Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Name of the Course: Third Year B. Tech (Sem. – I & II)

(Syllabus to be implemented from Academic Year 2022-23)

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
Electronics & Telecommunication Engineering

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To make students competent for professional career in Electronics & allied fields.
2. To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields
3. To imbibe professional ethics, develop team spirit and effective communication skills to be successful leaders and managers with a holistic approach.
4. To nurture students to be sensitive to ethical, societal & environmental issues while conducting their professional work.

B. Program Outcomes

Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of t h e engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

1. Graduates will be able to attain a **solid foundation** in Electronics and Communication Engineering with an ability to function in multidisciplinary environment.
2. Graduates will be able to use **techniques and skills** to design, analyze, synthesize, and simulate Electronics and Communication Engineering components and systems.
3. Graduate will be capable of **developing programs** in Assembly, High level and HDL languages using contemporary tools for software development.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2022-23***

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET311	Electromagnetic Field Theory	3	1	--	4	30	70	25	125
ET312	Microcontrollers and Applications	3	--	--	3	30	70	25	125
ET313	Digital Signal Processing	3	-	--	3	30	70	25	125
ET314	Open Elective-I	3	1	--	4	30	70	25	125
SLM31	Self Learning Module–I (HSS Course)	--	--	--	2	--	50	--	50
Sub Total		12	2	--	16	120	330	100	550
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET312	Microcontrollers and Applications	--	--	2	1	--	50	--	--	50
ET313	Digital Signal Processing	--	--	2	1	--	50	--	--	50
ET315	Electronic Software Lab-III	1	--	4	3	--	50	--	50	100
Sub Total		--	--	8	5	--	150		50	200
Grand Total		**13**	**2**	**8**	**21**	**120**	**480**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech..Electronics& Telecommunication Engineering ***W.E.F. 2022-23***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET321	Antenna & Wave Propagation	3	1	--	4	30	70	25	125
ET322	Embedded System	3	--	--	3	30	70	25	125
ET323	Electronic System Design	3	--	--	3	30	70	25	125
ET324	Professional Elective-I	3	--	--	3	30	70	25	125
ET325	Open Elective-II	3	--	--	3	30	70	25	125
Sub Total		15	1	--	16	150	350	125	625
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET322	Embedded System	--	--	2	1	--	25	--	--	25
ET323	Electronic System Design	--	--	2	1	--	--	25	--	25
ET324	Professional Elective-I	--	--	2	1	--	--	--	--	--
ET325	Open Elective-II	--	--	2	1	--	--	--	--	--
ET327	Mini Project	--	--	2	1	--	50	--	25	75
Sub Total		--	--	10	5	--	100		25	125
Grand Total		**15**	**1**	**10**	**21**	**150**	**450**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA-Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

 Note –

1. Batch size for the practical /tutorial shall be of 16 students. On forming the batches, if the strength of remaining student exceeds 8, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year Part-I) of minimum 15 days shall be completed in any vacation after S.Y. Part-I but before Final Year Part-I & the report shall be submitted and evaluated in Final Year Part-I.

3. Self-Learning Module I at T.Y. B.Tech.– Semester-I

   - Student shall select & enroll a Self Learning Module-I Course from PAH Solapur University, Solapur HSS Course List (SLM31). Student must appear and pass university examination.
   - Curriculum for Humanities and Social Sciences (HSS), Self Learning Module-I is common for all undergraduate engineering programs.
   - Minimum four assignments for Self Learning Module (SLM31) shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute/department.

   OR

   - Student shall select and enroll for university approved minimum eight weeks MOOC based HSS course (SLM31), and complete its assignments. Student must appear and pass certificate examination conducted through MOOC courses.

4. Open Elective I & II shall be common and open for the students of the branches – Electronics Engineering, Electronics & Telecommunication Engineering and Electrical Engineering. Students of these branches can take any of these Open Electives. Syllabus and university examination question paper will be same for all these branches.

5. Student shall select Professional Elective-I from given course list. Student must appear and pass university examination.

6. Project group for T.Y. B.Tech. - Semester II – Mini Project shall not be of more than three students. This mini project may include simulation and/or Software and/or Hardware. Report of this work should be submitted at the end of semester.

8. ICA assessment shall be a continuous process based on student's performance in class tests, assignments, homework, subject seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions as applicable.

- **List of Open Electives -**

Sr.	Branch Offering Elective	Open Elective I	Open Elective II
1.	Electronics &Telecommunication Engineering	1. Managerial Economics 2. Project Management and Operation Research	1. Sensors and Applications 2. Open Source Technologies
2.	Electronics Engineering	Information Technology & Management	Operating Systems
3.	Electrical Engineering	Business Ethics	Power System Planning

- **List of Professional Elective I–**
  1. Optical Fiber Communication
  2. Image and Video Processing
  3. Multimedia Communication Technology
- **List of Self Learning Modules (HSS Course) (SLM 31)–**
  1. MOOC/University Defined Courses

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-I

ET311: ELECTROMAGNETIC FIELD THEORY

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30 Marks
ICA– 25 Marks

This course introduces electromagnetic field theory which deals with electric and magnetic field vectors. The course also introduces theoretical and analytical aspects of electromagnetic field, electromagnetic wave propagation and transmission lines.

Course Prerequisite:
Student shall have knowledge of vector operations.

Course Objectives:

1. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
2. To familiarize with the different concepts of electrostatic and magneto static fields.
3. To describe Maxwell's equations for different fields.
4. To expose the students to the ideas of EM waves and propagation through different media.
5. To derive transmission line equations and parameters.

Course Outcomes:
At the end of this course, Students will be able to,

1. Define and recognize different co-ordinate systems and apply divergence, gradient, curl to EM waves.
2. Derive the laws of electrostatic, magneto static fields and electromagnetic wave equation.
3. Apply Maxwell's equations for static, Time varying and Harmonic field.
4. Calculate transmission line parameters.
5. Apply knowledge of Smith chart to determine transmission line parameters.

Section- I

Unit 1: Vector calculus **(05)**

Scalars and vectors, vector algebra, coordinate system, differential length, surface and volume, point and vector transformations.

Unit 2: Electrostatics **(08)**

Coulomb's law & electric field intensity, electric field intensity for different charge configurations, Electric flux and flux density, Gauss's law and its applications, divergence theorem, electrostatic potential, potential gradient, electric dipole, electrostatic energy density, boundary conditions for electrostatic field.

Unit 3: Static magnetic field **(08)**

Biot Savart's law, Ampere's circuital law and its applications, Stroke's theorem, magnetic flux density, current carrying conductors in magnetic fields, torque on loop, energy stored in magnetic field, boundary conditions for magneto static field.

Section- II

Unit 4: Maxwell's equations **(07)**

Continuity equation for static conditions, displacement current and conduction current density, Maxwell's equations in integral form and point form, Maxwell's equations for static case, time varying field, harmonically varying field.

Unit 5: Electromagnetic wave propagation **(07)**

Wave propagation in dielectric & conducting media, modification in wave equations for sinusoidal time variations, propagation in good conductor, skin effect, Poynting theorem, power flow in uniform plane wave

Unit 6: Transmission lines **(07)**

Transmission line sections as circuit elements, Transmission line equations using field theory and circuit theory, transmission line primary constant (R,L,C,G) and secondary (Z_0, γ) constant , reflection coefficient, transmission coefficient, VSWR, Smith Chart and solution of transmission line problems using Smith Chart,.

- **Internal Continuous Assessment (ICA):**

ICA consists of **minimum eight tutorials** based upon above curriculum. Tutorial shall include numerical problems and derivations.

