GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

DEPARTMENT OF ELECTRONICS ENGINEERING

M. TECH. (Electronics Systems and Communication)

2019-2020

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Specialization: Electronics Systems and Communication

PROGRAM OBJECTIVES

1. Students should have Core Competence in mathematical, scientific and engineering principles necessary to formulate, analyze and solve hardware/software engineering problems and also to pursue higher study or research.

2. Student should function effectively as an individual and in a team in industry and research activity.

3. Student should understand the social issues and should have ability to come up with remedial measures.

4. Students should have enough techno-scientific excellence to serve the rising demands in agricultural as well as industrial sectors and contribute to nation building.

5. Students should have enough analytical skills to visualize the applications of Electronics and Communication engineering concepts in real life situations.

6. Students should come up with entrepreneurship quality with ethical attitude.

PROGRAM OUTCOMES (POs):

Students will be able to

1. Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude.

2. Identify, formulate and solve engineering problems in the broad areas like System Design using communication and Networking platform, Applications in Signal Processing, Machine Vision.

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Government College of Engineering Amravati	Principal (Prof. A.M.Mahalle)

3. Use different software tools in the domain of Communication; Signal processing, VLSI and Embedded Systems Design. Analysis and Verification such as Design entry, Synthesis, Functional and Timing Simulation, Platform specific EDA sets.

4. Design and conduct experiments, analyze and interpret data, imbibe programming skills for development of simulation experiments.

5. Function as a member of a multidisciplinary team with sense of ethics, integrity and responsibility

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

M. Tech. (Electronics Systems and Communication)

SEM I													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
EC	ETP121	Advanced Digital Signal Processing	3	-	-	3	30	10	60	-	-	100	3
EC	ETP122	Advanced Communication Networks	3	-	-	3	30	10	60	-	-	100	3
EC	ETP123	Optoelectronics and Optical Communication Systems	3	-	-	3	30	10	60	-	-	100	3
ECEL	ETP124	Program Elective I	3	-	-	3	30	10	60	-	-	100	3
EC	ETP125	System Design and Communication Lab-I	-	-	6	6	-	-	-	50	50	100	3
ECP	ETP126	Seminar-I	-	-	4	4	-	-	-	50	-	50	2
MC	SHP121	Audit Course	-	-	-	-	30	20	-	-	-	50	-
	Total		12	-	10	22	150	60	240	100	50	600	17

ETP125 System Design and Communication Lab-I will consist of practical / assignments based on theory of first semester subjects. ETP126 Seminar-I to be delivered by the students on general topic not covered in syllabi and to be evaluated by two members committee, appointed by HOD wherein guide should be one of the members

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE I(ETP124)

(A) RF & Microwave circuit design

(B) Embedded System Design

(C) Soft Computing

(D) Optical Network

LIST OF AUDIT COURSE

AUDIT COURSES(SHP121)

(A) English for Research Paper Writing

(B) Disaster Management

(C) Sanskrit for Technical Knowledge

(D) Value Education

(E) Pedagogy Studies

(F) Stress Management by Yoga

(G) Personality Development through Life Enlightenment Skills.

(H) Constitution of India

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

M. Tech. (Electronics Systems and Communication)

SEM II													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
EC	ETP221	Antennas and Radiating Systems	3	-	-	3	30	10	60	-	-	100	3
EC	ETP222	Analog and Digital CMOS VLSI Design	3	-	-	3	30	10	60	-	-	100	3
EC	ETP223	Image and Video Processing	3	-	-	3	30	10	60	-	-	100	3
ECEL	ETP224	Program elective II	3	-	-	3	30	10	60	-	-	100	3
MC	SHP221	Research Methodology	2	-	-	2	30	20	--	-	-	50	2
EC	ETP225	Systems Design and Communication Lab-II	-	-	6	6	-	-	-	50	50	100	3
ECP	ETP226	Seminar II	-	-	4	4	-	-	-	50	-	50	2
	Total		14	00	10	24	150	60	240	100	50	600	19

ETP225 System Design and Communication Lab.-II will consist of practicals / assignments based on theory of second semester subjects

ETP226 Seminar-II to be delivered by the students on Literature survey based on dissertation topic and to be evaluated by two members committee, appointed by HOD wherein guide should be one of the members.

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE II(ETP224)
(A) Satellite Communication
(B) Programming Language for Embedded Systems
(C) Pattern Recognition and Machine Learning
(D) Wireless Sensor Network

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

M. Tech. (Electronics Systems and Communication)

SEM III*													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
ECEL	ETP321	Program Elective III	3	-	-	3	30	10	60	-	-	100	3
OE	SHP321	Open Elective	3	-	-	3	30	10	60	-	-	100	3
ECP1	ETP322	Dissertation Stage I	-	-	20	20	-	-	-	100	-	100	10
	Total		06	00	20	26	60	20	120	100	60	300	16

Dissertation Stage I: Student has to submit the report and deliver the seminar based on 50% or more work on Dissertation topic. It is to be evaluated internally by three member's panel of examiners headed by HOD wherein guide should be one of the members of the panel. Last date of submission of report shall be two weeks before the end of semester.*Students going for Industrial Project/Thesis will complete these courses through MOOCs.

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE III (ETP321)
A) Wireless communication
B) VLSI Design verification and testing
C) Computer Vision
D) Network security and Cryptography

LIST OF OPEN ELECTIVES

OPEN ELECTIVE (SHP321)
(A) Business Analytics(ME)
(B) Industrial Safety(ME)
(C) Operations Research(ME)
(D) Cost Management of Engineering Projects(CE)
(E) Composite Materials(ME)
(F) Waste to Energy(CE)
(G) Finance Management(EE)
(H) Project Management(EE)
(I) Data Structure and Algorithms(CS)
(J) Any other course approved by BOS

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Government College of Engineering Amravati

Principal
(Prof. A.M.Mahalle)

M.Tech. (Electronics Systems and Communication)

SEM IV												
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					
							Theory		Practical		Total	Credits
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	ESE	ICA	ESE		
ECP2	ETP421	Dissertation Stage II	-	-	32	32	-	-	200	200	400	16
	Total		-	-	32	32	-	-	200	200	400	16

Dissertation Phase-II: Internal assessment of dissertation (complete work) is to be carried out by the guide for 100 marks. External assessment of Dissertation (complete work) is to be carried out by panel of examiner consisting of internal (guide) and external examiner for 200 marks. Candidate shall present the entire work on Dissertation, followed by viva-voce. Last date of submission of dissertation will be the end of the semester. Please see Appendix-C of Rules & Regulation for further information.

*** Note: ETP322Dissertation Stage I, SHP121 Audit course, ETP126 Seminar I and ETP226 Seminar II as prerequisite for ETP421Dissertation Stage II.**

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Department of Electronics Engineering

Equivalence Scheme

Programme Name: -Electronics Systems and Communication

Sr. No.	Course code with Name of course(old) with total 90 credits		Credit	Remark	Course code with Name of course(new)with total 68 credits		Credit	Remark
1	ETP108	Electronic Design Technology with HDL	4	No equivalence	ETP121	Advanced Digital Signal Processing	3	No equivalence
2	ETP109	Digital Signal and Speech Processing	4	No equivalence	ETP122	Advanced Communication Networks	3	No Equivalence
3	ETP110	Wireless Digital Communications	4	No equivalence	ETP123	Optoelectronics and Optical Communication Systems	3	Newly added
4	ETP104	Optic communication Systems	4	No equivalence	ETP124	Program Elective I	3	
5	ETP111(A)	Digital image processing	4	No equivalence	ETP124(B)	RF & Microwave circuit design	3	No equivalence
6	ETP111(B)	Digital Communication Systems	4	No equivalence	ETP124(B)	Embedded System Design	3	No equivalence
7	ETP111(C)	Artificial Intelligence	4	No equivalence	ETP124(C)	Soft Computing	3	Newly added
8	ETP111(D)	Biomedical Instrumentation Techniques	4	Omitted from syllabus	ETP124(D)	Optical Network	3	Newly added
9	ETP111(E)	Telecomm Network Planning and Management	4	Omitted from Syllabus	ETP125	Systems and Communication Lab-I	3	No equivalence
10	ETP112	System Design and Communication Lab- I	4	No equivalence	ETP126	Seminar-I	2	EquivalenceWithETP107 Seminar-II
11	ETP107	Seminar-I	1	Equivalence with ETP126Seminar-I	SHP221	Audit Course	0	Newly added
12	ETP201	Embedded System Design	4	No equivalence	ETP221	Antennas and Radiating Systems	3	Newly added

