SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Syllabus for

T.E. (Electronics & Telecommunication Engineering)

w.e.f. Academic Year 2018-19

Choice Based Credit System

SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

Electronics & Telecommunication Engineering

Programme Educational Objectives and Outcomes

Program Educational Objectives (PEO'S)

1. To prepare students to give good theoretical background with sound practical knowledge, enable them to analyze and solve Electronics and Telecommunication Engineering problems by applying basic principles of mathematics, science and engineering using modern tools and techniques.

2. To make students to test hardware components and software for offering solution to real life situations.

3. To inculcate students to be sensitive to ethical, societal and environmental issues while pursuing their professional duties.

4. To build strong fundamental knowledge amongst students to pursue higher education and to enhance research and continue professional development in Electronics, Communication and IT industries with attitude for lifelong learning.

5. To nurture students with technical and communication skills in order to be able to function on multidisciplinary fields and make them aware of contemporary issues at national and international levels.

6. To develop students for team-works and managerial skills leading to entrepreneurship and leadership.

Program Outcomes (PO's)

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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

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

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CBCS *structure of T.E. Electronics & Telecommunication Engineering W.E.F. 2018-19*

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET311	Electro Magnetic Engg. & Radiating System	3	1	--	4	30	70	--	100
ET312	Principles of Digital Communication	4	--	--	4	30	70	--	100
ET313	Software Engineering & Project Management System	3	--	--	3	30	70	--	100
ET314	Digital Signal Processing	4	--	--	4	30	70	--	100
ET315	Microcontroller – I (8051)	4	--	--	4	30	70	--	100
SLH31	Self Learning Course I -HSS	--	--	--	2	--	50	--	50
Sub Total		18	1	--	21	150	400	--	550
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET311	Electro Magnetic Engg. & Radiating System	--	--	2	1	--	--	--	25	25
ET312	Principles of Digital Communication	--	--	2	1	--	50	--	25	75
ET314	Digital Signal Processing	--	--	2	1	--	25	--	25	50
ET315	Microcontroller – I (8051)	--	--	2	1	--	50	--	25	75
ET316	Electronic Software Lab-III	--	1	2	2	--	--	--	50	50
Sub Total		--	2	10	6	--	125		150	275
Grand Total		**18**	**2**	**10**	**27**	**150**	**525**		**150**	**825**

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

SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Engineering & Technology

CBCS *structure of T.E. Electronics & Telecommunication Engineering W.E.F. 2018-19*

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET321	Radar & Microwave Engineering	4	_	_	4	30	70	-	100
ET322	Microcontroller-II (PIC)	4	_	_	4	30	70	-	100
ET323	Electronics Applications & System Design	4	1	_	5	30	70	-	100
ET324	Optical Communication	3	_	_	3	30	70	-	100
ET325	Mobile Communication	3	1	_	4	30	70	_	100
ET327	Self Learning Course II- Technical	_	_	_	2	--	50	_	50
Sub Total		18	2	_	22	150	400	--	550
Course Code	***LaboratoryCourse Name***								
							ESE		
							POE	***OE***	
ET321	Radar & Microwave Engineering	_	_	2	1	_	_	_	25	25
ET322	Microcontroller-II (PIC)	_	_	2	1	_	50	_	25	75
ET323	Electronics Applications & System Design	_	_	2	1	_	_	#50	25	75
ET324	Optical Communication	_	_	2	1	_	_	25	25	50
ET325	Mobile Communication	--	--	--	--	_	_	_	25	25
ET327	Mini Hardware Project	_	_	2	1	_	_	_	25	25
Sub Total			_	10	5	_	125		150	275
Grand Total		**18**	2	**10**	**27**	**150**	**525**		**150**	**825**

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

- **Note** –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

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

3. Student shall select one Self Learning Course at T.E. Part I and T.E. Part II each from 'Humanities & Social Sciences (HSS) ' and 'Technical' Group respectively

4. Curriculum for Humanities and Social Sciences (HSS) Self Learning Courses is common for all under graduate programmes of faculty of Engineering and Technology

5. For TE Part I -

A. Student can select a Self Learning Course from Solapur University, Solapur HSS Course List and appear for its examination as and when conducted by Solapur University, Solapur

OR

B. Student can enroll for National Programme on Technology Enhanced Learning (NPTEL) course, complete its assignments and appear for certificate examination as and when conducted by NPTEL.

For more details about Self Learning Course (HSS) please refer to separate rule document available from Solapur University, Solapur

More details about NPTEL are available at http://nptel.ac.in

6. Minimum four assignments for Self Learning Modules at T.E. Part I and T.E. Part II shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute / department

7. Project group for T.E.(Electronics) Part II Mini Project shall not be of more than **three** student

8. Project group for B.E.(Electronics) Part I and Part II shall not be of more than **three** student.

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

10. # indicates Oral Examination of Electronics Applications & System Design is combined with Mini Project (Hardware)

Solapur University, Solapur

T.E. (Electronics & Telecommunication Engineering) Semester-I

ET311-ELECTROMAGNETIC ENGINEERING & RADIATING SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures– 3 Hours/week, 3 Credits	**ESE –70 Marks**
Tutorial – 1 Hour/week, 1 Credit	**ISE – 30 Marks**
Practical – 2 Hours/week, 1 Credit	**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 wave propagation and radiating system.

Course Prerequisite:

Student should have knowledge of vector algebra. They should have basic knowledge of basic laws in physics.

Course Objectives:

1) To derive basic laws of electrostatics and magneto statics hence define electromagnetic waves.
2) To describe the Maxwell's equations and apply it for analysis of wave propagation.
3) To apply boundary conditions to different media.
4) To define radiating systems and it's types. To develop skills to analyze its characteristics.

Course Outcome:

On the completion of this course, students will be able to

1) Able to derive the laws of electrostatics and magneto statics and can derive wave equations.
2) Apply Maxwell's equations for analysis of wave propagation.
3) Apply boundary conditions to different media, and formulate uniform plane wave equations.
4) Define radiating systems and it's types. Students also develop skills to analyze it'scharacteristics.

SECTION I

Unit 1: Mathematical Fundamentals

No of lectures – 05

Vector analysis, Coordinate systems & transformations, line, surface & volume integrals DELoperator (gradient, divergence and curl in different co-ordinate systems).

Unit 2: Electrostatic field – I

No of lectures – 08

Coulomb's law, electric field intensity, electric field due to continuous line charge, sheet charge, volume charge distribution, electric flux density, gauss law with applications, divergence theorem.