- **Text Books:**

1. Electromagnetic Engineering, William Hyte, 7th Edition, Tata McGraw Hill
2. Electromagnetic Waves, R.K. Shevgaonkar, Tata McGraw Hill
3. Electromagnetics by John D. Kraus - McGraw Hill Third Edition
4. Electromagnetic field theory & Transmission Lines, GSN Raju, Pearson Education

- **Reference Books:**

1. Electromagnetic Schaum's outline series by J.A.Edminister - Tata McGraw Hill
2. Problems and solutions in electromagnetic, William Hyte, Tata McGraw Hill
3. Electromagnetic Waves and Transmission Lines, Rao, Prentice Hall India Publications
4. Applied Electromagnetics by F. Ulaby (2001 Media Edition) – PHI

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T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-I

ET312: MICROCONTROLLERS AND APPLICATIONS

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30 Marks
ICA – 25 Marks
POE – 50 Marks

This course introduces Basics of microcontroller's theory which includes internal details of MCS51 series and PIC Microcontroller. The course also introduces Assembly level as well Embedded C Level programming aspects of both microcontrollers, Memory interfacing and Interfacing various I/O devices

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Course Prerequisite:
Student shall have knowledge of Digital Electronics.

Course Objectives:
1. To provide an introduction to microcontroller families and details of RISC and CISC microcontrollers.
2. To describe Core features and Peripheral features of Microcontrollers
3. To explain and practice assembly language and Embedded C programming techniques
4. To demonstrate and perform hardware interfacing and design for various applications.

Course Outcomes:
At the end of this course, Students will be able to,
1. Expose the fundamental features and operation of contemporary microcontroller
2. Demonstrate and perform hardware interfacing.
3. Explore the students to the fundamentals of CISC and RISC Microcontroller architectures
4. Introduce the various core and peripheral features in microcontroller family.
5. Develop applications programs in assembly language and C language for microcontrollers

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Section- I

Unit 1: : Introduction of Microcontroller (05)

Introduction, Microprocessor and Microcontrollers, CISC & RISC Microcontroller, Harvard and von Neumann architecture, Development platforms and tools for programming for Microcontroller.

Unit 2: The 8051 Architecture and Instructions (08)

8051 Microcontroller Hardware, Addressing modes, Instruction set ,Input / Output Pins, ports and Circuits, External Memory, Counters and Timers, Serial Data Input/ output, interrupts. Fundamentals of C programming.

.

Unit 3: Programming Microcontroller (8051) (08)

Programming in assembly and C for Input/ Output Ports, Serial Port Programming, Timer Programming and Interrupt Programming. Interfacing Switches, LED, Relay, Buzzer, LCD display, Matrix keyboard, Stepper Motor

Section-II

Unit 4: PIC Microcontrollers (05)

PIC Microcontrollers Introduction, Architecture, features, Configuration word and Instruction Set

Unit 5: PIC 16F877A Microcontroller Core Features (08)

Functional pin description, various registers, Program memory and data memory organization, Input / output ports, Interrupts, various kinds of RESET

Unit 6: Peripheral Features and Programming (08)

Input/ output ports Timers, Capture/ compare / PWM (CCP) Modules in PIC 16F877, Internal ADC, The Watchdog Timer. The Universal Synchronous Asynchronous Receiver Transmitter (USART) module.

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum Eight Practical based upon above curriculum. Equal weightage should be given to 8051and PIC 16F877A. Students should be introduced to assembly and embedded C programming and minimum four practical's should be taken using embedded C programming

- **Suggested List of Practical's:**

1. Arithmetic and Logic operations
2. Interfacing of Switches, LEDs and Buzzer.
3. Interfacing of Matrix Keyboard
4. Interfacing of LCD Display.
5. Use of Timer for generation of time delays
6. Use of Timer as counter.
7. Interfacing of Stepper motor.
8. Speed control of DC Motor using PWM.
9. Use of ADC of PIC Microcontrollers.
10. Use of Interrupts for any Application.
11. Use of CCP Module of PIC Controller
12. Serial communication.
13. Study of any one Industrial application using Microcontroller.

- **Text Books:**

1. The 8051 Microcontroller Architecture, programming and Applications by Kenneth Ayala Penram International (Third Edition)
2. The 8051 Microcontroller and Embedded systems by Muhammad Ali Mazidi Pearson Education Asia LPE (Second Edition)
3. Designs with PIC Microcontrollers by John B. Peatman Pearson Education Asia LPE
4. PIC Microcontroller & Embedded Systems – Mazidi – Pearson Education
5. Microcontrollers [Theory and Applications] by Ajay V Deshmukh- Tata McGraw Hill Education. Education

- **Reference Books:**

1. 8051 Microcontrollers programming and practice by Mike Predcko.
2. Data sheets of MCS51 family microcontrollers, PIC 16F877A Flash microcontrollers,
3. 8051 Microcontroller by I Stott, Mackenzie, Rathel & Phan – Fourth Edition - Pearson
4. Designing & Customizing of PIC Microcontrollers by Mike Predcko

Semester-I

ET313: Digital Signal Processing

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks
	POE – 50 Marks

The digital computers are large and expensive as a result their use was limited to general purpose Application. The development of powerful, smaller, faster and cheaper digital circuits and are performing complex digital processing functions and tasks. This course covers basic analysis tools and techniques for digital signal processing of signals. This course also presents design and implementation of Finite and Infinite Impulse Response Filter and also applications of DSP.

Course Prerequisite:

Student shall have knowledge of signals and system, basic knowledge of mathematics and transforming tools like Fourier transform, Laplace and Z-transform.

Course Objectives:

1. To interpret the concept of stability in the DSP system.
2. To analyze the given signal and convert time to frequency domain and vice versa using FT and Z transforming tools.
3. To draw the structure for realization of a given system.
4. To design FIR and IIR filters.
5. To describe audio, Telecommunication and Radar processing applications of DSP

Course Outcomes:

. At the end of this course, Students will be able to,

1. Solve problems based on Correlation and DFT.
2. Analyze response of the system using linear filtering.
3. Calculate FFT of the Discrete signal.
4. Calculate and analyze FIR & IIR filter coefficients using different techniques.
5. Realize transfer function of FIR & IIR filters using different methods.
6 .Apply concepts of DSP in various applications

Section- I

Unit 1: Introduction (02)

Introduction to DSP system, co-relation and its properties, Digital transfer function, stability Consideration. Types of DSP systems (No problems included)

Unit 2: Discrete Fourier Transform (07)

Frequency Domain Sampling and Reconstruction of Discrete Time Signals, DFT as linear Transformation, relation between DFT and Z transform, Properties of DFT, Computation of DFT & IDFT, multiplication of two DFTs and circular convolution.

.

Unit 3: Linear Filtering Method Based on DFT (06)

Use of DFT in linear filtering, Filtering of long data sequences such as Overlap-save and Overlap add method, Frequency analysis of signals using DFT.

Unit 4: FFT Algorithm (06)

Divide and conquer approach, Radix-2 FFT algorithm for the computation of DFT and IDFT, decimation in time (DIT) and decimation in frequency (DIF) algorithms.

Section- II

Unit 5: Realization of Digital Linear Systems (06)

Structures for realization of Discrete time systems
Structures for FIR Filters: Direct form, Cascade form & Lattice Structure.
Structures for IIR Filters: Direct form, Cascade form & parallel form.

Unit 6: FIR Filter Design (06)

FIR filter design: Introduction to FIR filters, Design of FIR filter using Fourier series method, design of FIR filters using windowing technique, FIR filter design using frequency sampling technique(type-I).