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

13	ETP208	Mixed Signal VLSI Design	4	No equivalence	ETP222	Analog and Digital CMOSVLSI Design	3	Newly added
14	ETP203	RF and Microwave Communications	4	No equivalence	ETP223	Image and Video Processing	3	Newly added
15	ETP209	Satellite Communications	4	No equivalence	ETP224	Program elective II	3	
15	ETP209	Satellite Communications	4	No equivalence	ETP224	Program elective II	3	
16	ETP210(A)	Mobile Communication Systems	4	Omitted from syllabus	ETP224(A)	Satellite Communication	3	No equivalence
17	ETP210(B)	Fuzzy Logic	4	Omitted from syllabus	ETP224(B)	Programming Language for Embedded Systems	3	Newly added
18	ETP210(C)	Neural Network	4	Omitted from syllabus	ETP224(C)	Pattern Recognition and Machine Learning	3	Newly added
19	ETP210(D)	Computer Network and Applications	4	No equivalence	ETP224(D)	Wireless Sensor Network	3	Newly added
20	ETP210(E)	Data Compression	4	Omitted from syllabus	SHP221	Research Methodology	2	Newly added
21	ETP206	System Design and Communication Lab – II	4	No equivalence	ETP225	Systems and Communication Lab-II	3	No equivalence
22	ETP207	Seminar – II	1	Equivalence with ETP226 Seminar-II	ETP226	Seminar II	2	Equivalence with ETP207 Seminar-II
23	ETP301	Dissertation Phase-I	10	Equivalence with ETP322 Dissertation Phase-I	ETP321	Program Elective III	3	Newly added
24	ETP401	Dissertation Phase-II	30	Equivalence with ETP421 Dissertation Phase-II	ETP321(A)	Wireless Communication	3	No equivalence
					ETP321(B)	VLSI Design Verification and testing	3	Newly added
					ETP321(C)	Computer Vision	3	Newly added
					ETP321(D)	Network Security and Cryptography	3	Newly added

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

					SHP321	Open Elective	3	Newly added
					ETP322	Dissertation Stage I	10	Equivalence with ETP301 Dissertation Phase-I
					ETP421	Dissertation Stage II	16	Equivalence with ETP401 Dissertation Phase-II

- All students promoted to second year with some backlog courses shall remain in old scheme (90 Credits) with old curriculum.
- All students who failed in second year (DC Students) shall be transferred to new same scheme (68 Credits) but with new curriculum.
- Important notes for * courses
  i) All courses of old curriculum shall be offered during the academic year (2019-2020) for back logger students.
  ii) In the academic year 2020-21and onward all students shall register for courses as revised curriculum.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Department of Electronics Engineering

Equivalence Scheme for online courses

Programme Name:-Electronics Systems and Communication

Sr. No.	Course code with Name of course(old/new)		Credit	Course code with Name of course (online)	Name of Online platform	Credit
1.	ETP121	Advanced Digital Signal Processing	3	1. NPTEL course on **Foundations og Wavelets and Multirate Digital Signal Processing** 2. NPTEL course on **Fundamentals of Wavelets, filter bsnks and Time Frequency Analysis and Wavelet Transform** 3. NPTEL course on **Adv. Digital Processing- Multirate and Wavelet** 4. NPTEL course on **Introduction to Time Frequency Analysis and**	NPTEL	--

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Sr. No.	Course code with Name of course(old/new)		Credit	Course code with Name of course (online)	Name of Online platform	Credit
				Wavelet Transform		
2.	ETP122	Advanced Communication Networks	3	1. NPTEL course on **Computer Network and IP protocol** 2. NPTEL course on **Wireless Adhoc and Sensor Network** 3*. NPTE--L course on **Communication Network and Switching(Web)**	NPTEL	--
3.	ETP123	Optoelectronics and Optical Communication Systems	3	1. NPTEL course on **Fiber Optic Communication Technology** 2. NPTEL course on **Optical Communication** 3. NPTEL course on **Non linear Optics(Web)**	NPTEL	--
4.	ETP124(A)	RF and Microwave Circuit Design	3	1. NPTEL course on **Design Principles Of RF And Microwave Filters And Amplifiers**	NPTEL	--

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Sr. No.	Course code with Name of course(old/new)		Credit	Course code with Name of course (online)	Name of Online platform	Credit
5.	ETP124(B)	Embedded System Design	3	1*. NPTEL course on **Embedded Systems** 2. NPTEL course on **Embedded Systems Design with ARM** 3. NPTEL course on **Embedded Systems Design**	NPTEL	--
6.	ETP124(C)	Soft Computing	3	1. NPTEL course on **Introduction to soft computing**	NPTEL	--
7.	ETP124(D)	Optical Network	3	1*. NPTEL course on **Advanced Optical Communication** 2. NPTEL course on **Optic Communication Technology**	NPTEL	--
8.	ETP321(A)	Wireless Communication Networks	3	1. NPTEL course on **Wireless Adhoc and Sensor Networks**	NPTEL	--
9.	ETP321(B)	VLSI Design Verification and testing	3	1. NPTEL course on **VLSI Design Verification and test**	NPTEL	--

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Sr. No.	Course code with Name of course(old/new)		Credit	Course code with Name of course (online)	Name of Online platform	Credit
10.	ETP321(C)	Computer Vision	3	1. NPTEL course on **Computer Vision**	NPTEL	--
11.	ETP321(D)	Network Security and Cryptography	3	1. NPTEL course on **Cryptography and Network Security**	NPTEL	--

*Courses without online certification available on NPTEL

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP121 ADVANCED DIGITAL SIGNAL PROCESSING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE Duration: 2.30 hrs.

Course Objectives:

To make the student understand

I. The use of various transforms in digital signals and systems analysis.
II. Spectrum estimation of discrete random signals.
III. Optimum filters and adaptive filters.
IV. Multirate digital signal processing.

Transforms and their applications: Review of Z Transform, Discrete Fourier Transform, Discrete Time Fourier Transform, Discrete Fourier series. Introduction to Discrete Wavelet Transform, Haar wavelet. Application of transforms to discrete signals.

Discrete Time Random Processes and Spectrum Estimation: Deterministic process, Stochastic(random) process, Auto correlation and auto covariance of random processes, Cross correlation of random variables, Ergodic random process, Gaussian random process, Stationary and WSS random process, Power spectrum, Parseval's theorem, Wiener-Khintchine theorem, Spectral factorization, Periodogram - Modified periodograms using Bartlett, Welch, Blackman and Tukey windows, AR, MA, ARMA model based spectral estimation, Yule-Walker Equations, Durbin's algorithm.

Adaptive Filters: FIR adaptive filters, Stepest descent method, Window-Hoff LMS algorithm, Normalized LMS method, Adaptive channel equalization, Adaptive noise cancellation, IIR adaptive filters, RLS filters.

Multirate Digital Signal Processing: Need for multirate sampling, Decimation, Interpolation, Poly-phase filters, Multistage implementation, Phase shifters, Sub-band coders Transmultiplexers, Quadrature mirror filters.

References:

1. Monson H. Hayes, Statistical digital signal processing and modeling, John Wiley and Sons, 2005.
2. John G.Proakis& Dimitris G. Maolakis, DSP principles, algorithms and Applications, 4th edition, Pearson Education, 2007.

Course Outcomes:

After Completion of Course students shall be able to

ETP121.1 Implement various transforms in digital signals & systems analysis.
ETP121.2 Estimate Spectrum of discrete random signals.
ETP121.3 Design Optimum filters & adaptive filters.
ETP121.4 Understand multirate digital signal processing.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP 122 ADVANCE COMMUNICATION NETWORKS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30 hrs

Course Objectives:

To make the student able

I. To study the concept of Layered Architectures.
II. To study the principles of wired and wireless networks, Mobile Ad-hoc Networks.
III. To study the different TCP/IP based networks.
IV. To study High Performance networks based WiMax and UWB.

Introduction: Overview of Communication Networks: Telephone networks, Computer networks, Cable television networks, Wireless networks, Networking principles, Digitalization, Network externalities, Service integration; Network Services and Layered Architecture: Traffic characterization and QoS, Network services, Network elements, Network mechanisms, Layered architecture, Network bottlenecks.

Broadband Networks Introduction: Multihop wireless broadband networks, Mesh networks, MANET importance of routing protocols, Classification of routing protocols in MANET, Routing metrics, Packet scheduling algorithms, Admission control mechanism

Internet and TCP / IP Networks Internet: Internet protocol, Technology trends in IP networks, IP packet communications in mobile communication networks; TCP and UDP, Internet success and limitation, Performance of TCP/ IP networks; Circuits Switched Networks: SONET, DWDM, Fiber to home, DSL, Intelligent Network (IN) scheme, Comparison with conventional systems, Merits of the IN scheme, CATV and layered network, Services over CATV.