Unit 3: Electrostatic field – II

No of lectures – 08

Work done due to point charge, electric potential, relation between E & V, electric dipole,electrostatic energy & energy density, boundary conditions for electrostatic field(conductor-free space, dielectric- dielectric), Divergence Theorem, capacitor and capacitance(parallel and spherical), Poisson's and Laplace's Equations.

SECTION II

Unit 4: Magneto static field No of lectures – 07

Biot-Savart's law & its Applications, Amperes circuital law & its application, Stroke's theorem, Magnetic flux density, Magnetic scalar & Vector Potential, boundary condition for magnetic field, energy stored in magnetic field.

Unit 5: Electromagnetic waves No of lectures – 07

Continuity equation for static conditions, displacement and conduction current density, Maxwell's equation in point form & integral form (Time varying field, harmonically varying fields), Helmholtz wave equation, plane waves in lossless & lossy medium, pointing vector and power flow in EM – field, polarization of plane waves

Unit 6: Antennas No of lectures – 07

Basic principle of radiation, basic antenna parameters, Antenna field Zones, short dipole antenna and it's radiation resistance, slot antenna, Micro strip Patch antenna, parabolic reflector antenna. Antenna Array- Pattern multiplication, Linear array of n isotropic point sources of equal amplitude & spacing, Broad side array, end-fire –array, Yagi Uda array (Problems on antenna are not expected.)

Internal Continuous Assessment:

ICA should consist of minimum 4 experiments & 8 Tutorials based on above syllabus.

List of Practicals (Minimum four Practicals)

1. Verification of characteristics of different types of antenna
2. Plotting polar plot of an antenna
3. Measuring Gain of an antenna
4. Measuring Beamwidth of an antenna
5. Measuring front to back ratio of an antenna
6. Modulation test
7. Antenna radiation with distance
8. SWR Measurement
9. Simulation of any antenna is expected by using simulation software.

Text Books:

1. Electromagnetics by John D. Kraus - Mc Graw Hill Third Edition
2. Electromagnetic Engineering by William Hyte - Mc Graw Hill
3. Electromagnetic field theory & transmission lines by G.S.N. Raju - Pearson Education
4. Antennas and Wave Propagation by G.S.N. Raju- Pearson Education
5. Antenna and Wave Propagation by K.D. Prasad-Tech India

Reference Books:

1. Electromagnetic Schaum's outline series by J.A.Edminister -TATA Mc Graw Hill Second Edition
2. Electromagnetic waves & transmission lines by R.S. Rao – PHI
3. Antenna for all applications by John D. Kraus, Marhefka, Khan - Mc Graw Hill Third Edition
4. Applied Electromagnetics by F. Ulaby (2001 Media Edition) – PHI
5. Antenna theory analysis and design by C.A. Balanis (second edition) – Wiley

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T.E. (Electronics& Telecommunication Engineering) Semester-I

ET312-PRINCIPLES OF DIGITAL COMMUNICATION

Teaching Scheme	**Examination Scheme**
Lectures– 4 Hours/week, 4 Credits	**ESE–70 Marks**
Practical – 2 Hour/week, 1 Credit	**ISE– 30 Marks**
	ESE(POE)- 50 Marks
	ICA- 25 Marks

This course introduces the basic principles of design and analysis of digital communication systems. It also deals with significance of information theory, various coding techniques, synchronization methods, pulse and digital modulation techniques along with their performance analyses.

Course Prerequisite:

Student shall have knowledge of sampling theorem, analog modulation / demodulation techniques, probability theory, pulse amplitude modulation / demodulation techniques. He shall also have knowledge of Fourier transform and inverse Fourier transform.

Course Objectives:

1. To make student understand the significance of information theory, entropy coding, block coding techniques in communication system.
2. To introduce student basic components of digital communication system for different pulse, binary and M-ary digital modulation schemes with their performance analysis.
3. To explain various synchronizing techniques as well as coherent and non- coherent type of receivers used for demodulation techniques.
4. To make student understand the concept of baseband data transmission systems, methods and terms associated with it.
5. To introduce the concept and significance of multichannel and multicarrier system.

Course Outcomes:

1. Student will be able to explain, solve, and evaluate problems related to information theory, entropy coding and block coding techniques.
2. Student will be able to describe uniform and non-uniform quantization technique, design block diagram level digital communication system using PCM, DPCM, ADPCM, DM, ADM, binary and M-ary ASK, FSK, PSK, DPSK, QAM, MSK techniques, compare them and calculate the bandwidth requirement for different systems using PCM techniques
3. Student will be able to explain different bit and frame synchronization methods, coherent / non-coherent types of receivers used.
4. Student will be able to explicate the concept of baseband data transmission systems and effect of different precoding methods performance enhancement.
5. Student will be able to explain the concept and significance of multichannel and multicarrier system.

SECTION I

Unit 1–Information Theory and Channel capacity No of lectures – 08

Introduction to information theory, average and mutual information, Entropy, Joint Entropy and conditional entropy, Rate of information, redundancy, channel capacity, Shannon's Theorem, Shannon – Hartley

theorem, bandwidth, S/N trade off, entropy coding- Shannon Fano Coding, Huffman Coding.

Unit 2–Pulse Code Modulation Techniques No of lectures – 06

Basic block diagram of digital communication system, Quantization – Uniform & Non uniform, PCM System, Differential PCM, ADPCM, Bandwidth requirement of PCM, TDM-PCM Telephone system, Delta Modulation – Noise in DM, ADM.

Unit 3–Baseband Data Transmission No of lectures – 07

Binary and M-ary signaling scheme, Duo-binary baseband PAM system – use of controlled ISI in duo binary signaling scheme, Shaping of transmitted signal spectrum, Effect of precoding , Pulse shaping by Digital Methods, Equalization, Eye Diagrams , Synchronization , Scrambler & unscramble , ISI.

Unit 4–Binary Digital Modulations Techniques No of lectures – 06

Binary ASK, PSK, FSK, Coherent PSK & FSK, Differential coherent PSK, Non coherent FSK, Probability of error, Comparison of digital modulation schemes–Bandwidth, power requirements& Equipment complexity.

Section II

Unit 5– M-ary Digital Modulations Techniques No of lectures – 07

M–ary coherent PSK, QPSK transmitter and Receiver, M-ary differential PSK transmitter and Receiver, M-ary wideband FSK, structure of the receiver for an orthogonal (widebabd FSK) signaling scheme, QAM modulation and demodulation, Minimum shift keying transmitter and receiver.

Unit 6–Optimum receiver for digital Modulation No of lectures – 07

Matched filter receiver, Correlation receiver, Synchronization- Symbol Synchronization, Frame synchronization, Carrier recovery circuits.

Unit 7–Multichannel and Multicarrier systems No of lectures – 06

Multichannel Digital Communication in AWGN channels, M-ary Orthogonal signals, multicarrier Communication System, FFT Based multicarrier system, Minimizing Peak-to-average ratio in multicarrier system.