Unit 7: IIR Filter Design (06)

Analog low pass buttreworth filter and its design. IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation (problems on filter design up to 3rd order only), Characteristics of Butterworth filter.

Unit 8: Application (03)

Application of DSP in Audio processing, telecommunication & Radar signal processing

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum ten experiments based upon above curriculum.

- **Suggested List of Practical:**

1. Introduction to MATLAB.
2. Waveform generation using discrete time signals using MATLAB.
3. To implement auto co-relation and cross co-relation using MATLAB
4. To implement linear convolution using MATLAB and C-language.
5. Implementation of DFT and IDFT using MATLAB and C-language.
6. To implement circular convolution using MATLAB and C-language.
7. Fast convolution using Overlap add/Overlap save method using MATLAB.
8. Design of FIR filter using windowing technique.
9. Design of FIR filter using frequency sampling method.
10. Design of IIR filter using impulse invariant technique.
11. To design Butterworth filter using Bilinear transformation technique.
12. Introduction to Matlab Simulink.
13. Verification of sampling theorem using Matlab Simulink.

- **Text Books:**

1. Digital Signal Processing – Principles, Algorithms and ApplicationsJohn G Proakis-4th edition, Pearson Education
2. Digital Signal Processing by S Salivahanan, A Vallavaraj& C Gnanapriya –2nedition, TMH.
3. Discrete time signal ProcessingA.V. Oppenheim & R.W. Schafer.- Low price edition, John Wiley

- **Reference Books:**

1. Digital Signal Processing Ramesh Babu -4th Edition, Scientic Publication.
2. Digital Signal Processing Dr. Shaila D. Apte, Second edition, Wiley India.
3. Essentials of Digital Signal Processing using MATLAB Vinay K. Ingle & John G. Proakis, Cengage Learning, 2012
4. Digital Signal Processing- A Practical Approach, E. C. Ifleachor and B. W. Jervis, Second Edition, Pearson education.
5. Theory and Application of Digital Signal Processing Digital Rabiner& Gold-First edition, Prentice Hall
6. Digital Signal Processing S. Palani& D. Kalaiyarasi, Ane's Student Edition, Ane Books Pvt. Ltd New Delhi

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T. Y. B.Tech (Electronics& Telecommunication Engineering)

Semester-I

ET314.1: OPEN ELECETIVE-I

Managerial Economics

Teaching Scheme:
Lectures– 3 Hours/week, 3 Credits
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30Marks
ICA– 25 Marks

This course introduces basics of economics and concepts related to economics. The course also introduces theoretical and practical aspects of decision making for managers.

Course Prerequisite:
Student shall have knowledge basic management principles.

Course Objectives:

1. To make students aware to concepts of managerial economics
2. To introduce students to concepts of demand, supply and market
3. To introduce different tools for demand analysis and forecasting
4. To make students aware about production and cost functions
5. To make students aware about correlation of pricing with market, demand and supply

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Course Outcomes:
At the end of this course, Students will be able to,

1. Elaborate the concepts of managerial economics
2. Analyze the issues related to demand, supply and market
3. Use different tools for demand analysis and forecasting
4. Analyze the production and cost functions
5. Decide price on the basis of market, demand and supply

Section – I

Unit 1: Introduction: (07)

Meaning and Definition of Managerial Economics, Characteristics of Managerial Economics, Nature of Managerial Economics, Economics contribution to managerial decision, Scope of Managerial Economics –Microeconomics and Macroeconomics, Basics of Mathematical Tools – Statistics and Operational Research

Unit 2: Theory of Demand **(08)**

Concept of Demand, Supply, Market Equilibrium, Measuring value of market exchange, changes in Market equilibrium, Price ceilings and Price floors, Demand Schedule and Demand Curve, Approaches to Consumer demand analysis, Analysis of consumer behavior – Cardinal behavior and ordinal approach

Unit 3: Elasticity of Demand and Market Analysis **(06)**

Types Of Elasticity of Demand -Price Elasticity & Income Elasticity, Total Revenue and Marginal Revenue, Factors Affecting Elasticity of Demand, Importance of Elasticity of Demand, Elasticity for Nonlinear Demand Functions, Elasticity of Supply

Section – II

Unit 4: Demand Forecasting **(08)**

Concept of Demand Forecasting , Demand Forecasting Process ,Methods of Demand Forecasting- Survey Methods – Consumer survey and Opinion Poll, Statistical Method – Trend Projection, Barometric Method, Econometric Method, Simultaneous equation, Linear Regression Model, Multiple Regression, Basic concepts used in Linear Programming, Application of Linear Programming Techniques

Unit 5: Production Function and Cost Analysis **(06)**

Concept of production , Production Function, Theory of cost concepts, Determinants of Costs ,Cost of Production, Breakeven analysis- Linear, Non-linear,

Unit 6: Market Structure and Pricing Decision **(07)**

Objective of Market Structure, Demand side of market, Supply side of Market, Market Structure and Degree of Competition, Pricing Decision under Perfect Competition, Price Leadership

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- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight tutorials based upon above curriculum. Tutorial shall include case studies related to above curriculum.

- **Text Books:**

  1. Managerial Economics by D. N. Dwivedi – 8th Edition- Vikas Publications
  2. Managerial Economics Foundations of Business Analysis and Strategy- C. R. Thomas & Maurice – 8th Edition- McGraw Hill

- **Reference Books:**

  1. Managerial Economics Concepts and Applications - C. R. Thomas & Maurice – 8th Edition- MCGraw Hill
  2. Managerial Economics- Mathur N.D- Shivam Book House Private Limited, Jaipur

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T. Y. B.Tech (Electronics& Telecommunication Engineering)

Semester-I

ET314.2: OPEN ELECETIVE-I

Project Management and Operation Research

Teaching Scheme:
Lectures– 3 Hours/week, 3 Credits
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30Marks
ICA– 25 Marks

Course Prerequisite:

Software and its applications, management skills, Concept of projects.

Course Objectives:

1. To the successful development and implementation of all project's procedures.
2. To the achievement of the project's main goal within the given constraints.
3. To impart knowledge in concepts of Operations Research
4. To analyze models associated with Operations Research.

Course Outcomes:

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

1. To understand fundamental components of Project Management.
2. To understand different aspects of activity planning, Scheduling and risk Management techniques.
3. To know about Operations Research and LPP.
4. To understand different models used in Operations Research

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Section – I

Unit 1: Project Management **(07)**

Concepts of project management, objectives and function of project management, categories of project, project evaluation, project planning, project failure, project life cycle concept and cost components.

Unit 2: Project Planning and Scheduling (08)

Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques (PERT, GANTT chart (no numerical)).

Unit 3: Risk Management (06)

Risk & its categories, risk management planning, risk identification and risk register, Qualitative and quantitative risk assessment, Risk response strategies for positive and negative risks.

Section – II

Unit 4: Introduction of Operation Research (07)

Definition of operations research, Characteristics of operations research and its other aspects, Models of operations research, Limitations of operations research.

Unit 5: Linear Programming Problem & Replacement Model (08)

Introduction to LPP, Applications of LPP, Advantages of LPP, Formulation of problem, Graphical Method, Simplex method. Replacement Model–Introduction**,** Need for replacement, failure mechanism, Categories of replacement problems.

Unit 6: Assignment Model, Location and Layouts of facilities (06)

Introduction, applications of assignment models, types of assignment problems, Methods to solve balanced and unbalanced assignment problems, facility location, General Procedure for making location decisions, factors affecting location decision.

