Signals and Distributions, Averages, Stationary Processes, Special Random signals & its Probability Density Functions (PDF) and its properties, Eigen values and Eigen Vectors of the correlation matrix, one dimensional gradient search algorithm,	06
Unit-2	**Wiener Filters:** Input signal and weight vectors, desired response and error, Mean Square Error (MSE), Principle of Orthogonality, FIR Wiener Filters, Wiener Hopf equation, Error performance surface, multiple linear regression model, linearity constrained minimum-variance filter.	06
Unit-3	**Adaptive Filtering Algorithms:** Steepest Descent algorithm, LMS algorithm, comparison of the LMS with Steepest Descent Algorithm, Modified LMS algorithm and Examples of LMS algorithm, Normalised LMS filter.	06
Unit-4	**Kalman Filters and Square Root Adaptive Filters:** Recursive minimum MSE for Scalar random variables, Kalman filtering problem, Innovation process and estimation of state, Kalman filtering, Square root Kalman filters, QRRLS algorithm.	06
Unit-5	**Recursive Least Square Algorithms:** Linear Least Square Estimation Problem, Introduction to Recursive Least-Squares Adaptive filters, Matrix Inversion Lemma, RLS Algorithm, Convergence analysis of RLS algorithm.	06

Unit-6	**Applications of Adaptive filtering:** Adaptive Equalization, noise cancellation, linear prediction, Echo Cancellation, Lattice Filters. System identification, Inverse modeling.	06
	Total	**36**

Text Book:

1. "Adaptive Filter Theory", Simon Haykin, 3rd Ed, Prentice Hall Inc, 2002.

References:

1. "Adaptive Signal Processing", Bernard Widrow, Prentice-Hall Signal Processing Series.
2. "Adaptive Filtering Primer with MATLAB", Alexander D. Poulanikas & Zayed M Ramadan, Taylor & Francis Series, CRS Press.
3. "Adaptive Digital Filters", Maurice G Bellanger, 2nd Edition

2SMTE03 – ADVANCED WIRELESS COMMUNICATION **Max. Marks: 60**

Semester: II Sem

Name of Subject (TH): ADVANCED WIRELESS COMMUNICATION

Course Objectives: The objectives of this course are to make the student

1. To study the Channel planning for Wireless Systems
2. To study the Mobile Radio Propagation
3. To study the Equalization and Diversity
4. To study the Wireless Networks

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand Cellular communication concepts
2. Study the mobile radio propagation
3. Study the wireless network different type of MAC protocols

	Subject: ADVANCED WIRELESS COMMUNICATION	L
Unit-1	**Fundamentals of Wireless Communication:** Evolution of wireless networks and challenges Long term fading models: two ray model, diffraction model, scattering model, Shadow fading Short term fading: Impulse response of time varying channels, Narrow band fading model, wide band fading models, discrete time model. Capacity of wireless channel, Capacity of AWGN channel, Capacity of flat fading channel, Capacity of frequency selective fading channel, Basic diversity combining techniques.	06
Unit-2	**Analog and Digital Cellular Mobile System:** Analog Cellular System: AMPS, NMT Digital Cellular System: GSM, GSM Architecture, TDMA frame structure, Traffic and Control channels, Voice Processing in GSM. IS -95 (CDMA one): Forward Modulation channel, Reverse Modulation channel.	06
Unit-3	**Wireless Sensor Network:** DARPA efforts toward wireless sensor network, other application of wireless sensor network, Fixed wireless sensor network, wireless sensor networks, sensor deployment, network characteristic, and Design issues in sensor network, Secured communication. Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.	06
Unit-4	**Low power wireless communication systems, Data Networks and protocols:** Cordless Telephony 2 (CT2), Digital Enhanced Cordless Telephony (DECT), PHS, PDC, PCS (Functional Architecture, Radio Specifications, Frame Structure). Protocols: IEEE 802.11, IEEE 802.15.	06
Unit-5	**Wireless Communication Standards:** Bluetooth: Bluetooth network, Bluetooth Protocol stack, Bluetooth MAC layer , Modified version of Bluetooth.Wi Fi: MAC, security enhancement, WAP, Quality of service enhancements, different version of WiFi standards, EDCA, HCCA, Wimax standard : Wimax physical layer interface, Wimax application in competition with WiFi,Wimax modes, Different versions of Wimax standards, Quality of services of Wimax	06