Unit 8–Linear Block Codes No of lectures – 07

Introduction to linear block code, linear block code examples, generator matrix, systematic linear block codes, Parity-check matrix, Syndrome testing, Error correction, Decoder implementation.

- **Internal Continuous Assessment:**
  ICA consists of Minimum 12 experiments performed out of which at least two experiments must be using MATLAB / Scilab)

  List of Practicals

  1) Sampling and reconstruction
  2) PAM,PWM, PPM
  3) TDM / FDM
  4) Data Formats
  5) PCM,
  6) DPCM /ADCM
  7) PAM TDM / PCM TDM
  8) Companding
  9) DM
  10) ADM
  11) ASK
  12) FSK
  13) BPSK
  14) DPSK
  15) QPSK
  16) Eye Diagram
  17) MATLAB Based Experiment.

- **Text Books:**
  1. Communication System Analog & Digital - Singh &Sapre.-TMH.
  2. Digital Communication System Design – M.S. Roden.-PHI
  3. Digital Communication -John G. Proakis- Pearson Education
  4. Communication Systems (Analog and Digital) – Sanjay Sharma – Katsons

- **Reference Books:**
  1. Principles of Communication System - Taub&Schling-TMH
  2. Digital & Analog Communication systems – K. Sam Shanmugan-Wiley
  3. Digital communication Fundamentals and Applications–2nd edition by Bernard Sklar Pearson Education.
  4. Contemporary Communication system using MATLAB by John G. Proakis, M AsonidSalehi, GenhardBauch.

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T.E. (Electronics& Telecommunication Engineering) Semester-I

ET313- SOFTWARE ENGINEERING & PROJECT MANAGEMENT SYSTEM

Teaching Scheme
Lectures– 3 Hours/week, 3 Credits

Examination Scheme
ESE – 70 Marks
ISE – 30 Marks

This course introduces Software Engineering which deals with process activities involved in projects. The course also introduces various project management aspects like Risk management, resource management and monitoring and control.

Course Prerequisite:
Student shall have knowledge of programming language concepts. Student shall also have basic knowledge of activities performed in a project.

Course Objectives:

1. To outline software engineering and process models for development of software Projects and Agile Software development.
2. To analyze the requirements for project and software testing.
3. To widen managerial skills for planning, implementing and risk management of software Project.

Course Outcomes:

On completion of this course, students will be able to:

1. To explain Software Development Life Cycle, Development models and Agile Software development.
2. Prepare SRS (Software Requirement Specification) document and able to state various testing techniques.
3. Identify different tasks of project managers and need for Project planning in Project completion.
4. Visualize progress of software project.

Section I

Unit 1–Software Processes No. of lectures – 05

Software process models, Process activities, coping with change, the rational unified process

Unit 2–System Models No of lectures – 08

Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering Agile software development, Plan-driven and agile development.

Unit 3– Requirement Engineering No of lectures – 04

Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management

Unit 4-Software testing No of lectures – 04

Development testing, Test-driven development, Release testing, User testing

Section II

Unit 5-Project Management No of lectures – 05

Concepts of software project management, project evaluation & program management, project planning.

Unit 6- Activity Planning No of lectures – 05

Project schedules, projects & activities, Network planning model & formulation, Forward & backward pass, critical path analysis, resource planning

Unit 6-Risk Management No of lectures – 06

Risk & its categories, risk identification, assessment, planning & management, PERT (Only problem solving method), Monte Carlo & critical chain concept in Risk management (Only application)

Unit 6-Monitoring and Control No of lectures – 05

Framework, data collection, visualizing methods, cost monitoring, change control.

- **Internal Continuous Assessment:**

Case Study: (Any one)

1. Study the complete Software Development Life Cycle (SDLC) and analyze various activities conducted as a part of various phases. For each SDLC phase, identify the objectives and summaries outcomes.
2. Subject Project: For below mentioned Systems and other systems assign a mini-project two a group of students to prepare Software documents mentioned as A to C
   Library Information System, Villager Telephone System, Waste Management Inspection Tracking System (WMITS), Flight Control System, Ambulance Dispatching System
   A. Development of Software Requirements Specification, B. Test case design, C. Implement
3. Risk management in Software Company.

- **Text Books:**

1. Software Engineering - Summerville- Pearson Education (9th Edition)
2. Software Project Management – Bob Hughes & Cottrell – TMH (5th Edition)

- **Reference Books:**

1. Software Engineering – (Theory & Practice) – Pfleeger, Alleger, Atlee- Pearson (3rd Edition)
2. Software Engineering – RajaniKanta Malu, Scitech publication
3. Software Engineering A Practitioner's Approach, 6th Edition- ROGER S. PRESSMAN, TMH
4. Software Project Management- S.A. Kelkar, PHI Publication (3rd Edition)

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T.E. (Electronics and Telecommunication Engineering) Semester-I

ET 314-DIGITAL SIGNAL PROCESSING

Teaching Scheme
Lectures– 4 Hours/week, 4 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme
ESE –70 Marks
ISE –30 Marks
ESE(POE)-25 Marks
ICA- 25 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. Student shall also have basic knowledge of mathematics and transforming tools like 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 domain 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:

Students will be able to

1. Interpret the concept of stability in the DSP system.
2. Analyze the given signal and convert time domain to frequency domain and vice versa using FT and Z transforming tools.
3. Draw the structure for realization of a given system.
4. Design FIR and IIR filters.
5. Describe audio, Telecommunication and Radar processing applications of DSP.

Section I

Unit 1– Introduction No of lectures – 03

Introduction to DSP system, co-relation and its properties, Digital transfer function, stability consideration.

Unit 2–Discrete Fourier Transform No of lectures – 08

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 No of lectures – 05

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 No of lectures – 08

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

Section II

Unit 5- FIR Filter Design No of lectures – 07

FIR filter design: Introduction to FIR filters, design of FIR filters using -Rectangular, Hamming and Bartlet windows, FIR filter design using frequency sampling technique, finite word length effects in FIR filters, FIR Implementation techniques.

Unit 6- IIR Filter Design No of lectures – 07

IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation, Characteristic of commonly used Analog Filters(Butterworth Filter), Some examples of Digital Filter Design Based on above Transformation, finite word length effects in IIR filter, IIR implementation technique.

Unit 7- Realization of Digital Linear Systems No of lectures – 07

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 8-Application No of lectures – 03

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

- **Internal Continuous Assessment:**
  Minimum ten experiments as follows.