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight tutorials based upon above curriculum. Tutorial shall include case studies related to above curriculum.

- **Text Books:**

1. Hamdy Taha, "Operations Research – An Introduction", 7th edition PHI (2003)
2. S. D. Sharma, "Operation Research", Kedarnath and Rannalt Pub.
3. Hira and Gupta, "Operation Research", S. Chand and Co.
4. K Nagrajan, "Project Management", New Age International Publication
5. Pawan Jhabak, "Project Management", Himalaya Publishing House.

- **Reference Books:**

1. Rechard Newton, "Project Management- Step by Step", PEARSON
2. P Rama Murthy, "Operations Research", 2nd edition New Age International Publication

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T. Y. B.Tech (Electronics & Telecommunication Engineering)

Semester-I

ET316: ELECTRONIC SOFTWARE LAB-III

Teaching Scheme:
Practical – 4 Hours/week, 2 Credit
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
POE - 50 Marks

This course introduces Java Programming from basics to advanced Java concepts. The importance of Java language cannot be denied as it has already started ruling over the entire Software Industry. The aim of this course is to provide students with an understanding of the object-oriented design and programming techniques. Java, a prime object-oriented programming language, is used to illustrate this programming paradigm

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Course Prerequisite:
Students must be familiar with basic programming languages like C

Course Objectives:

1. To make students aware of Object Oriented features in Java.
2. To introduce students the ability of Java runtime library APIs
3. To make students facilitate error handling exceptions.
4. To make students aware of Java runtime library APIs for designing GUI applications

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Course Outcomes:
At the end of this course, Students will be able to,

1. Implement Object oriented features and server-side programming
2. Use Java runtime library APIs for implementing functionality of various applications
3. Implement exceptional handling through Java programming for a given problem.
4. Select appropriate Java runtime library APIs to create GUI and web application using Java language.

Section – I

Unit 1: Basics of Java and Strings in Java (07)

Basics: Java Runtime Environment, Naming Conventions, Language Basics: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays,

Type Casting. Fundamentals: String Class and Methods, Immutability of Strings, String Buffer Class and Methods, String Builder class and Methods.

Unit 2: Introduction to OOPs (07)

Objects and Classes, Fields and Methods, Abstraction, Encapsulation, Inheritance, Polymorphism, Type Compatibility and Conversion, Overriding Methods, Access control, Modifiers, Constructors, Abstract classes, Nested classes, Packages, Wrapper classes, Interfaces, Object Life time & Garbage Collection.

Unit 3: Exceptions, Error Handling and Basic IO (07)

Exceptions and Error Handling: Exceptions and Errors, Catching and Handling Exceptions, The try Block, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions, Custom Exceptions. J Unit Testing Framework. Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning and Formatting, Data Streams, Object Streams , File I/O Classes: Reading, Writing, and Creating Files and Directories.

Section – II

Unit 4: Java Collections Framework (07)

Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arrays of Objects, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator, Collections: Lists, Sets, Maps, Trees, Iterators and Collections, The Collection Class.

Unit 5 : Multithreading and Networking (07)

Multithreading: Creating Threads, Thread scheduling and priority, Thread interruptions and Synchronization. Network Programming: InetAddress, URLs, Socket (TCP & UDP) communication in Java, Servlet Programming.

Unit 6: GUI Programming using Swing & JDBC (07)

Swing package, Layouts, Events, Listeners and Event handling, and Swing Components. Introduction to JDBC, JDBC Drivers & Architecture, CRUD operations Using JDBC API.

- **Internal Continuous Assessment (ICA):**

Students should undertake minimum 08 practicals/assignments based on above topics.

- **Text Book:**

1. Head First Java – Kathy Sierra, Bert Bates, O'Reily Publication
2. The Java TM Programming Language By Ken Arnold, James Gosling, David Holmes, Pearson Publication
3. Core Java for Beginners- RashmiKanta Das, Vikas Publishing House Pvt. Ltd
4. Programming with Java, Balaguruswamy, TMH 5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House

- **Reference Books:**

1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc. (eResource: http://docs.oracle.com/javase/specs/)
2. Java: The Complete Reference 8 Edition - Herbert Schildt , Tata McGraw - Hill Education
3. Head First Servlets and JSP – Bryan Bosham, Kathy Sierra, Bert Bates, O'Reily Publication
4. The JavaTM Tutorials. Oracle Inc. (e-Resource: http://docs.oracle.com/javase/tutorial/)
5. Java Server Programming for Professionals - Ivan Bayross, Sharanam Shah, Cynthia Bayross And Vaishali Shah, Shroff Publishers and Distributors Pvt. Ltd, 2nd Edition

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Semester-II

ET321: ANTENNA AND WAVE PROPOGATION

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Tutorial – 1 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks

This course introduces Antenna and Wave Propagation which deals with different types of antenna, and propagation of wave over ground and through atmosphere. The course also introduces theoretical and analytical aspects of wave propagation and radiating system.

Course Prerequisite:

Student shall have knowledge of Electromagnetic Fundamentals.

Course Objectives:

The student will learn and understand
1. Basics of antenna
2. Various types of antenna and radiation mechanism of antenna
3. Techniques used for antenna parameters measurement
4. Wave propagation over ground, through troposphere and inosphere.

Course Outcomes:

At the end of this course, Students will be able to,
1. Identify basic antenna parameters.
2. Analyze radiation pattern of various antennas.
3. Illustrate techniques for antenna parameter measurements.
4. Identify the characteristics of radio wave propagation.
5. Understand the various applications of antenna.

Section-I

Unit 1:Antenna Fundamentals: (06)

Comparison between an antenna & transmission line, Radiation Principle, Antenna parameters: Beam area, Beam width, Polarization, Radiation Intensity, Beam Efficiency, Directivity and directive gain, radiation resistance, radiation efficiency, Antenna aperture-physical and effective apertures, effective height, antenna field zones.

Unit 2: Antenna Arrays: (07)

Arrays of two isotropic point sources, non isotropic Sources, principle of pattern multiplication, linear arrays of n elements, Broadside, End-fire radiation pattern, directivity, Beam-width and null directions, array factor.

Unit 3: HF, VHF and UHF Antennas: (08)

Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Radiated Power, Radiation Resistance.

Helical Antennas: Helical geometry, transmission and radiation modes, wide band characteristics of helical antenna.

Slot antenna: Patterns of slot antenna, Babinet's principle and complementary antennas, impedance of slot antennas. (Excluding mathematical derivations for Helical and Slot Antennas. The problems on Helical and Slot Antennas will be included.)

Section-II

Unit 4: UHF and Microwave Antennas: (07)

Important horn shapes, Design equation of horn antenna, Optimum Horn, Uses of horn antenna.

Reflector Antennas: Introduction, Plane Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods.

Microstrip Antennas: Introduction, Advantages and Limitations, Various microstrip patch configurations, Radiation mechanism, Feeding techniques, Applications of microstrip antenna.

Unit 5: Special Antennas: (06)

Introduction of frequency independent antennas –Spiral antenna, Log periodic antenna, Modern antennas- Reconfigurable antenna, Active antenna, Smart antenna.

Antenna Measurements: Measurement of Gain, Radiation pattern and Polarization.

Unit 6: Radio Wave Propagation: (08)

Modes of propagation, structure of atmosphere, ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, flat earth and curved earth concept. Sky wave propagation- Virtual Height, Critical frequency, Maximum usable frequency, Skip distance, Fading, Multi hop propagation.

