# SOLAPUR UNIVERSITY, SOLAPUR

## FACULTY OF ENGINEERING & TECHNOLOGY

## ELECTRONICS & TELECOMMUNICATION ENGINEERING

**Syllabus for**

**S.E. (Electronics & Telecommunication Engineering)**
**W.e.f. Academic Year 2017-18**

**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. To apply knowledge of mathematics, science and engineering to the solution of complex engineering problems.
2. To identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences and engineering sciences.
3. To 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. To 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. To 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. To 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. To understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
8. To apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. To function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
10. To 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. To 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. To 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.

# SOLAPUR UNIVERSITY, SOLAPUR

## Faculty of Engineering & Technology

CBCS *structure of S.E. Electronics & Telecommunication Engineering*

*W.E.F. 2017-2018 Semester I*

| Course Code | Theory Course Name | Hrs./week | | | Credits | Examination Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ISE | ESE | ICA | Total |
| ET211 | Engineering Mathematics – III | 3 | 1 | _ | 4 | 30 | 70 | 25 | 125 |
| ET212 | Electronics Circuit Analysis and Design-I | 4 | _ | _ | 4 | 30 | 70 | - | 100 |
| ET213 | Network Theory & Analysis | 4 | - | _ | 4 | 30 | 70 | - | 100 |
| ET214 | Digital Techniques | 4 | _ | _ | 4 | 30 | 70 | - | 100 |
| ET215 | Analog Communication | 3 | _ | _ | 3 | 30 | 70 | - | 100 |
| | **Sub Total** | 18 | 1 | _ | 19 | 150 | 350 | 25 | 525 |
| | **Laboratory** | | | | | | | | |

| | | | | | | | ESE | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | POE | OE | | |
| ET212 | Electronics Circuit Analysis and Design-I | _ | _ | 2 | 1 | _ | 50* | -- | 25 | 75 |
| ET213 | Network Theory & Analysis | _ | _ | 2 | 1 | _ | _ | _ | 25 | 25 |
| ET214 | Digital Techniques | -- | -- | 2 | 1 | -- | 50 | -- | 25 | 75 |
| ET215 | Analog Communication | _ | _ | 2 | 1 | _ | 50 | _ | 25 | 75 |
| ET216 | Electronic Software Lab-I | -- | 1 | 2 | 2 | _ | -- | _ | 50 | 50 |
| ENV21 | Environmental Science-I | 1 | - | -- | -- | -- | -- | -- | -- | -- |
| | **Sub Total** | -- | 1 | 10 | 6 | _ | 150 | | 150 | 300 |
| | **Grand Total** | **18** | **2** | **10** | **25** | **150** | **500** | | **175** | **825** |

Note: 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) *- Practical and Oral Examination of Electronics Circuit Analysis and Design – I includes some of the practical from Network Theory and Analysis

2) Student is required to study and pass Environmental Science subject in Second Year of Engineering to become eligible for award of degree.

# SOLAPUR UNIVERSITY, SOLAPUR

## Faculty of Engineering & Technology

*CBCS structure of S.E. Electronics & Telecommunication Engineering*
*W.E.F. 2017-2018 Semester II*

| Course Code | Theory Course Name | Hrs./week | | | Credits | Examination Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ISE | ESE | ICA | Total |
| ET221 | Electronics Circuit Analysis and Design – II | 4 | _ | _ | 4 | 30 | 70 | - | 100 |
| ET222 | Data Structure | 4 | _ | _ | 4 | 30 | 70 | - | 100 |
| ET223 | Control Systems | 3 | _ | _ | 3 | 30 | 70 | - | 100 |
| ET224 | Linear Integrated Circuits | 4 | _ | _ | 4 | 30 | 70 | - | 100 |
| ET225 | Signals and Systems | 3 | 1 | _ | 4 | 30 | 70 | 25 | 125 |
| | **Sub Total** | 18 | 1 | _ | 19 | 150 | 350 | 25 | 525 |
| | **Laboratory/Workshop** | | | | | | | | |
| | | | | | | | **ESE** | | |
| | | | | | | | **POE** | **OE** | |
| ET221 | Electronics Circuit Analysis and Design – II | _ | _ | 2 | 1 | _ | 50$ | - | 25 | 75 |
| ET222 | Data Structure | _ | _ | 2 | 1 | _ | 50 | _ | 25 | 75 |
| ET223 | Control Systems | _ | _ | 2 | 1 | _ | _ | _ | 25 | 25 |
| ET224 | Linear Integrated Circuits | _ | _ | 2 | 1 | _ | 50 | _ | 25 | 75 |
| ET226 | Electronic Software Lab-II | _ | 1 | 2 | 2 | _ | _ | _ | 50 | 50 |
| ENV22 | Environmental Science-I | 1 | - | -- | -- | -- | -- | -- | -- | -- |
| | **Sub Total** | | 1 | 10 | 6 | -- | 150 | | 150 | 300 |
| | **Grand Total** | **18** | **2** | **10** | **25** | **150** | **500** | | **175** | **825** |

Note: 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) $- Practical and Oral Examination of Electronics Circuit Analysis and Design – II includes Some of the simulation practical from Electronic Software Lab-II
2) Student is required to study and pass Environmental Science subject in Second Year of Engineering to become eligible for award of degree.