Unit-6	**Private Mobile Radio network and Introduction to 3G Systems:** Private Mobile Radio (PMR): Introduction, user community, requirement of PMR services, PMR configurations, PMR standards, TETRA Network Architecture. IMT 2000: Radio aspects, Network Aspects and Regional initiatives Universal Personal Communication: UPT, Concepts and Service aspects, Functional architecture, Routing, Scenarios for partitioning and location of service information, Access security, Basic concepts of UMTS.	06
	Total	**36**

Text Book:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
4. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

References:

1. "Wireless Networks", G. S. Papadimitriou, A. S Pomportisis, P Nicopolitidis, John Wiley & Sons.
2. "Wireless Communication", Upena Dalal, Oxford.
3. "Introduction toWireless and Mobile System", D.P. Agrawal and Qing-An-Zeng , 3rd edition, Oxford,
4. "Wireless Communication", Andrea Goldsmith, Cambridge University Press.
5. "Mobile and Personal Communication: Systems & Service", Raj Pandya, Prentice Hall India.
6. "Digital Mobile Communication and TETRA Systems", John Dunlop, Demessie Girma, James Irvine, John Wiley & Sons.
7. "Wireless communications: Principles and Practice", Theodore S. Rappaport, P.E.
8. "Principles of Mobile Communication", Gordon L Stuber, 2nd Ed, Kluwer Academic Publishers
9. "Mobile Cellular Telecommunication", William C Y Lee , Mc Graw Hill

2SMTE04-i DIGITAL IMAGE PROCESSING & Applications
Elective 3 (i) **Max. Marks: 60**
Semester: II Sem
Name of Subject (TH): DIGITAL IMAGE PROCESSING & Applications Professional

	Subject: DIGITAL IMAGE PROCESSING & APPLICATIONS	L
Unit-1	**Image processing fundamental:** Basic image processing Steps, Digital image representation, Image acquisition ,sampling and quantization, basic relationship between pixels, distance measures ,point operations ,Human visual system, Image types, zooming operation	06
Unit-2	**Image enhancement in spatial domain :** Basic gray level transformations, Histrogram processing, Arithmatic and logic operations, ,spatial domain filtering ,bit-plane slicing, median filter, color image processing fundamentals and color models	06
Unit-3	**Image Transforms:** 2D DFT, Walsh transform ,Hadamard transform, Slant transform, Discrete Cosine transform and Multiresolution wavelet transform	06
Unit-4	**Image enhancement in the frequency domain:** Filtering in frequency domain, Homomorphic filter, Image Restoration and Denoising ,Image degradation models, Types of image blur, image restoration model, linear image restoration, nonlinear image restoration techniques, image denoising, noise in image.	06
Unit-5	**Image segmentation:** Detection of discontinuities, edge based segmentation, edge detection, edge linking, Hough transform, Thresholding, region based segmentation, Morphological techniques	06
Unit-6	**Image Compression:** Lossy block truncation & vector quantization, lossless Huffman coding, run length coding & block coding, transform coding.	06
	Total	**36**

Text Book:

1. "Digital Image Processing", R.C Gonzales & Woods –Addison Wesley IIIrd Ed.
2. "Digital Image Processing", S Jayaraman, S Esakkirajan,T Veerakumar- Tata Mc Graw Hill

References:

1. "Fundamental Digital Image Processing "by A.K.Jain –Prentics Hall Inc.
2. "Digital Image Processing", W.K Pratt IIIrd ed John Wiley
3. "Digital Image Processing and Analysis", B Chanda and D. Mujumdar-PHI new Delhi