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight tutorials based on above curriculum

- **Text Books:**

1. Antennas for All Applications – John D. Kraus and R. J. Marhefka, and Ahmad S. Khan TMH, New Delhi, 4th ed., (Special Indian Edition) 2010. Electromagnetic field theory & Transmission Lines, GSN Raju, Pearson Education
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd edition 2000

- **Reference Books:**

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

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Semester-II

ET322: EMBEDDED SYSTEMS

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30Marks
ICA – 25 Marks
POE – 25 Marks

This course introduces Embedded System Design with software and hardware perspective. The course also introduces practical design aspects of embedded system.

Course Prerequisite:
Student shall have knowledge digital circuits, basic C programming, Microcontroller fundamentals.

Course Objectives:
1. To make student realize different aspects and application areas of embedded systems.
2. To make student understand ARM core architecture.
3. To make student understand interfacing of input & output devices
4. To introduce to student concepts of Real time operating system.

Course Outcomes:
At the end of this course, Students will be able to,
1. Student can describe hardware and software architecture of embedded system.
2. Student can describe ARM7TDMI core architecture and Controller based on this architecture
3. Student can write C program for different applications for LPC2148microcontroller.
4. Student can interface different peripherals with LPC2148 microcontroller.
5. Student can describe microcontroller based real time systems for different applications.

Section - I

Unit 1: Embedded System Introduction (05)

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, energy and power analysis and program size optimization

Unit 2: System Architecture (08)

Introduction to ARM7TDMI core architecture, ARM extension family, Pipeline, LPC 2148, ARM instruction set, thumb instruction set, memory management, Bus architecture.

Unit 3: On Chip Peripherals (08)

Study of on-chip peripherals like I/O ports, PLL, timers / counters, interrupts, on-chip ADC, DAC, RTC module, WDT, PWM.

Section – II

Unit 4: Interfacing and Programming (08)

Introduction to Embedded C Programming, Basic embedded C programs for on-chip peripherals studied in system architecture like PLL, timers, ADC, DAC. Interfacing of devices – LED, Switches (buttons), 7-segment display, LCD display, DC motor.

Unit 5: Real Time Operating System (09)

Architecture of kernel, task scheduler, Threads, Process, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS, introduction to μcosII.

Unit 6: Case Studies (04)

Case studies like Digital Camera, Smart Card System based ATM and Mobile Internet Device.

- **Internal Continuous Assessment:**

ICA consists of 8 to 10 practical's based upon above curriculum.

- **Suggested Practical's List:**

1. Arithmetic and Logic operations
2. Interfacing of Switch, LED / Buzzer / Relay
3. Interfacing of LCD Display.
4. Interfacing matrix Keypad and display key pressed on LCD / Seven Segment Display
5. Use of Timer for generation of time delays
6. Use of Interrupts for any Application
7. Use of ADC of Microcontroller.
8. Interfacing of Stepper motor.
9. Interfacing of DC Motor.
10. USART Serial communication.
11. Creating two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.
12. Implementing a semaphore for any given task switching using RTOS on microcontroller board.
13. Implementing a Mailbox for task communication.

- **Text books:**

1. Embedded Systems: Architecture, Programming And Design by Rajkamal Tata McGraw-Hill

Education

2. Frank Vahid - Embedded Systems - Wiley India
3. ARM System Developer's Guide, Designing and Optimizing System Software - Andrew N. Sloss , Dominic Symes, Chris Wright - Morgan Kaufmann Publisher.
4. Embedded systems software primer - David Simon – Pearson
5. MicroC / OS-II, Jean J Labrose - Indian Low Price Edition

- **Reference Books:**

1. DR.K.V.K.K. Prasad - Embedded / real time system – Dreamtech
2. Embedded real systems Programming – Iyer, Gupta, TMH
3. Embedded systems: a contemporary design tool, James K. Peckol- Wiley India
4. Datasheet of LPC 2148.
5. Application Handbook of Embedded System

Semester-II

ET323: ELECTRONIC SYSTEM DESIGN

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hour/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks
	OE– 25 Marks

This course introduces construction, characteristics of power electronics devices and its applications. The course also introduces design of different electronics systems such as frequency synthesizer, frequency counter, time period measurement. This course also covers design of industrial controllers and aspects of PLC & automation.

Course Prerequisite:

Student shall have knowledge of Basic Electronics, Linear Integrated Circuits and Digital Electronics

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Course Objectives:

1. To describe the concept and applications of power electronic devices.
2. To design and analyze timer, frequency counters and digital voltmeters.
3. To design applications of Phase Locked Loop (PLL) and industrial process control.
4. To provide introduction of the concept of PLC and its applications.

Course Outcomes:

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

1.Describe construction, working & analyze characteristics of thyristors.

2.Analyze AC and DC power control circuits using thyristors.

3. Design and implement timers, frequency counters, digital voltmeters and frequency synthesizers.

4.Design and simulate Communication system components for system design.

5.Design and analyze controllers for industrial applications.

Section I

Unit 1: Introduction to Power Semiconductor Devices (07)

SCR - construction, working, VI characteristics, turn on and turn off methods (Class A, B, C, D). TRIAC - construction, working, VI Characteristics. DIAC - construction, working, VI Characteristics.

Unit 2: Power Electronics Applications (06)

Single phase half wave controlled rectifier, center tapped full wave controlled rectifier, fully controlled bridge rectifier, AC power control using DIAC & TRIAC and its applications.

Unit 3: Modulator, Demodulator & PLL (08)

Balanced modulator principle, IC 1596, applications of IC 1596 as AM modulator & Mixer. PLL- Working Principle, design consideration, FM detector, FSK demodulator, PSK demodulator, design of frequency synthesizer using LM565.

Section II

Unit 4: Timer, Counters &Digital Voltmeter (07)

Design of Timer using XR 2240, Design of counter using IC 74C926 for the time & event counting, Design of 3 ½ digit Multi-range DVM using discrete components.

Unit 5: Signal Conditioning Circuits (06)

Signal conditioning for sensors PT 100, LM 35, Thermocouples (J & K type), current loop Interface (4mA to 20mA), zero & span circuit, offset V to I & I to V converter, V to V converter.

Unit 6: Design of Controllers and PLC Applications (08)

Design of analog ON/OFF controller and proportional controller for controlling process, PLC architecture and applications, bottle filling plant & elevator control.

• Internal Continuous Assessment:

ICA consists of minimum eight practical from following suggestive list.

- **Suggestive List of Practical's:**

1. VI Characteristics of SCR.
2. VI characteristics of TRIAC & DIAC.
3. Single phase half wave controlled rectifier.
4. Lamp dimmer using TRIAC & DIAC.
5. AM simulation using MATLAB SIMULINK.
6. PLL application using MATLAB SIMULINK.
7. Implementation of frequency division circuit using IC.
8. Application implementation using PLC.

9. Temperature controller using OPAMP.
10. V to V Converter.
11. Simulation of Display design.
12. Design and simulate 3 ½ digit DVM.

- **Text Books:**

1. Power Electronics, circuits, devices & applications by M. H. Rashid, Pearson Education, 3rd edition.
2. Power Electronics by P. C. Sen, TATA Mc. Graw Hill, 2nd Edition.
3. Power Electronics by M. D. Singh & K. B. Khanchandani, TATA Mc. Graw Hill, 2nd Edition.
4. Introduction to System Design Using Integrated Circuits by B. S. Sonde, NewAge International Publishers, 2nd Edition.