ATM Networks Introduction: ATM reference model, Addressing, Signaling, Routing, ATM Adaptation Layer (AAL), Traffic classes, Traffic management and quality of service, Traffic descriptor, Traffic shaping, Management and control, Traffic and congestion control, Network status monitoring and control, User/ network signaling, Internetworking with ATM, IP over ATM, Multiprotocol over ATM.

High Performance Networks Introduction: WiMAX overview, Competing technologies, Overview of the physical layer, PMP mode, Mesh mode, Multihop relay mode; Introduction: UWB overview, Time hopping UWB, Direct sequence UWB, Multiband UWB; Introduction: LTE and LTE, A overview, System model, Specifications, Frame structure, Comparison with broadband technologies.

References:

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Principal (Prof. A.M.Mahalle)

1. Amitabha Ghosh and Rapeepat Ratasuk, “Essentials ofLTE and LTE-A”, Cambridge University, 2011.
2. David Tung Chong Wong, Peng-Yong Kong, Ying-Chang Liang, Kee Chaing Chua and Jon W. Mark, “Wireless Broadband Networks”, John Wiley and Sons.
3. Jean Warland and Pravin Varaiya, “High Performance Communication Networks”, 2nd Edition, Harcourt and Morgan Kanffman Publishers, London, 2008.
4. Leon Gracia and Widjaja, “Communication Networks”, Tata McGraw Hill, 2008.
5. Lumit Kasera and Pankaj Sethi, “ATM Networks: Concepts and Protocols”, Tata McGraw Hill, 2007.
6. Jeffrey G. Andrews, Arunabha Ghosh and Rias Muhamed, “Fundamentals of WiMAX understanding Broadband Wireless Networking”, Prentice Hall of India, 2008.

Course Outcome:

By the end of course, the students shall be able to

ETP122.1 Understand the requirement of theoretical and practical aspect of computer network.

ETP122.2 Describe various protocols used in High Performance based network.

ETP122.3 Design the network

ETP122.4 Design MANET based applications.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP123 OPTOELECTRONICS AND OPTICAL COMMUNICATION SYSTEMS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30 hrs

Course Objectives:

To make the student able

I. To study the concept of designing parameters for optical transmitter and receiver.
II. To study the implementation of digital system.
III. To study the principles of direct and coherent detection systems.
IV. To study the nonlinear properties of light propagation through optical.

Integrated optics and photonics technologies, Planar waveguides, Some integrated optical devices, Beam splitters, directional couplers and switches, Modulators, Periodic structures for filters and injection lasers, Polarization transformers and wavelength converters, Optoelectronic integration, Photonic integrated circuits, Optical bistability and digital optics, Optical computation.

The optical transmitter circuit, Source limitations, LED drive circuits, Laser drive circuits; The optical receiver circuit, The preamplifier, Automatic gain control, Equalization; System design considerations, Component choice, Multiplexing; Digital systems; Digital system planning considerations, The optoelectronic regenerative repeater, The optical transmitter and modulation formats, The optical receiver, Channel losses, Temporal response Optical power budgeting, Line coding and forward error correction.

Analog systems, Direct intensity modulation (D–IM), System planning, Subcarrier intensity modulation, Subcarrier double-sideband modulation (DSB–IM),Subcarrier frequency modulation (FM–IM), Subcarrier phase modulation (PM–IM), Pulse analog techniques; Distribution systems; Multiplexing strategies; Optical time division multiplexing, Subcarrier multiplexing, Orthogonal frequency division multiplexing, Wavelength division multiplexing, Optical code division multiplexing, Hybrid multiplexing, Application of optical amplifier.

Basic coherent system, Coherent detection principles, Practical constraints of coherent transmission, Injection laser line width, State of polarization, Local oscillator power, Transmission medium limitations; Modulation formats, Amplitude shift keying, Frequency shift keying, Phase shift keying, Polarization shift keying; Demodulation schemes, Heterodyne synchronous detection, Heterodyne asynchronous detection, Homodyne detection, Intradyne detection, Phase diversity reception, Polarization diversity reception and polarization scrambling ,Differential phase shift keying, Receiver sensitivities, ASK heterodyne detection, FSK heterodyne detection, PSK heterodyne detection, ASK and PSK homodyne detection, Dual-filter direct detection FSK, Interferometric direct detection

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

DPSK, Comparison of sensitivities; Multicarrier systems, Polarization multiplexing, High-capacity transmission.

Fiber Soliton, Nonlinear Schrodinger Equation, Bright Solitons, Dark Solitons; Soliton-Based Communications, Information Transmission with Solitons, Soliton Interaction3, Frequency Chirp, Soliton Transmitters; Loss-Managed Solitons, Loss-Induced Soliton Broadening ,Lumped Amplification, Distributed Amplification, Experimental Progress.

Dispersion-Managed Solitons, Dispersion-Decreasing Fibers, Periodic Dispersion Maps, Design Issues; Impact of Amplifier Noise, Moment Method, Energy and Frequency Fluctuations, Timing Jitter, Control of Timing Jitter; High-Speed Soliton Systems, System Design Issues, Soliton Interaction, Impact of Higher-Order Effects, Timing Jitter; WDM Soliton Systems, Interchannel Collisions, Effect of Lumped Amplification, Timing Jitter, Dispersion Management.

References:

1. Senior J.M, "Optical Fiber Communications Principles and Practice", 3rd edition, Pearson Education, 2009.
2. Govind P. Agrawal, "Fiber- Optic Communication Systems", 3rd edition John Wiley and Sons, 2002.

Course Outcomes:

At the end of this course, students shall be able to

ETP123.1 Design different parameters for optical transmitter and optical receiver.

ETP123.2 Implement digital system using digital planning considerations.

ETP123.3 Comprehend, understand and analyze direct detection and coherent detection system.

ETP123.4 Understand how to use nonlinear property of light propagation in optical fiber in the form of Soliton.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP124 PROGRAM ELECTIVE-I

ETP124(A) RF AND MICROWAVE CIRCUIT DESIGN

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student understand

I. Different passive and active components.
II. Various parameters of transmission line and use of Smith chart.
III. Choosing Optimum components.
IV. Application of RF circuit design.

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 Variance Inter-symbol interference, Random process & noise, Definition of sensitivity and Dynamic range, Conversion gain and distortion.

Microwave Semiconductor Devices and Modeling: 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, 4th edition, 2011.
3. R.Ludwig and P.Bretchko, "R. F. Circuit Design", Pearson Education Inc, 2009.
4. G.D. Vendelin, A.M. Pavoi, U. L. Rohde, "Microwave Circuit Design Using Linear and Non Linear Techniques", John Wiley 1990.
5. S.Y. Liao, "Microwave circuit Analysis and Amplifier Design", Prentice Hall 1987.
6. Radmanesh, "RF and Microwave Electronics Illustrated", Pearson Education, 2004.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

Course Outcomes:

At the end of this course, students shall be able

ETP124 (A).1 To understand the behavior of RF passive components and model active components.

ETP124 (A).2 Perform transmission line analysis and demonstrate use of Smith Chart for high frequency circuit design.

ETP124 (A).3 Justify the choice/selection of components from the design aspects.

ETP124 (A).4 Contribute in the areas of RF circuit design.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP 124 (B) EMBEDDED SYSTEM DESIGN

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student able

I. To understand basics of embedded systems.
II. To study the architecture of Microcontroller.
III. To understand need and application of Microcontroller in embedded system.
IV. To learn external interfacing of real world input and output devices with Microcontroller.

Introduction to Embedded System, Applications and Scope
32 bit Microcontroller architecture, Assembly Language and C language programming, Microcontroller based development boards
Introduction to Arduino boards, Sketching in code
Working with variables, Making decisions and repetitive operations
Digital Ins and Outs, Analog Ins and Outs, Interfacing switches, buzzer, seven segment displays
Timings functions, Random Functions, Writing new functions, Hardware Interrupts
Arrays and Memory, Hardware Libraries Using Serial and I2C bus
Case studies of a few projects using Arduino boards and Shields

References:

1. Joseph Yiu, "The definitive guide to ARM Cortex-M3", Elsevier, 2nd Edition
2. Brian Evans, "Beginning Arduino Programming", Springer, 2011
3. Michael J. Pont, "Embedded C", Pearson Education, 2nd Edition, 2008
4. Raj Kamal, "Embedded Systems – Architecture: Programming and Design", TMH
5. Frank Vahid and Tony Givargis, "Embedded System Design", Wiley

Course Outcomes:

At the end of this course, students shall be able to

ETP124(B).1 Deploy low end applications using low and high level languages on microcontroller platform.
ETP124(B).2 Implement simple sketches on the Arduino boards involving several Peripherals.
ETP124(B).3 Identify, design and implement applications on the Arduino boards producing custom shields.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP 124 (C) SOFT COMPUTING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student able

I. To understand the fundamentals of soft computing.
II. To understand the concepts of Fuzzy logic and Artificial Neural Networks and optimization techniques using Genetic algorithm.
III. To solve single and multi-objective optimization problems.
IV. To solve real time applications based on soft computing techniques.