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. Realization of FIR system.
9. Realization of IIR system.
10. Design of FIR filter using frequency sampling method.
11. Design of FIR filter using windowing technique.
12. Design of IIR filter using impulse invariant technique.
13. To design Butterworth filter using Bilinear transformation technique.

- **Text Books:**

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

- **Reference Books:**

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

Solapur University, Solapur
T.E. (Electronics& Telecommunication Engineering) Semester-I
ET315-MICROCONTROLLER-I (8051)

Teaching Scheme
Lectures– 4 Hours/week, 4 Credits
Practical – 2 Hour/week, 1 Credit

Examination Scheme
ESE – 70 Marks
ISE – 30 Marks
ESE (POE)- 50 Marks
ICA- 25 Marks

This course introduces Basics of microcontroller's theory which deals with internal details of MCS51 series. The course also introduces theoretical and programming aspects of MCS51microcontrollers for interfacing various I/O devices and peripherals.

Course Prerequisite:
Student shall have basic knowledge of Digital electronics and working for various peripherals use for interfacing with the microcontroller. Also student shall have basic programming skills.

Course Objectives:

1) To introduce student to microcontroller families and details of MCS51.
2) To make student describe Core features and Peripheral features of 8051.
3) To make student develop and practice assembly language programming techniques
4) To enable student demonstrate and perform hardware interfacing and design.

Course Outcomes:
At the end of the course, the student shall be able to,

1) Describe the fundamental features and operation of contemporary microcontroller
2) Identify memory organization of a microcontroller and Illustrate microcontroller memory and peripherals expansion capability
3) Analyze the program for time and code complexity
4) Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
5) Interface various I/O's and Peripherals to MCS 51 Series Microcontroller.

SECTION I

Unit 1: Introduction Microcontroller No of lectures – 4

Introduction to Microprocessor, Architecture of 8085 Microprocessor and 8051 Microcontroller. Comparison between Microprocessor and Microcontroller, CISC & RISC, Harvard and Von Neumann architecture.

Unit 2: The MCS51 Hardware No of lectures – 10

Pin Diagram, Oscillator and clock, Reset Circuits, Internal Data and Program Memory organization, ports and Circuits, External Memory, Timers and Counters, UART serial Port, Interrupts.

Unit 3: Instructions Set No of lectures – 4

Addressing modes, Instruction set, Moving Data, Logical and Arithmetic operations, Jump and Call Instructions,

Unit 4: programming Concepts No of lectures – 6

Introduction to 8051 Assembly Programming, Data types and Directives, Introduction to C Programming: Data types and time delay, I/O Port Programming, Logic operations, Data conversion programs, Accessing code ROM space, Data serialization, Programming Tools and techniques.

SECTION II

Unit 5: Programming MCS51 No of lectures –12

I/O ports programming, serial port programming, Timer / Counter programming,Programming timer interrupts, serial port Interrupts & External hardware interrupts.

Unit 6: Peripheral Interfacing I No of lectures – 3

Programs for interfacing Switches, LED, Relay, Buzzer, LCD display & Matrix Keyboard.

Unit 7: Peripheral Interfacing II No of lectures – 4

ADC 0809, DAC 0808 & sensor interfacing. Semiconductor memory, memory Address decoding, external program & Data memory interfacing.

Unit 8: Applications No of lectures – 5

Industrial Infrared counter, Advanced digital stopwatch and Alarm setting, Obstruction detecting robot, Robotic gripper arm.(Only electronic hardware and software design using MCS51 Microcontrollers)

- **Internal Continuous Assessment:**
  ICA consists of minimum ten practical's based upon above curriculum. Minimum five practical should be taken using embedded C programming.

  List of Practical's:

  Introduction to MCS51 system development aids

1. Arithmetic and Logic operations
2. Interfacing of Switches, LEDs and Buzzer.
3. Interfacing of Matrix Keyboard
4. Interfacing of LCD Display.
5. Interfacing of DAC 0808 and generation of various waveforms.

6. Interfacing of ADC 0809
7. Use of Timer for generation of time delays
8. Use of Timer as counter.
9. Interfacing of Stepper motor.
10. Speed control of DC Motor.
11. Use of Interrupts for any Application.
12. UART Serial communication.

- **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) Embedded Systems and Robots by SubrataGhoshal, Cengage Learning .

- **Reference Books:**

1) Programming and Customizing the 8051 Microcontroller by Mike Predcko, McGrawHill Education.
2) Data sheets of MCS51 family microcontrollers
3) 8051 Microcontroller by I Stott, Mackenzie, Rathel& Phan – Fourth Edition - Pearson

Solapur University, Solapur

T.E. (Electronics& Telecommunication Engineering) Semester-I
ET316-Electronic Software Lab-III

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

Examination Scheme
ICA – 50 Marks

Learn object-oriented programming in Java and create conditional statements, functions, and loops to process information and solve problems. Important features related to any OOP language such as data abstraction, data encapsulation, polymorphism, inheritance are also introduced along with additional packages and interfaces available within the JAVA development environment.

Course Prerequisite:

Student shall have an adept knowledge of programming with C and C++.

Course Objectives:

1. To learn Object oriented programming paradigms using Java language.
2. To understand importance of Multi-threading & different exception handling mechanisms
3. To create simple GUI applications and store and retrieve data from relational databases.

Course Outcome:

At the end of the course Students will be able to

1. Apply Object oriented programming paradigms using Java language.
2. Demonstrate and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
3. Develop GUI applications using AWT and store and retrieve data from relational database with JDBC.

Section I

Unit 1–Basics and Fundamentals of Java No of lectures – 03

Java Runtime Environment, Languages Basics: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements. Data Types, Arrays, Objects and Classes. Fields and Methods, Access control, Modifiers, Constructors, Overloading methods, Wrapper classes, this Keyword, Scanner class, Type casting.

Unit 2–Inheritance, Polymorphism & Generics No of lectures – 03

Types of Inheritance in Java, Polymorphism, Type Compatibility and Conversion, Overriding and Hiding Methods, Hiding Fields, Using the Keyword "super".
Strings: String Class and Methods, Introduction to Generics Classes and Methods.

Unit 3–Exceptions and Basic IO No of lectures – 02

Types of Exception, types of error, use of try, catch and finally blocks , throws keyword , user-defined Exception 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 No of lectures – 02

Advantage of Collection framework, Set Interface, List Interface, Map Interface, Iterator Interface & Sorted Map Interface.

Unit 5-Multithreading and Network Programming No of lectures – 03

Creating Threads, Thread scheduling and priority, Thread interruptions and synchronization, Thread groups, deadlock
Network Programming: Networking fundamentals, TCP, UDP communication in Java. Client server programming: Inet Address, URLs, Sockets

Unit 6-JDBC & GUI Programming with AWT No of lectures – 03

JDBC: Introduction to JDBC, JDBC Drivers & Architecture, CRUD operations Using JDBC API .Hierarchy of classes in AWT, Layouts, Events, Listeners and Event handling. AWT and Swing Components.