- **Reference Books:**

1. Integrated Circuits by K. R. Botkar, Khanna publishers, 10th Edition.
2. Programmable Logic Controllers by Job Den Otter, Prentice Hall International Editions.
3. Programmable Logic Controllers by John Web & Ronald Reis, PHI Publications, 5th edition.
4. Process Control Instrumentation Technology by Curtis. D. Joshon, Pearson Education, 8th edition.
5. Data sheets of Analog and digital ICs used for design using Web resources.

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ET324.1 (Professional Elective-I)- Optical Fiber Communication

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks

This course introduces the basic concept of optical communication. It explains the basic working principle of optical fiber. It covers the study of basic optical devices as optical source, optical detector and optical joints. It also introduces aspects of practical design of optical communication system.

Course Prerequisite:

Student should have knowledge of basic communication system, light reflection, refraction process.

Course Objectives:

1. To make students to understand basic working principle of optical fiber.
2. To introduce to student basic losses in optical fiber & reasons behind the losses.
3. To make students to understand the basics of optical sources (LASER & LED).
4. To make students to understand the basics of optical detectors.
5. To study the concepts of optical networks.

Course Outcomes:

After completion of syllabus students should be able to

1. Demonstrate working of optical fiber.
2. Explain transmission characteristics of optical fibers & concept of optical joints.
3. Illustrate different optical sources & optical detectors.
4. Solve the numerical to calculate the various parameters of optical sources & detectors.
5. Explain the different types of optical amplifier & optical networks.
6. Analyze the functional blocks in optical communication system.

Section I

Unit 1– Introduction **(06)**

Introduction, Historical development, general optical communication system, advantages, disadvantages, optical fiber waveguides, ray theory ,mode theory, Types of optical fibers, single

mode ,multimode fiber, step index & graded index fibers, applications of optical fiber communication.

Unit 2– Optical Fiber losses and Joints (07)

Introduction, Attenuation, absorption- intrinsic & extrinsic, linear &non linear scattering losses, bending loss, dispersion- intermodal & intramodal, Fibers alignment and joint loss, fiber splices, connectors, fiber couplers & its types.

Unit 3– Optical Sources (08)

LASER: Requirements of optical source, basic concept of LASER, optical emission from semiconductors, double heterojunction (DH) structure, Semiconductor injection laser and structures, Injection laser characteristics.

LED: LED structures, LED characteristics. Introduction of Light Modulation.

Section II

Unit 4-Optical Detectors (08)

Introduction, requirements of optical detector, optical detection principles, performance parameters of detector- absorption, quantum efficiency, responsivity, cut off wavelength.

Semiconductor photo diodes with and without internal gain:- PN, PIN, Avalanche Photo diodes, Phototransistors.

Unit 5-Optical Networks (06)

Optical Networks: Introduction, networking terminology, optical network modes, SONET / SDH, Optical Ethernet, Fiber Distributed Data Interface (FDDI), data buses.

Unit 6-Fiber Optical Communication Systems (07)

Introduction, Transmitter Design, Receiver Design, Noise equivalent model of receiver, Link Design, Wavelength Division Multiplexing (WDM), DWDM, Optical Time Division Multiplexing (OTDM).

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum eight Practical's from suggestive list

- **Suggested List of Practical's:**

1. Setting up fiber optic analog & digital link.
2. Frequency modulation using fiber optic cable.
3. Pulse width Modulation using fiber optic cable.

4. Study of propagation loss in optical fiber.
5. Study of bending loss in optical fiber.
6. Measurement of optical power using optical power meter.
7. Measurement of Numerical Aperture.
8. Transmission of voice signal using FOC.
9. Study of WDM.
10. Study of LED output characteristics.

- **Text Books:**

1. Optical Fiber Communications, John M. Senior, Pearson Education. 3rd Impression, 2007
2. Optical Fiber Communications, Gerd Keiser, 4th Ed., MGH, 2008
3. Optical Fiber Communications ,D.C. Agarwal - S.Chand and company

- **Reference Books:**

1. Optical Communications, David Gover – PHI
2. Fiber Optics communication, HozoldKolimbiris - Pearson Education.
3. Fiber Optics Communication – 5th Edition, Palais-Pearson Education

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ET324.2 (Professional Elective-I)- Image and Video Processing

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE –30 Marks**
	ICA- 25 Marks

This course covers fundamental notions in image and video processing, as well as covers most popular techniques used, such as edge detection, motion estimation, segmentation, and case studies.

Course Prerequisite:

Student shall have knowledge of Digital Signal Processing

Course Objectives:

1. To describe and performs basic operations on image and video.
2. To design and apply filter on images in spatial and frequency domain.
3. To analyze and implement algorithm for image and video processing application using modern tools.
4. To select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Course Outcomes:

After completion of syllabus students should be able to

1. Describe and performs basic operations on image and video.
2. Design and apply filter on images in spatial and frequency domain.
3. Analyze and implement algorithm for image and video processing application using modern tools.
4. Select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Section I

Unit 1: Image fundamentals **(07)**

Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color images, RGB, HSI and other models

Discrete Fourier Transform, Discrete Cosine Transform, KL Transform

Unit 2: Image Enhancement **(07)**

Spatial Domain: Point Processing: Digital Negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transform and power law transform.

Neighborhood Processing: Averaging filters, order statistics filters, high pass filters and high boost filters.

Frequency Domain: DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothening and sharpening, and Homomorphic filters.

Histogram Modeling: Histogram equalization and histogram specification**.**

Unit 3: Image segmentation and Morphology **(07)**

Point, line and edge detection, edge linking using Hough transform and graph theoretic approach, thresholding, and region based segmentation. Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening, and boundary extraction on binary images

Section II

Unit 4: Image Restoration **(06)**

Degradation model, noise models, estimation of degradation function by modeling, restoration using Weiner filters and Inverse filters.

Unit 5: Video Formation, Perception and Representation: **(07)**

Digital Video Sampling: Video Frame classifications, I, P and B frames, Notation, ITU-RBT 601Digital Video formats, Digital video quality measure.

Video Capture and display: Principle of color video camera, video camera, digital video.

Sampling of video Signals: Required sampling rates, sampling in two dimensions and three dimensions, progressive versus interlaced scans.

Unit 6: Two Dimensional Motion Estimation **(08)**

Optical Flow: 2-D motion Vs optical flow, optical flow equations, motion representation, motion estimation criteria, optimization method.

Pixel based motion estimation: Regularization using motion smoothing constraints, using multipoint neighborhood.

Block Matching Algorithms: Exhaustive block matching algorithms, phase correlation method, Binary feature matching.

Multi resolution Motion Estimation: General formulation, Hierarchical blocks matching Algorithms.

- **Internal Continuous Assessment(ICA):**

Minimum Eight Laboratory experiments must be conducted on above topics for ICA.

- **Text Books:**

1. Gonzales and Woods--Digital Image Processing, Pearson Education, India, Third Edition
2. Murat Tekalp--Digital Video Processing, Pearson, 2010.
3. A.I.Bovik--Handbook on Image and Video Processing", Academic Press.

- ***Reference Books:***

1. Anil K. Jain, ―Fundamentals of Image Processing, Prentice Hall of India, First Edition, 1989.
2. John W. Woods, ―Multidimensional Signal, Image and Video Processing, Academic Press 2012
3. J.R. Ohm , ―Multimedia Communication Technology", Springer Publication.

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ET324.3 (Professional Elective-I)- Multimedia Communication Technology

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE –30 Marks**
	ICA- 25 Marks

Course Objectives:

1. After learning this course, students will get benefit to learn and understand the working of real life video system and the different elements of video system.
2. Students will get insight on functioning of individual blocks, different standards of compression and they will be acquainted with different types of analog, digital TV systems.