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2SMTE04-ii PE 3:CMOS & VLSI Design **Max. Marks: 60**

Semester: II Sem

Name of Subject (TH): CMOS & VLSI Design Professional Elective 3(ii)

Course Objectives:

1. To study CMOS transistor theory and performance parameters.
2. To study layout design rules for size & power optimization.
3. To be aware of manufacturing process in VLSI technology.
4. To learn design of digital VLSI circuits, computer aided simulation and synthesis tools on programmable chips (FPGA/CPLD) using Verilog HDL.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Gain knowledge about the trends in VLSI semiconductor technology and it's impacts on scaling and performance.
2. Draw Layout, Stick diagrams of simple CMOS Circuits
3. Understand Front & Back end design aspects of simple VLSI Digital circuits
4. Model digital circuits with Verilog HDL, simulate, synthesize and prototype in PLDs.

	Subject: CMOS & VLSI Design	L
Unit-1	**CMOS Circuits Design I:** Moore's Law, MOS structure capacitance, Channel capacitance, Junction capacitance, MOS Transistor Switches, CMOS Logic gates, CMOS Inverter - DC Characteristics, CMOS combinational logic design, Introduction to Delays in CMOS, Power consumption / Dissipation Issues.	06
Unit-2	**CMOS Circuits Design II:** Clocked Latch and Flip-Flop Circuits, CMOS Transmission Gates (Pass Gates), Static Read - Write Memory (SRAM) Circuits, Dynamic Read-Write Memory (DRAM) Circuits.	06

Unit-3	**Logical Effort:** Logical Effort of Different Digital Circuit Design, Input capacitance, Logical and Electrical effort, parasitic delay ,Clocks Skew, Clock distribution techniques, Clock Jitter.	06
Unit-4	**CMOS Technology & Design Rules:** CMOS fabrication processing steps, p-well CMOS Process, n-well CMOS Process, Twin well process, Silicon-on-Insulator Process, CMOS Process enhancements –Interconnect, Circuit Elements, CMOS Lambda-based Design Rules, Stick Diagrams, Physical layout of simple CMOS Logic Gates.	06
Unit-5	**Verilog HDL:** VLSI Design flow, Module, ports, Data types, Compiler, Directives, Operators, Propagation Delay (Inertial & Transport),Gate-Level, Data Flow, Structural Modeling and behavioral Modeling combinational and sequential circuits examples, Initial & always statements, procedural assignment	06
Unit-6	**Verilog HDL:** Timing controls, Conditional Statements, Loops, Sequential and Parallel Blocks, Generate blocks, Task and Functions, Procedural continuous assignments, Overriding Parameters, Introduction to state machines examples.	06
	Total	**36**

Text Book:

1. S. M. Kang and Y. Leblebici, "CMOS Digital Integrated Circuits : Analysis and Design", 3rd Edn., MH, 2002.
2. Neil H. Weste, D. Harris, "Principles of CMOS VLSI design A Circuit & System Perspective" 4th Edition, Pearson(Addison-Wesley), 2011.
3. Samir Palnitkar, "Verilog HDL: A guide to Design and Synthesis", 2nd edition, Prentice Hall PTR, 2003
4. Wayne Wolfe, "Modern VLSI Design: IP based Approach", 4th Edition, PHI

References:

1. Jan M.Rabaey, A.Chandrakasan, B. Nikolic,"Digital Integrated Circuits:A Design Perspective", 2nd Edn.Pearson.
2. Plummer, Deal, Griffin, "Silicon VLSI Technology: Fundamentals, Practice & Modeling" PH, 2001.
3. Navabi Z., "Verilog Digital System Design", McGraw-Hill Publishing, New York, 1999.
4. S.M. Sze (Ed), "VLSI Technology", McGraw Hill.
5. Michael Ciletti, "Advance digital design with the Verilog HDL", Pearson publication.