- **Internal Continuous Assessment:**

1. ICA consists of minimum 15 (Fifteen) practical's based upon above curriculum.

2. Use of IDEs like Blue J, Eclipse, Netbeans for Interactive development and debugging of Java applications is highly recommend to enhance hands on skills in Java Programming of Students.

- **Text Books:**

1. Programming with Java a primer – E. Balgurusamy (TMGH)
2. Head First Java – Kathy Sierra, Bert Bates, O'Reily Publication.
3. Core Java for Beginners- Rashmi Kanta Das, Vikas Publishing House Pvt Ltd.

- **Reference Books:**

1. The Java Language Specification, Java SE 7 Edition Book by James Gosling, Oracle Inc. (e-Resource: http://docs.oracle.com/javase/specs/)
2. The complete Reference, Java2 (5th edition) – Herbert Scheldt et. a (Osborn)
3. The Java™ Tutorials. Oracle Inc. (e-Resource: http://docs.oracle.com/javase/tutorial/)

Solapur University, Solapur
T.E. (Electronics & Telecommunication Engineering) Semester-II
ET321-RADAR & MICROWAVE ENGINEERING

Teaching Scheme	**Examination Scheme**
Lectures– 4 Hours/week, 4 Credits	**ESE – 70 Marks**
Practical – 2 Hour/week, 1 Credit	**ISE – 30 Marks**
	ICA- 25 Marks

The basic knowledge of microwave signal generation, propagation, amplification and measurement is vital. This course introduces microwave transmission line (waveguides), microwave devices, components and accessories used in telecommunication industry. The course also introduces theoretical and analytical aspects of microwave devices, components and accessories. The course also includes microwave measurements and radar.

Course Prerequisite:

Student shall have knowledge of electromagnetics and communication engineering.

Course Objectives:

1. To evaluate different parameters of transmission line and derive transmission line equations.
2. To analyze the different passive microwave components and measure it's parameters.
3. To describe construction and working of solid state devices and active microwave devices and can evaluate it's parameters.
4. To describe the principle of Radar and types of Radars.

Course Outcomes:

On completion of this course, students will be able to:

1. Calculate parameters and properties of transmission lines.
2. Analyze different parameters of microwave components and measure it's parameters.
3. Describe construction and working of solid state devices and active microwave devices.
4. Measure parameters of microwave signal in the microwave bench.
5. Describe the principle of Radar and types of Radars.

Section I

Unit 1–Microwave Transmission line No of lectures – 06

Types of transmission lines, Transmission line equation, Characteristics of transmission lines : Primary (R,L,C,G) and secondary constants (α, β and γ), Transmission line parameters (VSWR, Reflection coefficient, transmission coefficient), Smith Chart, Microwave frequency band, Characteristics & applications of microwaves, Microwave hazards.

Unit 2–Rectangular waveguide No of lectures – 07

Solutions of Wave equations in Rectangular co-ordinates, TE mode & TM mode Rectangular Waveguide, Group Velocity & Phase Velocity, Power Transmission & Power loss in Rectangular Waveguide, Microwave cavities, types of cavities, Reentrant cavities

Unit 3–Microwave Components No of lectures – 08

Introduction to S parameters, E-Plane Tee, H-Plane Tee, Magic Tee, Hybrid ring, Directional Coupler, S matrix for E-Plane Tee, H-Plane Tee, Magic Tee, Hybrid Junction, Directional Coupler, Non reciprocal devices -Circulator and Isolator

Unit 4–Microwave Solid State Devices No of lectures – 06

Limitations of conventional semiconductor devices, Varactor diode, PIN diode, Tunnel diode, Gunn Diode, IMPATT, TRAPATT, BARITT diode

Section II

Unit 5-Microwave Measurements No of lectures – 06

Measurement of Power, frequency, attenuation, phase shift, VSWR, Impedance, dielectric constant, Insertion loss.

Unit 6-Microwave Tubes No of lectures – 09

Limitations of conventional Tubes, Klystron-working of Klystron, velocity modulation process and it's derivation, efficiency, Reflex Klystron- working, velocity modulation process, efficiency, Magnetron – working, Hull's cutoff voltage equation, mode jumping, frequency pushing and pulling, TWT- similarities and differences with klystron , working of TWT.

Unit 7-Radar Fundamentals No of lectures – 06

Basic principle, radar range equation, radar signal characteristics (PRF,avg. power, radar cross section of target, PRT etc.), Display Methods (PPI, A-scope, ATD)

Unit 8-MTI and Pulse Doppler Radar No of lectures – 06

Introduction, Doppler frequency shift, Moving target indicator (MTI), CW Doppler Radar, Pulse Doppler Radar, Frequency Modulated CW radar, Moving Target Detector (MTD), MTI from Moving Platform (AMTI).

- **Internal Continuous Assessment:**
  ICA consists of minimum eight practicals based upon above curriculum.

  List of Practicals

  1. Measuring characteristics of Transmission line.
  2. Measuring attenuation of Transmission line.
  3. Measuring input impedance of Transmission line.
  4. Measurement of Microwave wavelength and frequency.
  5. Verification of working of different Microwave Components.
  6. Plotting Gunn diode characteristics show negative resistance region.
  7. Measurement of reflection coefficient and VSWR for different loads.
  8. Measurement of attenuation provided by different attenuators.
  9. Measuring different parameters of directional couplers.
  10. Measuring different parameters of nonreciprocal devices (circulator, isolator).
  11. Find Frequency of Pendulum using Radar.
  12. Measure speed of the fan using Radar.
  13. Measure frequency of oscillations of tuning fork using Radar.
  15. Write a program to calculate Doppler frequency using MATLAB.
  16. Write a program to compute radar signal characteristics using MATLAB.
  17. Write a program to calculate radar range resolution using MATLAB.

- **Text Books:**

1) Microwave devices & Circuits by Samuel Y. Liao - Pearson Education
2) Introduction to Radar Systems by MerrilSkolnik – TMH Third Edition
3) Radar Principles, Technology, Applications by Byron Edde – Pearson Education
4) Microwave & Radar Engineering by M.Kulkarni - Umesh Publication

- **Reference Books:**

1) Foundations for Microwave Engineering by Robert Collin - Wiley Publication.
2) Microwave Engineering (Passive Circuit) by Peter A. Rizzi - Pearson Education.
3) Microwave Engineering by G.S. Raghuvanshi– Cengage
4) Microwave Engineering, M.L. Sisodia, G.S. Raghuvanshi- New Age international publication.