Course Outcomes:

After completion of syllabus students should be able to

1. Illustrate working of monochrome and color television transmitter and receiver.
2. Understand and compare different types of modern color televisions.
3. Acquire knowledge of latest digital TV systems and applications.
4. Understand the concept of multimedia and data representation.
5. Analyze different audio and video compression techniques.

Section– I

Unit 1: Fundamentals of Colour Television (07)

Aspect ratio, scanning, perception of brightness and colour, colour mixing, composite video signal, video bandwidth, CCIR-B Standards, synchronization details, video displays: LCD vs LED.

Unit 2: Colors Standards and Digital Video (07)

Color Spectrum, compatibility, Bandwidth of colour TV signal, Standards: NTSC, PAL, SECAM colour system, interleaving process

Unit 3: Digital TV (07)

Digital video, resolution, digital video formats, DTH, Video compression: MPEG-1, MPEG-2, MPEG-4.

Section-II

Unit 4: Audio and Video Recording Systems (06)

Digital sound, sound recording, CD/ DVD player, MP3 player, Blue Ray DVD Player, ITU-T(G) compression standards, multichannel/Dolby 5.1sound in DTV.

Unit 5: Basics of Digital Audio (08)

Digitization of sound, What is sound, Digitization, Nyquist Theorem, Signal to Noise ratio, Signal to Quantization noise ratio, Linear and Non linear Quantization,

Unit 6: Lossless Compression Algorithms (07)

Lossless Compression Algorithms: Introduction, Run-Length Coding, Variable-Length Coding (VLC), Arithmetic Coding

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- **Internal Continuous Assessment (ICA):**

ICA shall be based upon minimum Eight Experiments from following list.

- **Suggested List of Practical's**

1. Study of Disc Reproducing System.
2. To perform analysis of Composite Video Signal
3. Study the Yagi-uda antenna
4. Study of color pattern generator with pattern analysis
5. Study of CD/ DVD Player
6. Study of DT/HDTV
7. Study of Satellite System
8. Study of LED TV System
9. Study of audio and video coding scheme (soft)
10. Record speech & perform compression & decompression.

- **Text books:**

1. A.M. Dhake, Television and video Engineering, TMH Publication, 2nd Edition,2001
2. Kelth jack, Video Demystified: A Handbook for the Digital Engineer, 5th Edition, Newnes, 2007.
3. R.G. Gupta, Audio and Video Systems, McGraw Hill l Education (India), 2nd Edition, 2010.

- **Reference Books:**

1. S. P. Bali, Color Television Theory and Practice, McGraw Hill Education (India), 1994
2. A.M. Tekalp, Digital Video, Prentice Hall, 1995.
3. R.P. Gulathi, Modern Television Practice, 4th edition, New Age International Publisher, 2014
4. Zi-Niam Li and Mark Drew, Fundamentals of Multimedia, Pearson, 2004.
5. Khalid Sayood, Data Compression, PHI.
6. R.P. Gulati, Monochrome and Colour Television. 3rdedition, New Age International Publisher, 2014

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Semester-II

ET325.1 (Open Elective-II)- Sensors and Applications

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA – 25 Marks

This course provides good knowledge of working of different types of sensors used in various application areas. This course also provides knowledge of interfacing of electronic circuits with different sensors for its applications in different fields.

Course Prerequisite:

Concept of internal characteristics of passive elements like resistor, capacitor, inductor etc., Diode and transistor working, knowledge of basic fundamentals of mechanical terms like position, strain, stress etc.

Course Objectives:

1. To introduce students with the basics of various sensors and its characteristics.
2. To make students familiar with the working principle of different types of sensors andtransducers.
3. To introduce various signal conditioning and smoothing circuits for sensors
4. To interface various sensors with Arduino
5. To interface various sensors with Rapberry Pi

Course Outcomes:

After completion of syllabus students should be able to

1. Elaborate the concept of sensors and its characteristics.
2. Describe the working principle of analog and digital sensors.
3. Design sensor interface circuits for a given engineering problem.
4. Interface different sensors with Arduino and Raspberry Pi

Section– I

Unit 1: Sensors Fundamentals and Characteristics (06)

Sensors, Signals and Systems, Sensor Classification, Units of Measurements, Sensor Characteristics

.

Unit 2: Physical Principles of Sensing (08)

Electric Charges, Fields, and Potentials, Capacitance, Magnetism, Induction, Resistance, Piezoelectric Effect, Hall Effect, Temperature and Thermal Properties of Material, Heat Transfer, Light, Dynamic Models of Sensor Element

Unit 3: Interface Electronic Circuits (07)

Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

Section-II

Unit 4: Installation of Arduino and Raspberry Pi (06)

Introduction to Arduino and Raspberry Pi, Arduino setup and installation, Raspberry Pi basic setup and Installation, Interfacing of LED with Arduino/Raspberry Pi.

Unit 5: Interface `various Sensors using Arduino (07)

Interface Ultrasonic Sensor, PIR Sensor, IR Sensor, Smoke & Gas Sensor, Capacitive touch Sensor, Potentiometer Interfacing, Temperature Sensor, LDR, Accelerometer Sensor (MPU 6050), Atmospheric Pressure Sensor (GY 65), Soil Moisture detection Sensor using Arduino

Unit 6: Interface `various Sensors using Raspberry Pi (08)

Interface Ultrasonic Sensor, PIR Sensor, IR Sensor, Smoke & Gas Sensor, Capacitive touch Sensor,Potentiometer Interfacing, Temperature Sensor, LDR, Accelerometer Sensor(MPU6050), Atmospheric Pressure Sensor(GY 65), Soil Moisture detection Sensor using Raspberry Pi

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- **Internal Continuous Assessment (ICA):**
  ICA shall be based upon minimum Eight Experiments based upon above curriculum.
- **Text books:**

1. J. Fraden, Handbook of Modern Sensors: Physical, Designs, and Applications, AIP Press, Springer
2. Sensors and Actuators Engineering System Instrumentation By Clarence W deSilva
3. Electrical and Electronic Measurements and instrumentation R.K Rajput S. Chand

- **Reference Books:**

1. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
2. A Course in Electronics and Electrical Measurements and Instruments, J.B. Gupta, Katson Books
3. A Course in Electrical and Electronic Measurements and Instrumentation, A.K.Sawheny, Dhanpat Rai
4. Sensors and Actuators, Engineering System Instrumentation (second edition) by Clarence W. Desilva, CRC press is an imprint of Taylor and Francis Group.
5. Mechatronic Systems, Sensors and Actuators (Fundamental Modeling) edited by Robert H. Bishop, CRC press is an imprint of Taylor and Francis Group.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET325.2 (Open Elective-II)- Open Source Technologies

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA – 25 Marks

Course Objectives:

1. To introduce the concept of Open Source Software.
2. To enable students to learn Linux Environment.
3. To make students well versed Shell Programming
4. To make students understand working of Version Control System

Course Outcomes:

On successful completion of this course students should be able

1. To work on Open Source Software platforms.
2. To install and work on Linux.
3. To perform Shell Programming.
4. To install and work on Version Control System (GIT)

Section-I

Unit 1: Over View of Open Source Software (06)

Need of Open Sources, Advantages of Open sources, Applications, FOSS – FOSS usage, Free Software Movement, Commercial Aspect of Open Source Movement, Licensing, Certification, Open Source Software Development Model, comparison with close source / Proprietary software, Free Software, Open source vs source available Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License.