Introduction to Soft Computing: Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques

Fuzzy logic: Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.

Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc, Solving single-objective optimization problems using GAs.

Multi-objective Optimization Problem Solving: Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA),Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs

Artificial Neural Networks: Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, Applications of ANNs to solve some real life problems.

References:

1. Soft Computing and Its Applications: R.A. Aliev, R.R. Aliev
2. Neuro-Fuzzy and Soft Computing: A computational Approach to Learning & Machine Intelligence; Roger Jang, Tsai Sun, Eiji Mizutani, PHI.
3. Neural Network: A Comprehensive Foundation; Simon Haykin, PHI.
4. Elements of artificial Neural Networks; Kishan Mehtrotra, S. Ranka, Penram International Publishing (India).
5. Fuzzy Logic with Engineering Applications; Timothy Ross, McGraw-Hill.

Course Outcomes:

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

After completing this course, Students shall be able to learn:

ETP124(C).1 Fuzzy logic and its applications

ETP124(C).2 Artificial neural network and its applications

ETP124(C).3 Solve single and multi-objective optimization problems

ETP124(C).4 Applications of soft computing to solve any real life problem.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP 124(D) OPTICAL NETWORKS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

I. To make the student able
II. To understand various issues in designing an optical network.
III. To study WDM network design.
IV. To study optical network

SONET/SDH: Optical transport network, IP, Routing and forwarding, Multiprotocol label switching.

WDM network elements: Optical line terminals and amplifiers, Optical add/drop multiplexers, OADM architectures, Reconfigurable OADM, Optical cross connects.

Control and management: Network management functions, Optical layer services and interfacing, Performance and fault management, Configuration management, Optical safety.

Network Survivability: Protection in SONET/SDH & client layer, Optical layer protection schemes.

WDM network design: LTD and RWA problems, dimensioning wavelength routing networks, statistical dimensioning models.

Division multiplexing, synchronization, header processing, buffering, burst switching, test beds, Introduction to PON, GPON, AON.

References:

1. Rajiv Ramaswami, Sivarajan, Sasaki, "Optical Networks: A Practical Perspective", MK, Elsevier, 3 rd edition, 2010.
2. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks: Concepts Design, and Algorithms", PHI, EEE, 2001.

Course Outcomes:

At the end of this course, students shall be able to

ETP124(D).1 Contribute in the areas of optical network
ETP124(D).2 Work in WDM network design.
ETP124(D).3 Implement simple optical network
ETP124(D).4 Understand further technology developments for future enhanced network

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP 125 SYSTEM DESIGN AND COMMUNICATION LAB.- I

Teaching Scheme: 06P **Total: 06** **Credits: 03**

Evaluation Scheme: 50 Internal + 50 External **Total Marks: 100**

The instructor may choose experiments as per his/her requirements, so as to cover entire course contents of ETP121, ETP122, ETP123 and/or ETP124. Minimum 10 experiments should be performed.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

SHP121 AUDIT COURSE

SHP121(A) ENGLISH FOR RESEARCH PAPER WRITING

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title

Ensure the good quality of paper at very first-time submission

Planning and Preparation, Word Order, Breaking up long sentences, Structuring paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

useful phrases, how to ensure paper is as good as it could possibly be the first time submission

Suggested reading :

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Member Secretary	Chairman, BoS		Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)		(Prof. A.M.Mahalle)

SHP121(B) DISASTER MANAGEMENT

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course objectives:

Students will be able to:

1. demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response

2. critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives

3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations

4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Introduction : Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Disaster Preparedness And Management :

Preparedness: monitoring Of phenomena Triggering A Disaster Or Hazard, Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community preparedness.

Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co- Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India

Suggested reading :

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP121(C) SANSKRIT FOR TECHNICAL KNOWLEDGE

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course objectives:

Students will be able to:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Order, Introduction of roots, Technical information about Sanskrit Literature

Technical concepts of Engineering-Electrical,Mechanical, Architecture, Mathematics

Suggested reading :

1. "Abhyaspustakam" – Dr.Vishwas, Sanskrit-Bharti Publication,New Delhi

2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Outcomes: -

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

SHP121(D) VALUE EDUCATION

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance.Confidence,Concentration.Truthfulness, Cleanliness.Honesty ,Humanity.Power of faith, National Unity. Patriotism.Love for nature ,Discipline

Personality and Behaviour Development - Soul and Scientific attitude.Positive Thinking.Integrity and discipline.Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality ,Non violence ,Humility, Role of Women. All religions and same message. Mind your Mind ,Self-control. Honesty, Studying effectively

Suggested reading :

1 Chakroborty , S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press ,New Delhi

Course Outcomes :

Students will be able to

1.Knowledge of self-development 2.Learn the importance of Human values

3.Developing the overall personality

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Principal (Prof. A.M.Mahalle)

SHP121(E) PEDAGOGICAL STUDIES

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Introduction and Methodology:

Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

- **Theory of change.**

Professional development: alignment with classroom practices and follow- up support
Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Suggested reading:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf

Course Outcomes:

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

SHP121(F) STRESS MANAGEMENT BY YOGA

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course Objectives:

Students will be able to:

1. To achieve overall health of body and mind.
2. To overcome stress

Definitions of Eight parts of yog (Ashtanga)

Yam and Niyam.
Do`s and Don'ts in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Asan and Pranayam
i) Various yog poses and their benefits for mind & body
ii)Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading:

1. Yogic Asanas for Group Training-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to understand:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP121(G) PERSONALITY DEVELOPMENT THROUGH LIFE ENHANCEMENT SKILLS

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course Objectives:

Students will be able to:

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (don'ts)
- Verses- 71,73,75,78 (do's)

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,
- 23, 35,
- Chapter 18-Verses 45, 46, 48.

Statements of basic knowledge.
Shrimad Bhagwad Geeta: Chapter2-VerseChapter 12 -Verses 13, 14, 15, 16,17, 18
Personality of Role model. Shrimad Bhag
Chapter2-Verses 17, Chapter 3-Verses 36,Chapter 4-Verses 18, 38,39
Chapter18 – Verses 37,38,63

Suggested reading:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes:

Students will be able to understand:

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

Member Secretary	Chairman, BoS		Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)		(Prof. A.M.Mahalle)

SHP121(H) CONSTITUTION OF INDIA

Teaching Scheme: --- **Credit:00**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

Course Objectives:

To acquaint students about constitution of India, Fundamental rights, fundamental duties, electoral process and role of central, state, and local government and its administration.

Course Content

Unit I: Introduction to Constitution of India
Salient features of the Constitution of India, Preamble of the Constitution, fundamental rights and fundamental duties, Directive Principles of State Policy, and relevance of directive principles. Parliamentary Form of Government in India- President, Vice-President, Prime Minister along with council of Minister, Parliament, Supreme court, Electoral process in India. Amendment procedure.

Unit II: State executives Governor, chief minister, state legislature, high courts of state,

Unit III: Role and functions of local self government- Municipalities in India, with special reference to 73rd amendment. Panchayat Raj in India with special reference to 74th amendment.

Course outcomes:

On the successful completion of this course, Students shall be able to-

1. Understand and remember the knowledge of basic information about Indian Constitution.
2. Apply the knowledge of fundamental rights and fundamental duties.

Reference Books: -

1. An Introduction to Constitution of India, M.V.Pylee, Vikas Publishing, 2002
2. Constitution of India, Dr. B. R. Ambedkar, Government of India Publication
3. Latest Publications of Indian Institute of Human Rights, New Delhi

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP 221 ANTENNAS AND RADIATING SYSTEMS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30Hrs.

Course Objective:

The students shall

I. Be acquainted with various types of antennas and different methods of their analysis.
II. Develop the concepts of antenna arrays and their applications.
III. Be able to appreciate the role of aperture antennas in communication systems
IV. Be able to understand radiation pattern, how to design antenna and antenna arrays.