Solapur University, Solapur

T.E. (Electronics& Telecommunication Engineering) Semester-II

ET322-MICROCONTROLLER-II (PIC)

Teaching Scheme	**Examination Scheme**
Lectures– 4 Hours/week, 4 Credits	**ESE – 70 Marks**
Practical – 2 Hour/week, 1 Credit	**ISE – 30 Marks**
	ESE(POE)- 50Marks
	ICA - 25 Marks

This course focuses on the study of PIC microcontroller. It also briefs the students about interfacing of memory and various I/O devices like A to D converter, D to A converter LED, LCD to PIC microcontroller. The students learn the Programming language (Embedded C) used for microcontrollers. They will be able to use the advanced fast microcontroller in electronics engineering related fields.

Course Prerequisite:

Student should have had an introductory digital course. Knowledge of Assembly language would be helpful. For the PIC 16F877 programming a basic knowledge of C programming is required.

Course Objectives:

1) To expose the students to the fundamentals of PIC Microcontroller 16F877 architecture and its Peripherals.
2) To introduce the advanced features in PIC Microcontroller 16F877.
3) To make student develop and practice assembly language and C language programming techniques
4) To enable student demonstrate and perform hardware interfacing and design.

Course Outcomes:

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

1) Describe how PIC microcontroller and its peripherals function.
2) Interpret advanced features in PIC Microcontroller 16F877.
3) Program an embedded system in assembly and C.
4) Design, implement and test a single-processor embedded systems for real-time applications

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SECTION I

Unit 1: PIC Microcontrollers No of lectures – 3

The PIC Microcontrollers: History, Overview and Features.

Unit 2: PIC 16F877 Microcontroller No of lectures – 14

PIC 16F877- features, architecture, functional pin description, program memory and data memory organization, STATUS register, OPTION_REG register, Power Control Register (PCON), Data EEPROM and FLASH Program Memory.

Unit 3: PIC Microcontroller Programming No of lectures – 5

Addressing modes, Instruction set, Assembly Language and C programming.

Unit 4: On-Chip Peripherals No of lectures – 8

I/O Ports, timers and counters, Capture/Compare/PWM Modules, Analog-to-digital converter (A/D) module, Special features of CPU- Oscillator section, RESET, Interrupts, Watchdog timer.

SECTION II

Unit 5: Serial Communication No of lectures – 8

Master synchronous serial port (MSSP), Universal Synchronous Asynchronous Receiver Transmitter (USART), SPI, I2C.

Unit 6: Interfacing and Applications No of lectures – 8

Interfacing of devices- LED, Keyboard, 7-segment display, LCD display, DC motor.

Unit 7: Industrial Applications of Microcontroller No of lectures – 8

Introduction, Measurement Applications, Automation and Control Applications.

Unit 8: Advanced Microcontrollers No of lectures – 6

PIC18 – features, architecture, functional pin description.

- **Internal Continuous Assessment:**
  ICA consists of minimum ten practical's based upon above curriculum. Minimum five practical should be taken using embedded C programming.

  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) Use of ADC of PIC Microcontroller.
8) Use of Interrupts for any Application
9) Interfacing of Stepper motor.
10) Speed control of DC Motor.
11) Use of Interrupts for any Application.
12) USART Serial communication.

- **Text Books:**

1) Ajay V Deshmukh – Microcontrollers Theory and Applications, Tata McGraw Hill
2) PIC Microcontroller and Embedded Systems Using Assembly and C for PIC18- Muhammad Ali Mazidi
3) 123 PIC Microcontroller Experiments for the Evil Genius – by Myke Predko

- **Reference Books:**

1) John .B. Peatman , "Design with PIC Microcontroller", Prentice Hall, 1997.
2) Data sheets of PIC 16F87X family microcontrollers
3) Data sheets of AVR microcontroller ATmega 328

- 8051 Microcontroller by I Stott, Mackenzie, Rathel& Phan – Fourth Edition - Pearson

Solapur University, Solapur

T.E. (Electronics& Telecommunication Engineering) Semester-II

ET323-ELECTRONICS APPLICATIONS & SYSTEM DESIGN

Teaching Scheme	**Examination Scheme**
Lectures– 4 Hours/week, 4 Credits	**ESE – 70 Marks**
Tutorial – 1 Hour/week, 1 Credit	**ISE –30 Marks**
Practical – 2 Hour/week, 1 Credit	**ESE (OE) – # 50 Marks**
	ICA– 25 Marks

This course introduces construction, characteristics of power electronics devices and its applications. The course also introduces design of different electronic 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:

On completion of this course, students will be able to:

1) Describe construction, working & characteristics of SCR, TRIAC & DIAC.
2) Analyze AC and DC power control circuits using SCR, TRIAC & DIAC.
3) Design and implement timers, frequency counters, digital voltmeters and frequency synthesizers.
4) Design and implement Communication system components for system design.
5) Design control systems for industrial applications.

Section I

Unit 1– Introduction to Power Semiconductor Devices No of lectures – 08

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 No of lectures – 08

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 No of lectures – 10

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 No of lectures – 10

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- Design of Industrial Control No of lectures – 08

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 convertor, V to V converter.

Unit 6- Controllers No of lectures – 08

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

Note: # Oral Examination of Electronics Applications & System Design is combined with Mini Project (Hardware)

- **Internal Continuous Assessment:**
  ICA consists of minimum eight practicals from following list.

  List of Practicals :

  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 Convertor.
  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.

Solapur University, Solapur

T.E. (Electronics& Telecommunication Engineering) Semester-II

ET324-OPTICAL COMMUNICATION

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

This course introduces the physics of optical communication components and applications to communication systems. Topics include fiber attenuation and dispersion, optical sources and detectors, optical amplifiers and networks, fiber optics communication system and future trends in optical communication.

Course Prerequisite: Basics of ray theory, Mode theory and basics Semiconductors.

Course Objectives:

1. To analyze and solve problems based on ray theory and transmission characteristics.
2. To explain the optical losses characteristic in optical fiber such as dispersion, scattering, absorption, non-linear effects, fiber alignment and splicing that affect the performance of transmission system.
3. To analyze and compare the different optical sources and detector.
4. To evaluate the fiber optical network components, variety of networking aspects, FDDI, and operational principles WDM.

Course Outcomes:

On completion of this course, students will be able to:

1. To visualize the significance of the different kind of losses in optical system performance.
2. To compare the various optical source materials.
3. To evaluate various parameters of given optical fiber.

Section I

Unit 1–Overview Of Optical Fiber Communication No of lectures – 8

Introduction, Historical development, general communication system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, mode theory, Ray theory, Types of optical fibers, single mode ,multimode fiber, cutoff wave length.