Unit 2: Open Source Operating System (05)

Installation of Linux: Theory about Multiboot Environment, Hard DiskPartitioning, Swap space, LVM, and Boot loader Command Line: Basic File System Management Task, Working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHS of Linux.

Unit 3: Open Source Operating System: System Administrator Task (05)

Job management, Process Management, Mounting Open Source Devices and file system working with Linux, Backup, working with user, group and permission, Managing Operating

System: Software. Understanding Boot process and related System files, Common kernel Management Task.

Unit 4: Open source Operating System: Network and Security Administration (05)

Basic networking commands, Configuration of Apache Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Securing servers with IP tables. Setting up cryptographic services, SSL, Managing Certificate with Open SSL, working with the GNU Privacy guard.

Section-II

Unit 5: Open source Operating System: Shell Programming (05)

Bash Shell Scripting, Executing Script, Working with Variables and Input, Using Control Structures, Script control, handling with signals, Creating functions, working sed and gawk - Working with web using shell script: Downloading web page as formatted text file and parsing for data, working URL etc.

Unit 6: Version Control Systems GIT (05)

Introduction: What is a Version Control System (VCS). Distributed vs Non-distributed VCS. What is Git and where did it come from. Alternatives to Git Cloud-based solutions (Github, Gitlab, BitBucketetc). Installation and Configuration: Obtaining Git, installing Git, Common configuration options, GUI tools. Key Terminology: Clone, Working Tree, Checkout, Staging area, Add, Commit, Push, Pull, Stash

Unit 7: GIT Local and Remote Repository Actions (06)

Git - Local Repository Actions, Creating a repository (git init), Checking status (git status), Adding files to a repository (git add), Committing files (git commit), Removing staged files (git reset), Removing committed files (git rm), Checking logs (git log), Git - Remote Repository Actions, Creating a remote repository (git init), Cloning repositories (git clone), Updating the remote repository from the local (git push), Updating the local repository from the remote (git pull), Tagging in Git, What are Git Tags?, Listing tags, Lightweight tags, Displaying tag details (tag show), Annotated tags, Checking out tags, Pushing tags, Pulling tags

Unit 8: Branching in Git (05)

What is a branch, A note about and lt; HEAD and gt; ,Listing branches, Create new branch, Checkout branch, Pushing branches, Pulling branches, Merging in Git, Fetching Changes (git fetch), Rebasing (git rebase), Git Pull, Git Workflows, Different ways of using Git, Centralised, Feature Branch, Gitflow Workflow, Forking Workflow. Git - Stashing Changes, What is Stashing? Creating a branch from a Stash.

- **Internal Continuous Assessment (ICA):**

ICA shall be based upon minimum Eight Experiments from following list.

- **Suggested List of Practical's**

1. Linux installation, disk partitioning, logical volume manager
2. Commands for files and directory handling(cd, ls, cp, rm, mkdir, rmdir, pwd, file, more, less, cat).
3. File permission, changing permission and ownership (chmod, chown)Process commands (kill, ps, who, top), Creating and editing files with Vi-editor
4. Managing user accounts (add, delete, modify users), Becoming super user, Creating and managing groups, Disk partition and sizes (df, du, dd etc.), Installing and removing packages (RPM, apt-get, yum..)
5. Service monitoring commands (uname, hostname, dnsip, nslookup, dig), Setting IPv4 and IPv6 static addressing
6. Remote file transfer (sshscp, ftp)
7. Shell programming in bash: Statement (Conditional, looping, case)
8. Installation and Configuration of GIT
9. Creating a repository, Addition and deletion of files to repository
10. Create and checkout a new branch.
11. Pushing branches, Pulling branches, Merging in Git
12. Create branch from stash

- **Textbooks:**

1) Open Source Technologyby Kailash Vadera and Bhavyesh Gandhi
2) Linux Command Line and Shell Scripting Bible by Richard Blum (Author), Christine Bresnahan
3) Learn Version Control with Git: A step-by-step course for the complete beginner, by Tobias Günther
4) Online Content: https://docs.github.com/en/get-started/using-git/about-git
5) Understanding Open Source and Free Software Licensing - By Andrew M. St. Laurent, Oreily Media

E- Resource available at: http://oreilly.com/openbook/osfreesoft/book/index.html

- **Reference Books:**

1) Managing Open Source Projects: A Wiley Tech Brief (Technology Briefs Series Book 24) by Jan Sandred
2) OpenSource: Technology and Policy By Fadi P. Deek and James A.M .McHugh, Cambridge University Press.
3) Ubuntu 20.04 Essentials: A Guide to Ubuntu 20.04 Desktop and Server Editions Ubuntu 20.04 Essentials: A Guide to Ubuntu 20.04 Desktop and Server Editions
4) Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer, by Tsitoara.

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ET326: MINI HARDWARE PROJECT

Teaching Scheme:
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ICA – 25 Marks
Practical- 25 Marks
POE – 50 Marks

This course is introduced to enable students to apply the knowledge and skills learned out of courses studied to solve/implement predefined practical problem. The Project work may be beyond the scope of curriculum of courses for learning additional skills, developing the ability to define, design, analysis and implementation of the problem and lead to its accomplishment with proper planning.

Course Prerequisite:
Student shall have knowledge of PCB designing, circuit designing, testing, soldering.

Course Objectives:
1. To produce PCB artwork using an appropriate EDA tool.
2. To practice good soldering, testing, fault detection and effective trouble-shooting.
3. To design and implement application based hardware project.
4. To present technical seminar and display the project.

Course Outcomes:
At the end of this course, Students will be able to,
1. Produce PCB artwork using an appropriate EDA tool.
2. Practice good soldering, testing, fault detection and effective trouble-shooting.
3. Design and implement application based hardware project.
4. Present technical seminar and display the project.

- **Guidelines for project implementation:**

  1) Project group should be not more than 3 students per group.

  2) Domains for projects may be based on a particular application from the following, but not limited to:

     i. Instrumentation and Control Systems

     ii. Electronic Communication Systems

iii. Biomedical Electronics

iv. Power Electronics

v. Audio, Video Systems

vi. Embedded Systems

vii. Mechatronics Systems

3) Week 1 & 2: Formation of groups, searching of an application based hardware project

4) Week 3 & 4: Finalization of Mini project & Distribution of work.

5) Week 5 & 6: PCB artwork design using an appropriate EDA tool & Simulation.

6) Week 7 & 8: Procurement of electronic components for the project & PCB manufacturing.

7) Week 9, 10 & 11: Hardware assembly, testing, fabrication

8) Week 12: Demo, Group presentation & report submission

- **Internal Continuous Assessment (ICA):**

1. The seminar shall consist of the Literature Survey, Market survey, Basic project work and applications of Mini project.
2. Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
3. A certified copy of seminar/ project report shall be required to be presented at the time of final submission.

- **Text Books:**

1. Thomas C Hayes, Paul Horowitz, ―The Art of Electronics, Newens Publication
2. Jim Williams (Editor) ― Analog Circuit Design: Art, Science and Personalities, EDN series for Design Engineers
3. M Ashraf Rizvi ― Effective Technical Communication, Tata McGraw Hill Education Pvt. Ltd.

- **Reference Books:**

1. Robert Boylested, ― Essentials of Circuit Analysis‖, PHI Publications
2. Meenakshi Raman, Sangeeta Sharma ― Technical Communication, Principles and Practice, Oxford University Press
3. A.E. Ward, Angus ― Electronic Product Design, Stanley thornes Publishers, UK.
4. C Muralikrishna, Sunita Mishra, ― Communication Skills for Engineers, Pearson