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, Cass grain reflectors, Introduction to MIMO.

References:

1. Constantine A. Balanis, "Antenna Theory Analysis and Design", John Wiley &

Member Secretary	Chairman, BoS		Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)		(Prof. A.M.Mahalle)

Sons, 4th edition, 2016.
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-Grew Hill,1984. R. I.J.Bhal and P.Bhartia, "Micro-strip antennas", Artech house, 1980.

Course Outcomes:

At the end of this course, students shall be able to

ETP221.1	Compute the far field distance, radiation pattern and gain of an antenna for given current distribution.
ETP221.2	Estimate the input impedance, efficiency and ease of match for antennas.
ETP221.3	Compute the array factor for an array of identical antennas.
ETP221.4	Design antennas and antenna arrays for various desired radiation pattern Characteristics

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP222 ANALOG AND DIGITAL CMOS VLSI DESIGN

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objective:

I. To understand the operation of MOS devices.
II. To analyze MOS devices in small and large signal conditions.
III. To understand back-end design tools.
IV. To impart in-depth knowledge about switched capacitors and Op-AMP using MOS devices.

Review: Basic MOS structure and its static behavior, Quality metrics of a digital design: Cost, Functionality, Robustness, Power, and Delay, Stick diagram and Layout, Wire delay models. Inverter: Static CMOS inverter, Switching threshold and noise margin concepts and their evaluation, Dynamic behavior, Power consumption.

Physical design flow: Floor planning, Placement, Routing, CTS, Power analysis and IR drop estimation-static and dynamic, ESD protection-human body model, Machine model. Combinational logic: Static CMOS design, Logic effort, Ratioed logic, Pass transistor logic, Dynamic logic, Speed and power dissipation in dynamic logic, Cascading dynamic gates, CMOS transmission gate logic.

Sequential logic: Static latches and registers, Bi-stability principle, MUX based latches, Static SR flip-flops, Master-slave edge-triggered register, Dynamic latches and registers, Concept of pipelining, Pulse registers, Non-bistable sequential circuit. Advanced technologies: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET etc. Analog CMOS Design:

Single Stage Amplifier: CS stage with resistance load, Divide connected load, Current source load, Triode load, CS stage with source degeneration, Source follower, Common gate stage, Cascade stage, Choice of device models. Differential Amplifiers: Basic difference pair, Common mode response, Differential pair with MOS loads, Gilbert cell.

Passive and active current mirrors: Basic current mirrors, Cascade mirrors, Active current mirrors. Frequency response of CS stage: Source follower, Common gate stage, Cascade stage and difference pair, Noise

Operational amplifiers: One stage OPAMP, Two stage OPAMP, Gain boosting, Common mode feedback, Slew rate, PSRR, Compensation of 2 stage OPAMP, Other compensation techniques.

References:

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Principal (Prof. A.M.Mahalle)

1. J P Rabaey, A P Chandrakasan, B Nikolic, “Digital Integrated circuits: A design perspective”, Prentice Hall electronics and VLSI series, 2nd Edition.
2. Baker, Li, Boyce, “CMOS Circuit Design, Layout, and Simulation”, Wiley, 2nd Edition.
3. Behzad Razavi , “Design of Analog CMOS Integrated Circuits”, TMH, 2007.
4. Phillip E. Allen and Douglas R. Holberg, “CMOS Analog Circuit Design”, Oxford, 3rd Edition. R J Baker, “CMOS circuit Design, Layout and Simulation”, IEEE Inc., 2008.
5. Kang, S. and Leblebici, Y., “CMOS Digital Integrated Circuits, Analysis and Design”, TMH, 3rdEdition. Pucknell, D.A. and Eshraghian, K., “Basic VLSI Design”, PHI, 3rd Edition.

Course Outcomes:

At the end of this course, students will be able to

ETP222.1 Analyze, design, optimize and simulate analog and digital circuits using CMOS constrained by the design metrics.

ETP222.2 Connect the individual gates to form the building blocks of a system.
ETP222.III Use EDA tools like Cadence, Mentor Graphics and other open source software
tools like Ngspice.

ETP222.3 Analyze switched capacitors and Op-AMP using MOS devices.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP223 IMAGE AND VIDEO PROCESSING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100 ESC**

Duration: 2.30hrs

Course Objectives:

Students will be able to understand,

I. Basic concepts of image processing, fundamentals and mathematical models in digital image and video processing.
II. Different types of image transforms for image processing
III. Image enhancement and develop time and frequency domain techniques for it.
IV. Image segmentation, restoration, and morphological signal processing with applications.

Introduction to Digital Image Processing & Applications: elements of visual perception, Mach band effect, sampling, quantization, basic relationship between pixels, color image fundamentals-RGB-HSI models, image transforms - two dimensional orthogonal and unitary transforms, separable unitary transforms, basis images, DFT, WHT, KLT, DCT and SVD

Image compression: lossy and lossless compression, image compression standards, Application in various fields

Image Enhancement: filters in spatial and frequency domains, histogram-based processing, homomorphic filtering, image restoration: degradation models, PSF, circulant and block-circulant matrices, deconvolution, restoration using inverse filtering, Wiener filtering and maximum entropy based methods, image segmentation: pixel classification, bi-level thresholding, multilevel thresholding, adaptive thresholding, spectral & spatial classification, edge detection, Hough transform, region growing.

Boundary Representation: chain codes, polygonal approximation, boundary segments, boundary descriptors, regional descriptors, relational descriptors, object recognition, pattern and pattern classes, recognition based on decision theoretic methods, matching, optimum statistical classifiers, structural methods, matching shape numbers, string methods, morphological image processing, erosion and dilation, opening or closing, HIT or MISS transformation, basic morphological algorithms, grey scale morphology.

Video Processing: display enhancement, video mixing, video scaling, scan rate conversion, representation of digital video, Spatio-temporal sampling, video compression-motion estimation, intra and interframe prediction, perceptual coding, standards - MPEG, H.264.

References:

1. Fundamentals of Digital Image processing, A. K. Jain, Pearson Education, 1989
2. Digital Image Processing using MATLAB, R. C. Gonzalez , R. E. Woods and S. L. Eddins: Pearson Education, 2004

Member Secretary	Chairman, BoS		Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)		(Prof. A.M.Mahalle)

3. Digital Image Processing; G. A. Baxes: John Wiley, 1994
4. Digital Image Processing and Computer Vision; R.J. Schalkoff: John Wiley, 1989.
5. Image Processing; Sid Ahmed: McGraw - Hill, 1994.
6. Digital Video and Audio Compression; S.J. Solari: McGraw - Hill, 1996.
7. Video Processing and Communications" by Yao Wang, Joern Ostermann, and Ya - Qin Zhang, Prentice Hall, 2002, ISBN 0 - 13 - 017547 - 1
8. Digital Video Processing , M. Tekalp Prentice Hall, 1995, ISBN 0 - 13 - 190075 - 7
9. The Art of Digital Video, J. Watkinson, 3rd edition, Focal Press, 2000. 11. "Video Demystified", K. Jack, 3rd edition, Llh Technology Publishing, 2001.
10. Motion Analysis and Image Sequence Processing, edited by M.I. Sezan and R.L. Lagendijk, Kluwer Academic Publishers, 1993.
11. Image and Video Compression Standards: Algorithms and Architectures, V. Bhaskaran and K. Konstantinides, Kluwer Academic Publishers, 2nd edition, 1997.

Course Outcomes:

At the end of the course student will be able to:

ETP223.1	Understand theory and models in Image and Video Processing.
ETP223.2	Interpret and analyze 2D signals in frequency domain through image transforms.
ETP223.3	Apply quantitative models of image and video processing for various engineering applications
ETP223.4	Develop innovative design for practical applications in various fields.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP224 PROGRAM ELECTIVE II

ETP224(A) SATELLITE COMMUNICATION

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100 ESE**
duration: 2.30hrs

Course Objectives:

To make the student understand

I. The architecture of satellite systems.
II. Various aspects like orbital equations, different sub systems of satellite, parameter to be considered while designing link budget, modulation and multiple access schemes.
III. How to design link budget and solve numerical of orbital motions.

Architecture of Satellite Communication System: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications, and frequency bands used for satellite communication and their advantages/drawbacks.

Orbital Analysis: Orbital equations, Kepler's laws of planetary motion, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc of a satellite, concepts of Solar day and Sidereal day.

Satellite sub-systems: Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems, antenna sub-system.

Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

Satellite link budget: Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions, Case study of Personal Communication system (satellite telephony) using LEO.