Unit 2–Transmission Characteristics of Optical Fibers and Optical Joints No of lectures – 10

Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion. Fibers alignment and joint loss. Fiber splices, connectors, Fiber couplers.

Unit 3–Optical Sources No of lectures – 8

Laser: Basic Concepts, optical emission from semiconductors, Semiconductor injection laser and structures, Injection laser characteristics. LED: LED power and efficiency, LED structures, LED characteristics, Modulation

Section II

Unit 4–Optical Detectors No of lectures – 8

Introduction, device, types, optical detection principles, absorption, quantum efficiency, responsivity. Semiconductor photo diodes with and without internal gain. Photoconductive detectors, PN, PIN, Avalanche Photo diodes, Phototransistors.

Unit 5–Optical Amplifiers and Networks No of lectures – 8

Optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA. Optical Networks: Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides.

Unit 6–Fiber Optical Communication Systems and Future Trends No of lectures – 8

Introduction, Transmitter Design, Receiver Design, Link Design, Line Codes for optical Fiber links, Wavelength Division Multiplexing (WDM), Optical Time Division Multiplexing, Data buses, FDDI. Applications, LIFI, cable TV.

- **Internal Continuous Assessment:**

List of Practicals (Minimum Eight Practicals)

1. Setting up fiber optic analog link & digital link.
2. Pulse width modulation system.
3. Propagation loss in optical fiber
4. Bending loss.
5. Measurement of optical power using optical power meter.
6. Measurement of Numerical Aperture.
7. To observe effect of EMI on copper medium and optical fiber medium.
8. Speed measurement of light using optical fiber.

9. To transmit and receive frequency modulated analog signal using fiber optic cable.
10. To transmit and receive computer signal using fiber optic cable.
11. To transmit and receive voice signal using fiber optic cable.
12. Frequency modulation system.

- **Text Books:**
  1. Optical Fiber Communications– – John M. Senior, Pearson Education. 3rd Impression, 2007
  2. Optical Fiber Communication – Gerd Keiser, 4th Ed., MGH, 2008.
  3. Optical Fiber communications By 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.
  4. Design of Integrated Circuits for Optical Communications—Razavi B---, McGraw-Hill. 2002
  5. Optical Signal Processing--Vanderlugt, A. -- John Wiley & Sons. 2005.

Solapur University, Solapur

T.E. (Electronics & Telecommunication Engineering) Semester-II

ET325-MOBILE COMMUNICATION

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

This course introduces key ideas, design principles, architectures and technology standards used in modern mobile communication systems.

Course Prerequisite:

Student shall have knowledge of basics of analog communication and digital communication.

Course Objectives:

1) To recognize cellular concept in mobile communication.
2) To examine the Mobile radio propagation, cellular system design, and to identify multiple access techniques used in mobile communication
3) To analyze mobile technologies like GSM
4) To categorize the mobile communication evolution of 2G, 3G technologies.
5) To describe overview of immerging technologies for 4 G standards.

Course Outcomes:

1) Students will be able to define cellular systems working and hand off strategies implemented in mobile communication.
2) Students will be able to analyze various losses in mobile radio propagations and define multiple access schemes sharing radio spectrum.
3) Students will be able to define GSM - architecture, frame structure, system capacity and services provided.
4) Students will be able to describe mobile communication evolution of 2G, 3G technologies.
5) Students will be able to analyze emerging technologies required for fourth generation mobile systems such as Long Term Evolution(LTE)

Section I

Unit 1: Introduction No of lectures – 08

Introduction to wireless communication systems

The Cellular Engineering Fundamentals : Introduction, Frequency Re-use, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, trunking and grade of service, Co-channel Interference (CCI), Adjacent Channel Interference (ACI), Cell Splitting, Sectoring, Microcell Zone concept, Repeaters. Cordless transmission technique (CT2, DECT).

Unit 2: Mobile Radio Propagation No of lectures – 07

Large scale path loss, Free space propagation model, ground reflection model (two ray model), diffraction, Practical Link Budget using path loss model, Small scale fading and multipath small scale multipath propagation, parameter of multipath channels, types of small scale fading.

Unit 3: Multiple Access Technique in Wireless Communications No of lectures – 06

Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access (SSMA), Space Division Multiple Access (SDMA), Orthogonal Frequency Division Multiple Access (OFDMA)

Section II

Unit 4: GSM No of lectures – 07

GSM Network architecture, signaling protocol architecture, identifiers, channels, Frame structure, speech coding, authentication and security, call procedure, handoff procedure, services and features. Mobile data networks, GPRS and higher data rates, SMS in GSM.

Unit 5: CDMA digital cellular standard (IS-95) & IMT – 2000 No of lectures – 08

Frequency and channel specifications of IS-95, forward and reverse CDMA channel, packet and frame formats, mobility and radio resource management. Forward and reverse channels in W-CDMA and CDMA-2000, Handoff and power control in 3G system.

Unit 6: Emerging Technologies for 4G (LTE) No of lectures – 06

4G Introduction and vision, LTE Architecture, Elements of LTE- EPS, LTE Radio / air interface-Modulation and features, LTE Channels, 4G Architecture

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- **Internal Continuous Assessment:**
  ICA shall include minimum **eight tutorials** based on above syllabus.

- **Text Books:**
  1. Wireless Communications - Theodore S. Rappaport, Prentice Hall of India, PTR Publication.
  2. Principles of Wireless Networks – Kaveh Pahlavan, Prashant Krishnamurthy, PHI.
  3. Mobile Communication – G. K. Behera & Lopamudra Das, Scitech Publication.
  4. Mobile Communications – Jochen Schiller, Pearson Education, Second Edition.

- **Reference Books:**
  1. Wireless Communication – Singhal, TMH.
  2. Mobile and Personal Communication Systems and Services – Raj Pandya, Prentice Hall of India.
  3. Wireless Communication – D. P. Agarwal, Thomnson learning 2007, Second Edition.
  4. Wireless Communication and Network –UpenaDalal, OXFORD higher Education
  5. 4 G Roadmap and Emerging Communication Technologies – Young Kyun Kim and Ramjee Prasad –Artechhouse.:

Solapur University, Solapur

T.E. (Electronics and Telecommunication Engineering) Semester-II

ET 326-MINI PROJECT (HARDWARE)

Teaching Scheme	**Examination Scheme**
Practical – 2 Hours/week, 1 Credit	**ICA – 25 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:

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.

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1) 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

2) Guidelines for group seminar:

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 to external examiner at the time of final examination.