Modulation and Multiple Access Schemes: Modulation and Multiple Access Schemes used in satellite communication. Typical case studies of VSAT, DBS-TV satellites and few recent communication satellites launched by NASA/ ISRO. GPS system.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

References:

1 Timothy Pratt and Others, “Satellite Communications”, Wiley India, 2nd edition, 2010.
2 S. K. Raman, “Fundamentals of Satellite Communication”, Pearson Education India, 2011.
3 Tri T. Ha, “Digital Satellite Communications”, Tata McGraw Hill, 2009.
4 Dennis Roddy, “Satellite Communication”, McGraw Hill, 4th Edition, 2008.

Course Outcomes:

At the end of this course, students will be able to

ETP224(A).1 Visualize the architecture of satellite systems as a means of high speed, high range communication system.
ETP224(A).2 State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.
ETP224(A).3 Solve numerical problems related to orbital motion.
ETP224(A).4 Design of link budget for the given parameters and conditions.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP224(B) PROGRAMMING LANGUAGE FOR EMBEDDED SYSTEMS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objective:

To make the student able

I. To understand fundamental of embedded C programming
II. To learn how to develop and analyze algorithms in C++
III. To comprehend Object oriented programming
IV. To study various scripting languages

Embedded 'C' Programming - Bitwise operations, Dynamic memory allocation, OS services - Linked stack and queue, Sparse matrices, Binary tree - Interrupt handling in C, Code optimization issues - Writing LCD drives, LED drivers, Drivers for serial port communication - Embedded Software Development Cycle and Methods (Waterfall, Agile)

Object Oriented Programming - Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, objects, classes, data members, methods, data encapsulation, data abstraction and information hiding, inheritance, polymorphism

CPP Programming: 'cin', 'cout', formatting and I/O manipulators, new and delete operators, Defining a class, data members and methods, 'this' pointer, constructors, destructors, friend function, dynamic memory allocation

Overloading and Inheritance: Need of operator overloading, overloading the assignment, overloading using friends, type conversions, single inheritance, base and derived classes, friend classes, types of inheritance, hybrid inheritance, multiple inheritance, virtual base class, polymorphism, virtual functions.

Templates: Function template and class template, member function templates and template arguments, Exception Handling: syntax for exception handling code: try-catch- throw, Multiple Exceptions.

Scripting Languages Overview of Scripting Languages – PERL, CGI, VB Script, Java Script. PERL: Operators, Statements Pattern Matching etc. Data Structures, Modules, Objects, Tied Variables, Inter process Communication Threads, Compilation & Line Interfacing.

References:

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

1. Michael J. Pont, “Embedded C”, Pearson Education, 2nd Edition, 2008 .
2. Randal L. Schwartz, “Learning Perl”, O’Reilly Publications, 6th Edition 2011
3. A. Michael Berman, “Data structures via C++”, Oxford University Press, 2002
4. Robert Sedgewick, “Algorithms in C++”, Addison Wesley Publishing Company,1995
5. Abraham Silberschatz, Peter B, Greg Gagne, “Operating System Concepts”, John,Willey &Sons, 2005

Course Outcomes:

At the end of this course, students shall be able to

ETP224(B).1 Write an embedded C application of moderate complexity.
ETP224(B).2 Develop and analyze algorithms in C++.
ETP224(B).3 Differentiate interpreted languages from compiled languages.
ETP224(B).4 Able to apply scripting language for different applications.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP 224(C) PATTERN RECOGNITION AND MACHINE LEARNING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student able

I. To Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms.
II. To Understand the basic methods of Neural Network along with new training Methods.
III. To understand deep learning and apply unsupervised classification methods to detect and characterize patterns in real-world data.
IV. To Develop prototype pattern recognition algorithms that can be used to study algorithm behavior and performance against real-world multivariate data.

Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bayes rule, discriminant functions, loss functions and Bayesian error analysis

Linear models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

Neural Network: Perceptron, multi-layer perceptron, backpropagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Adaboost, Deep Learning

Linear discriminant functions-Decision surfaces, two-category, multi-category, minimum-squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

Algorithm independent machine learning-lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers
Unsupervised learning and clustering-k-means clustering, fuzzy k-means clustering, hierarchical clustering

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

References:

1. RichardO.Duda,DavidG.Stork,"PatternClassification",2ndEditionJohn Wiley & Sons,2001.
2. Trevor Hasti, Robert Tibshirani, Jerome H. Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer, 2009.
3. C. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

Course Outcomes

At the end of this course, students shall be able

ETP224(C).1 To study the parametric and linear models for classification.

ETP224(C).2 To design neural network and SVM for classification.

ETP224(C).3 To develop machine independent and unsupervised learning techniques.

ETP224(C).4 To study algorithm independent machine learning.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP 224(D) WIRELESS SENSOR NETWORKS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives: To make the student understand

I. Various parameters for designing wireless sensor network.
II. How to select optimum sensors depending on application.
III. Different standards and protocols of wireless sensor network.
IV. What are different energy and security challenges involved in wireless sensors

Introduction and overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.

Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): tinyOS, MANTIS, Contiki, and RetOS.

Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet)

Overview of sensor network protocols (details of atleast 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi-hop and cluster based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

Data Management: Data dissemination and processing; differences compared with other database management systems, data storage; query processing.

Specialized features: Energy preservation and efficiency; security challenges; fault tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.

References:

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

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.

Course Outcomes:

At the end of this course, students shall be able to

ETP224(D).1	Design wireless sensor network system for different applications under consideration.
ETP224(D).2	Understand the hardware details of different types of sensors and select right type of sensor for various applications.
ETP224(D).3	Use operating systems and programming languages for wireless sensor nodes, performance of wireless sensor networks systems and platforms.
ETP224(D).4	Handle special issues related to sensors like energy conservation and security challenges.

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Government College of Engineering Amravati	Principal (Prof. A.M.Mahalle)

SHP221 RESEARCH METHODOLOGY

Teaching Scheme: 02L **Credit: 02**

Evaluation scheme: 20 TA+ 30 MSE **Total Marks:50**

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 Plagiarism, Research ethics

Unit 3: 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: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

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.

Suggested reading

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

2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

3. Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"

4.Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

5.Mayall , "Industrial Design", McGraw Hill, 1992.

6.Niebel , "Product Design", McGraw Hill, 1974.

7.Asimov , "Introduction to Design", Prentice Hall, 1962.

8.Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

Course Outcomes:

At the end of this 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 to be 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 benefit

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Government College of Engineering Amravati	Principal (Prof. A.M.Mahalle)

ETP 225 SYSTEM DESIGN AND COMMUNICATION LAB- II

Teaching Scheme: 06P **Total: 06** **Credits: 03**

Evaluation Scheme: 50 Internal + 50 External **Total Marks: 100**

The instructor may choose experiments as per his requirements, so as to cover entire contents of the courses ETP221, ETP222, ETP223 and/or ETP224. Minimum 10 experiments should be performed

---

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

EPT321 PROGRAM ELECTIVE III

ETP 321(A) WIRELESS COMMUNICATION

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student understand

I. Various parameters for designing wireless communication system.
II. How to make use of frequency reuse and its analysis.
III. Different multiple access techniques and design procedure.
IV. About path loss, interference occurs and different contemporary wireless system and protocols.

Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction techniques and methods to improve cell coverage, Frequency management and channelassignment.GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM.2.5 G Standards: High speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS),2.75 G Standards: EDGE.

Spectral efficiency analysis based on calculations for Multiple access technologies: TDMA, FDMA and CDMA, Comparison of these technologies based on their signal separation techniques, advantages, disadvantages and application areas. Wireless network planning (Link budget and power spectrum calculations).

Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading. Equalization, Diversity: Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, polarization, frequency diversity, Interleaving.

Code Division Multiple Access: Introduction to CDMA technology, IS 95 system Architecture, Air Interface, Physical and logical channels of IS 95, Forward Link and Reverse link operation, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Evolution of IS 95 (CDMA One) to CDMA 2000, CDMA 2000 layering structure and channels.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

Higher Generation Cellular Standards:3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, Introduction to 5G.

References:

1. H. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5thedition, 2008.
2. V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.
3. T.S.Rappaport, "Wireless Communications Principles and Practice", 2ndedition, PHI,2002.
4. William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2ndedition, TMH, 1995.
5. Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London, 1997.

Course Outcomes:

At the end of this course, students shall be able to

EPT321 (A). 1 Design appropriate wireless communication systems.

ETP321 (A).2 Apply frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, handoff techniques.