Solapur University, Solapur

T.E. (Electronics and Telecommunication Engineering) Semester-II

ET 327-ROBOTICS (Self Learning Course II-Technical)

Teaching Scheme	**Examination Scheme**
1 Credit	**ESE – 50 Marks**

This course introduces the basic abstractions, mechanisms, and their selection of a robotic system. The core of the course contains introduction to various sensors, their usage and applications in a robotic system and perhaps the most compelling reason for a robotics curriculum is that it introduces students to knowledge, concepts, and skills that are needed for understanding the intelligent information-based technology of the future.

Course Prerequisite:

Student shall have knowledge of novice level hardware and software aspects of an embedded system, basic mechanical concepts and some basics of geometry.

Course Objectives:

1. To acquire knowledge of concepts in robotics.
2. To develop the ability to use various sensors and controllers.
3. To familiarize the fundamentals of robotic vision and MEMS.

Course Outcomes:

On completion of this course, students will be able to:

1. Describe the various concepts in robotic system.
2. Interpret the use of various sensors and controllers
3. Analyze the fundamentals of robotic vision and MEMS

Section I

Unit 1– Robot Fundamentals:

Definitions, present and future trends in robotics, Robot classifications, Robot configurations, Point to Point robots, Continuous Path robots, Work volume, Issues in design and controlling robots Repeatability, Control resolution, spatial resolution, Precision, Accuracy, Applications of robots. Drives used in robots Hydraulic, Pneumatic and Electric drives, Comparison of drive systems and their relative merits and demerits.

Unit 2–Robot Sensors and Controllers:

Internal and external sensors, position potentiometric, optical sensors ,encoders absolute, incremental ,touch and slip sensors velocity and acceleration sensors, proximity sensors, force & torque sensors, DC motor Overload over current and stall detection methods, microprocessor based robot Controller.

Section II

Unit 3- Robot Vision:
Introduction, Image acquisition, Illumination Techniques, Image conversion, Cameras, sensors, Camera and system interface, Frame buffers and Grabbers, Image processing, low level & high level machine vision systems.

Unit 4- Futuristic topics in Robotics:
Microrobotics and MEMS (Microelectomechanical systems), fabrication technology for Micro robotics.

- **Text Books:**
  1) S.R.Deb, "Robotics Technology and Flexible Automation ", Tata Mc Graw Hill 1994.
  2) M.P.Groover, M. Weiss R.N. Nagel, N.G. Odrey" Industrial Robotics (Technology , Programming and applications) , McGraw, Hill 1996
  3) K.S.Fu, R.C.Gonzalez and C.S.G.Lee, "Robotics: Control , sensors , vision and in intelligence ", MCGraw Hill.1987.

- **Reference Books:**
  1) J.J.Craig , introduction to Robotics , Addisionwesely 1989.
  2) Klafter , Richard D., et al " Robotics Engineering",PhI,1996. 3) Zuech,Nello,"Applying Machine Vision ", John Wiley and sons, 1988.

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T.E. (Electronics and Telecommunication Engineering) Semester-II

ET 327-OPERATING SYSTEM (Self Learning Course II-Technical)

Teaching Scheme	**Examination Scheme**
1 Credit	**ESE – 50 Marks**

This course introduces the basic operating system abstractions, mechanisms, and their memory management. The core of the course contains Multi-programmed Batch System, Process Scheduling, and Threads, inter process communication, and an introduction to Deadlocks characteristics and prevention.

Course Prerequisite:

Student shall have knowledge of basic hardware and software aspects of computer systems organization. Prior programming experience with C is recommended, as C is required for the practical component of this course.

Course Objectives:

1) To provide knowledge of operation and performance of modern operating systems
2) To give ability to model, abstract, and implement efficient software solutions.
3) To compare, contrast, and evaluate the key trade-offs between multiple approaches to operating system design.

Course Outcomes:

On completion of this course, students will be able to:

1) Explain the objective and functions of modern operating systems.
2) Describe how computing resources are used by application software in an operating system.
3) Analyze the common algorithms used for various tasks in operating systems.

Section I

Unit 1–Introduction

Basics of operating system, Simple Batch System, Multi-programmed Batch System ,Time Sharing System, Personal Computer System, Parallel System, Real Time System, System Calls.

Unit 2– Process and Scheduling

Process Concept, Process Scheduling, Operation on process, Cooperating process, Threads, Interprocess Communication, Basic concept, Scheduling Criteria, Scheduling Algorithms.

Section II

Unit 3- Deadlocks

System modes, Deadlock characterization, Methods for handling deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection Recovery from deadlock.

Unit 4- Memory management

Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation.

- **Text Books:**

1) Operating System concepts – 8th Edition – Silberschatz Galvin (John Wiley).
2) Operating Systems – by K.A.Sumitradevi, N.P.Banashree – SPD Publ. (2nd Edition)

- **Reference Books:**

1) Operating System concepts ,6th Edition , Silberschatz Galvin , John Wiley
2) Operating systems-Concept and design, Milan Milenkovic's, TMGH
3) Operating Systems- - Tanenbaum – PHI Publ. (3rd Edition)

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T.E. (Electronics& Telecommunication Engineering) Semester-II

ET237-COMPUTER ORGANIZATION (Self Learning Course II-Technical)

Teaching Scheme	**Examination Scheme**
1 Credit	**ESE – 50 Marks**

Computer organization refers to the operational units and their interconnections that realize the architectural specifications. Examples of organizational attributes include those hardware details transparent to the programmer, such as control signals, interfaces between the computer and peripherals, and the memory technology used.

Course Prerequisite:

The students should have knowledge of Digital Logic Circuit Design & preliminary idea about computer programming.

Course Objectives:

1. To introduce the concept of computer architectures and organization.
2. To illustrate processor and programming basics.
3. To describe memory organization and input output control.

Course Outcomes:

1. Students will be able to describe processor architectures.
2. Students will be able implement basic programs.
3. Students will be able to analyze memory and I/O systems.

SECTION I

Unit 1: Processor Basic

CPU organization fundamental, Data representation, Basic formats, Floating point numbers, Instruction sets: Instruction formats, Instruction type, Programming consideration, Introduction to RISC and CISC.

Unit 2: Memory Organization:

Memory Systems, Multilevel memories, Address Translation, Memory allocation schemes FIFO, LRU, OPT, etc. Virtual Memory, Cache memory.

SECTION II

Unit 3:Control Design:

Introduction, hardwired control design examples, Micro programmed control, Multiplier control unit, CPU control unit design.

Unit 4: System Organization:

Processor programmed I/O architecture, DMA architecture, Interrupt I/O hardware.

- **Text Book:**

  1. J.P. Hayes “Computer Architecture and Organization” Third edition ,McGraw Hill publication

- **Reference Books:**

  1.HamacherZaki “Computer Organization” McGraw Hill publication
  2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002
  3. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann,1998