ETP 321(A).3 Analyze and design CDMA system functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using the technology

ETP 321(A). 4 Understanding upcoming technologies.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP321(B) VLSI DESIGN VERIFICATION AND TESTING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student able

I. To understand fundamental Verilog concepts of today's most advanced digital design techniques.
II. To study gate, dataflow (RTL), behavioral, and switch level modeling, describes leading logic synthesis methodologies.
III. To learn timing and delay simulation.
IV. To introduces essential techniques and to develop complex digital designs using EDA tools.

Verification guidelines: Verification Process, Basic testbench functionality, directed testing, Methodology basics, Constrained-Random stimulus, Functional coverage, Testbench components, Layered testbench, Building layered testbench, Simulation environment phases, Maximum code reuse, Testbench performance.

Data types: Built-in data types, Fixed-size arrays, Dynamic arrays, Queues, Associative arrays, Linked lists, Array methods, Choosing a storage type, Creating new types with type def , Creating user-defined structures, Type conversion, Enumerated types, Constants strings, Expression width.

Procedural statements and routines: Procedural statements, tasks, functions and void functions, Routine arguments, Returning from a routine, Local data storage, Time values Connecting the testbench and design: Separating the testbench and design, Interface constructs, Stimulus timing, Interface driving and sampling, Connecting it all together, Top-level scope Program – Module interactions.

SystemVerilog Assertions: Basic OOP: Introduction, think of nouns, Not verbs, your first class, where to define a class, OOP terminology, Creating new objects, Object de-allocation, Using objects, Static variables vs. Global variables, Class methods, Defining methods outside of the class, Scoping rules, Using one class inside another, Understanding dynamic objects, Copying objects, Public vs. Local, Straying off course building a testbench.

Randomization: Introduction, What to randomize, Randomization in SystemVerilog, Constraint details solution probabilities, Controlling multiple constraint blocks, Valid constraints, In-line constraints, The pre_randomize and post randomize functions,

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

Random number functions, Constraints tips and techniques, Common randomization problems, Iterative and array constraints, Atomic stimulus generation vs. Scenario generation, Random control, Random number generators, Random device configuration.

References:

1. Chris Spears, " System Verilog for Verification", Springer, 2nd Edition
2. M. Bushnell and V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers
3. IEEE 1800-2009 standard (IEEE Standard for SystemVerilog— Unified Hardware Design, Specification, and Verification Language).
4. System Verilog website – www.systemverilog.org
5. http://www.sunburstdesign.com/papers/CummingsSNUG2006Boston_System Verilog Events.pdf
6. General reuse information and resources www.design-reuse.com
7. OVM, UVM(on top of SV) www.verificationacademy.com
8. Verification IP resources
   http://www.cadence.com/products/fv/verification_ip/pages/default.aspx
   http://www.synopsys.com/Tools/Verification/FunctionalVerification/VerificationIP/Pages/defa ult.aspx Random number generators, Random device configuration.

Course Outcomes:

At the end of this course, students shall be able to

ETP321B.I Familiarity of Front end design and verification techniques and create reusable test environments.

ETP321B.II Verify increasingly complex designs more efficiently and effectively.

ETP321B.III Analyze timing and delay simulation.

ETP321B .IV Use EDA tools like Cadence, Mentor Graphics.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

ETP321(C) COMPUTER VISION

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student able

I. To understand the image formation models and feature extraction for computer vision.
II. To Study and Identify the segmentation and motion detection.
III. To understand estimation techniques.
IV. To Study Develop small applications and detect the objects in various applications.

Image Formation Models, Monocular imaging system, Orthographic & Perspective Projection

Camera model and Camera calibration , Binocular imaging systems Image Processing and Feature Extraction , Image representations (continuous and discrete), Edge detection, Motion Estimation

Regularization theory, Optical computation , Stereo Vision , Motion estimation , Structure from motion Shape Representation and Segmentation , Deformable curves and surfaces , Snakes and active contours

Level set representations , Fourier and wavelet descriptors, Medial representations , Multi-resolution analysis

Object recognition, Hough transforms and other simple object recognition methods

Shape correspondence and shape matching , Principal component analysis, Shape priors for recognition

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

References:

1. Computer Vision-A modern approach, D. Forsyth and J. Ponce, Prentice Hall , 2002
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A.Verri, Publisher: Prentice Hall,1998.
3. Robot Vision, by B. K. P. Horn, McGraw - Hill,1986

Course Outcomes:

At the end of this course, Students shall be able to

ETP321(C).I Study the image formation models and feature extraction for computer vision

ETP321(C).II Identify the segmentation and motion detection

ETP321(C).III Identify estimation techniques

ETP321(C).IV Develop small applications and detect the objects in various applications

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Principal (Prof. A.M.Mahalle)

ETP321(D) NETWORK SECURITY AND CRYPTOGRAPHY

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

ESE duration: 2.30hrs

Course Objectives:

To make the student able

I. To understand the fundamentals of Cryptography and acquire knowledge on standard algorithms.
II. To understand the various key distribution and management schemes.
III. To understand how to deploy encryption techniques to secure data in transit across data networks
IV. To design security applications in the field of Information technology

Security- Need, security services, Attacks, OSI Security Architecture, one time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

Number Theory- Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

Private-Key (Symmetric) Cryptography- Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

Public-Key (Asymmetric) Cryptography- RSA, Key Distribution and Management Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms:MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

Authentication- IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

System Security- Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Counter measures, Firewalls, Firewall Design Principles, Trusted Systems.

References:

Member Secretary (Dr. S.S. Thakare)	Chairman, BoS (Dr. P.R.Deshmukh)	Principal (Prof. A.M.Mahalle)

1. William Stallings, “Cryptography and Network Security, Principles and Practices”, Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security, Private Communication in a Public World”, Prentice Hall, 2nd Edition.
3. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, “Security Architecture, Design Deployment and Operations”, RSA Pres,
4. Stephen Northcutt, Leny Zeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey,“Inside Network Perimeter Security”, Pearson Education, 2nd Edition
5. Richard Bejtlich, “The Practice of Network Security Monitoring:Understanding Incident Detection and Response”, William Pollock Publisher, 2013.

Course Outcomes:

At the end of the course students shall be able to:

ETP321(D).1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
ETP321(D).2	Identify the security issues in the network and resolve it.
ETP321(D).3	Evaluate security mechanisms using rigorous approaches, including theoretical
ETP321(D).4	Compare and Contrast different IEEE standards and electronic mail Security

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

SHP321 OPEN ELECTIVE
SHP321(A) BUSINESS ANALYTICS

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**
Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**
Duration of ESE : 2 Hrs.30 min.

Course Objectives :

1.Understand the role of business analytics within an organization.

2.Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.

3.To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making

4.To become familiar with processes needed to develop, report, and analyze business data.

5.Use decision-making tools/Operations research techniques.

6.Mange business process using analytical and management tools.

7.Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

Unit 5:
Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit 6:
Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Suggested reading :

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2. Business Analytics by James Evans, persons Education.

Course outcome :

1.Students will demonstrate knowledge of data analytics.

2.Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.

3.Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.

4 Students will demonstrate the ability to translate data into clear, actionable insights

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP321(B) INDUSTRIAL SAFETY

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**
Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**
Duration of ESE : 2 Hrs.30 min.

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP321(C) OPERATIONS RESEARCH

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**
Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**
Duration of ESE : 2 Hrs.30 min.

Unit 1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Course Outcomes :

At the end of the course, the student should be able to

1. apply the dynamic programming to solve problems of discreet and continuous variables
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.

Member Secretary	Chairman, BoS		Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)		(Prof. A.M.Mahalle)

SHP321(D) COST MANAGEMENT OF ENGINEERING PROJECTS

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**

Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**

Duration of ESE : 2 Hrs.30 min.

Introduction and Overview of the Strategic Cost Management process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution : conception to commissioning. Project execution as conglomeration of technical and non technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team : Role of each member. Importance Project site : Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Suggested reading :

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of CostAccounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP321(E)COMPOSITE MATERIALS

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**

Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**

Duration of ESE : 2 Hrs.30 min.

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Suggested reading :

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.
Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP321(F) WASTE TO ENERGY

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**
Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**
Duration of ESE : 2 Hrs.30 min.

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Suggested reading :

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

SHP321(G) FINANCE MANAGEMENT

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**
Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**
Duration of ESE : 2 Hrs.30 min.

Financial Management, objectives and goals, Fixed Capital, Floating Capital, Fund flow analysis and Fund flow statements. Ratio analysis: Classification, structural group, standards for comparison and limitations

Profit planning and Break-even analysis, margin of safety. Financial Budgets, control measures, Authorized capital, working capital, reserve, capital Management, floating of shares, share capitals & fund raising –methods and their appraisal.

Control measures– Payback approach, Standard costing, Actual costing, Operating ratio, techniques of cost control, Marginal cost.

Elements of Costs: Material, Labor, Expenses, Overheads, Direct and Indirect Cost, Fixed and Variable Cost, other classifications. Allocation of overheads Methods for Depreciation calculation, Budgetary control and Variance analysis, Activity based costing (ABC). Biases in cash flow estimation.

Appraisal criteria: Net Present Value, benefit cost ratio, internal rate of returns urgency, payback period, accounting rate of returns, investment appraisal in practice

Analysis of Risk, Types and measure of risk , simple estimation of risk, sensitivity analysis, scenario analysis, Special decision situations: Choice between mutually exclusive projects of unequal life, optimal timing decision, determination of economic life, inter-relationships between investment and financing aspects, inflation and capital budgeting. Analysis of firm and market risk:

Portfolio theory and capital budgeting, Capital Asset Pricing Model.

Suggested reading :

1. J Pandey I M., Financial Management, Vikas Publication,10th Edition 2013
2. Henry M. Stenier, “Engineering economics Principles”, Mc Graw Hill Publication.
3. C. B. Gupta, “Fundamentals of Business”, Sultan Chand & Company.
4. S. K. Basu, K.C. Sahu and Rajiv B, “Industrial Organisation and Management”, PHI New Delhi, Nov 2012.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

SHP321(H) PROJECT MANAGEMENT

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**

Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks :100**

Duration of ESE : 2 Hrs.30 min.

Introduction: Human Factors and Systems, Information Input and Processing, Visual Displays of Dynamic Information, Human Output and Control: Physical Work and Manual Materials Handling, Motor Skills, Human Control of Systems, Hand Tools and Devices.

Definition of Ergonomics and its significance in designing workplace layout and detailed motion plan of work, Man-Machine Symbiosis, Human Factors in design & manufacturing, Viz. pressure of the environment, temperature, humidity etc., Principles of motion economy, anthropometric condition, stability criterion etc. Biodynamic analysis for design of products & its concept of learning by man and machine;

Measurement of Learning Index and training for each job and each man, Product design – various aspects including ergonomic design and reliability based design.

Dynamic consideration in design of product using vibration stability in biomechanisms. Safety in manufacturing. Considerations of human stress, Allowable limit of stress, stress adjustment.

Estimation of human error and human reliability, combining various forms of human error by random number simulation, Human Error, Accidents and safety, Human Factors and the Automobile, Human Factors in Systems Design.

Dynamic consideration in project operations, leadership, requirement, communication process, motivating a diverse workflow, facilitating team decisions, resolving interpersonal conflicts, managing different people, strengthening team accountability

Suggested reading :

1. Sanders, M.M. & Mc Cormick, E.J., Human Factors in Engineering & Design, McGraw-Hill, 7th ed. (1993)
2. S. K. Basu, K.C. Sahu and Rajiv B, Industrial Organisation and Management –, PHI New Delhi, Nov 2012.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

SHP321(I) DATA STRUCTURE AND ALGORITHM

Teaching Scheme : 03 L + 00 T Total 03 **Credit : 03**

Marking Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE : 2 Hrs.30 min.

Course Outcomes: Students will be able to:

I. Write neat code by selecting appropriate data structure and demonstrate a working solution for a given Problem.

II. Think of all possible inputs to an application and handle all possible errors properly.

III. Analyze "Clearly different possible solutions to a program and select the most efficient one.

IV. Write an application requiring an effort to fat least l000 lines of code to demonstrate a good working solution.

V. Demonstrate the ability to write reusable code and abstract data types in C, using object-based way of thinking

Introduction: Data, Data types. Object, data structure and abstract data types (ADT). Characteristics of an algorithm' Analyzing programs Frequency count Time and space complexity. Big 'O' and Ω notation. Best, average and worst cases. Dangling pointers and garbage memory.

Arrays, Files and Searching: Searching: linear and binary search algorithm. Hashing: hashing functions, chaining, overflow handling with and without chaining, open addressing: linear. Quadratic Teaching Scheme: Examination Scheme: probing. Files handling: text and binary files, use of various libraries for handling files.

Stacks and Queues: Stack and queue. as ADT. Operations on stack and queue. Implementations using arrays and dynamic memory allocation. Application of stack for expression evaluation, expression conversion. Recursion and stacks. Problems like maze and knight's tour.

Lists: List as ADT. Concept of linked organization of data against linked list. Singly linked list, doubly linked list, circular linked list. Representation & manipulations of polynomials/ sets using linked lists. Dynamic memory management. Representation of sparse matrix. Addition and transpose of sparse matrix.

Member Secretary	Chairman, BoS	Principal
(Dr. S.S. Thakare)	(Dr. P.R.Deshmukh)	(Prof. A.M.Mahalle)

Trees and Graphs: Basic terminology. Binary trees and its representation. Binary tree traversals (recursive and non-recusive) and various operations. Insertion and deletion of nodes in binary search tree. Representation of graphs using adjacency matrix, adjacency list. Implementation of algorithms for traversals; implementing Kruskal's. Prim's algorithms. Single source shortest paths using Djkstra's algorithm. Applications of graphs and trees.

Time Complexity Analysis, Algorithm Design: Verification of programs, invariants, assertions, proof of termination. Best, Average and Worst case analysis of binary search, quick sort, merge sort, insertion sort, hashing techniques, sparse matrix algorithms. Designing data structures for specific applications.

Books Recommended:

1. E. Horowitz, S. Sahni, S.Anderson-freed, "Fundamentals of Data Structures in C", Second Edition, University Press, ISBN 978-81-7371-605-8
2. B. Kernighan, D. futchie, "The C Programming Language", Prentice Hall of India, Second Edition, ISBN 8 1 -203-0596-5
3. Y. Langsam, M. Augenstin and A. Tarmenbaum, "Data Structues using C", Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1
4. Ellis Horowitz, S. Sahni, D. Mehta "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi 1995 ISBN 16782928
5. Jean-Paul Tremblay, Paul. G. Soresan, "An inhoduction to data structures with Applications", Tata Mc-Graw Hill International Editions, 2nd edition 1984, ISBN-O07-462471-7

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP322 DISSERTATION (PHASE- I)

Teaching Scheme: 20P **Total: 20** **Credits: 100**

Evaluation Scheme: 100 Internal **Total Marks: 100**

Course Outcomes:

At the end of this course, students shall be able to

ETP322.1	Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
ETP322.2	Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
ETP322.3	Ability to present the findings of their technical solution in a written report.
ETP322.4	Presenting the work in International/ National conference or reputed journals.

Syllabus Dissertation (Phase I):

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

1. Relevance to social needs of society
2. Relevance to value addition to existing facilities in the institute
3. Relevance to industry need
4. Problems of national importance
5. Research and development in various domain

Student shall complete dissertation work in III, & IV semesters individually. In III semester, student shall complete Literature survey and decide the dissertation topic. He/She shall complete conceptual study and design part of dissertation topic and submit the progress report in proper format. Student has to deliver a seminar on the selected topic (covering 25% or more work). It is to be evaluated internally by three member's panel of examiners headed by HoD wherein guide should be one of the members of the panel. Last date of submission of report shall be two weeks before the end of semester.

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)

ETP421 DISSERTATION (PHASE- II)

Teaching Scheme: 32P **Total: 32** **Credits: 100**

Evaluation Scheme: 100 Internal+100 External **Total Marks: 200**

Course Outcomes:

At the end of this course, students shall be able to

ETP421.1	Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
ETP421.2	Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
ETP421.3	Ability to present the findings of their technical solution in a written report.
ETP421.4	Presenting the work in International/ National conference or reputed journals.

Syllabus Dissertation (Phase II):

1. Student shall complete dissertation work in IV semester, and submit a progress report in proper format.
2. Dissertation (Phase-II): Internal assessment of dissertation (complete work) is to be carried out by three members panel of examiners headed by HOD wherein guide should be one of the members of the panel, for 100 marks. The external assessment of dissertation work is to be carried out by panel of examiners consisting of internal (guide) and external examiner for 200 marks.

Candidate shall present the entire work on Dissertation, followed by viva-voce. Last date of submission of dissertation will be the end of the semester. Please see Appendix-C of Rules & Regulation for Further information.

* Note: (ETP301) Dissertation Phase I & Seminar as prerequisite for (ETP401) Dissertation
In case of unsatisfactory performance, committee may recommend for extension or repeating the work

Member Secretary
(Dr. S.S. Thakare)

Chairman, BoS
(Dr. P.R.Deshmukh)

Principal
(Prof. A.M.Mahalle)