**Note** –Batch size for the practical /tutorial shall be of 20 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-I**

# ET211-Engineering Mathematics-III

**Teaching Scheme:**
**Lectures- 3 Hours / week, 3 Credits**
**Tutorial - 1 Hours / week, 1 Credit**

**Examination Scheme**
**ESE- 70 Marks**
**ISE - 30 Marks**
**ICA- 25 Marks**

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**Course Objectives:**

1. To introduce to student method of solving higher order linear differential equations
2. To introduce to student Laplace and inverse Laplace transforms and make him analyze Electrical circuits using it
3. To introduce to student Fourier series and integral transform
4. To make student understand Z transform and its properties
5. To introduce to student numerical methods for finding solution of non linear equations and simultaneous linear equations
6. To introduce to student various probability distributions

**Course Outcomes:**

1. Student can solve higher order linear differential equation related to electrical circuit theory
2. Student can apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits
3. Student can express a function in terms of sine's and cosines components so as to model simple periodic functions.
4. Student can solve problems on Z transform and explain its properties
5. Student can find the relation between two variables for the given data using regression
6. Student can sketch and explain various probability distribution functions
7. Student can solve simultaneous linear equations and nonlinear equations.
8. Student can solve the problems of Fourier integral and Fourier transform

**Course Prerequisite:**

Fundamentals of trigonometry, method of finding roots of algebraic equations, differentiation, integration, partial fraction, sum of sequence and methods of solving definite integrations, basics of statistics and probability theory

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## SECTION – I

**Unit 1:Linear differential equations with constant coefficients: [6Hr]**

Basic definition, differential operator, complimentary functions, particular integral, Shortcut methods for standard functions like $e^{ax}$ ,$\sin(ax+b)$, $\cos(ax+b)$, $x^m$ , $e^{ax}V$ *and* $xV$ , particular integral by general method (without method of variation of parameters) for other functions, electrical engineering applications

**Unit 2:Laplace transform: [5Hr]**

Definition, Laplace transform of standard functions, properties- first shifting, change of scale, multiplication of power t and division by t, Laplace transform of derivative and integral, Laplace transform of periodic functions, unit step functions and unit impulse functions.

**Unit 3:InverseLaplace transforms: [5Hr]**

Definition, Inverse Laplace transform of standard functions, Properties of inverse Laplace transforms- linear property, first shifting theorem, partial fraction, inverse transform of logarithmic & inverse trigonometric functions and convolution theorem, solution of differential equations by Laplace transform.

**Unit 4: Statistics and probability: [5Hr]**

Coefficient of correlation and lines of regression of bivariate data, random variable, Binomial, Poisson, Normal distribution

## SECTION-II

**Unit 5:Fourier series: [6Hr]**

Introduction, Definition, Euler's formula, Fourier series of periodic functions with period $2\pi$ and 2L, Dirichlet's theorem (only statement), even and odd functions, half range sine and cosine series.

**Unit 6: Fourier Transform: [5Hr]**

Fourier integral, Fourier sine and cosine integral, Complex form of Fourier integral. Fourier Transform, Fourier sine and cosine transform and Inverse transform.

**Unit 7: Numerical methods: [5Hr]**

Numerical solution of algebraic and transcendental equations: Regula-Falsi method, Newton-Raphson method, solution of simultaneous linear equations: Gauss elimination, Jacobi's method, Gauss Seidal method, largest Eigen values & corresponding Eigen vectors by Rayleigh's power method.

**Unit 8:Z-Transform:** **[5Hr]**

Introduction, Z-Transform of standard sequence, properties of Z-transform – linearity, change of scale, shifting property, multiplication by k, division by k, inverse Z-transform –power series method, partial fraction method

**Internal Continuous Assessment** (ICA):

*ICA shall consist of minimum six to eight assignments based on entire curriculum*

**Text books:**


1. A textbook of Applied Mathematics Vol. II and Vol. III, J.N. and P.N. Wartikar, Vidyarthi Grah Prakashan, Pune.
2. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publications, Delhi.
3. Numerical Methods, Dr.B.S.Grewal, Khanna Publications, Delhi
4. A Textbook of Applied Mathematics, N.P. Bali, Ashok Saxena and N.Ch. S.N. Iyengar, Laxmi Publications, Delhi.
5. Advanced Engineering Mathematics, Kreyzig-John Wiley & SMS, New York.


**Reference Books:**


1. Advanced Engineering Mathematics, Peter O'Neil , Cengage Learning.
2. Engineering Mathematics, Srimanta Pal, Subodh Chandra Bhunia, Oxford University Press

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-I**

# ET212-Electronic Circuit Analysis and Design-I

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

**Course Objectives:**

1. To emphasize on working and applications of diode.
2. To make student design and analyze unregulated power supply
3. To make student comprehend working of bipolar junction transistor with basic configurations and its hybrid model
4. To make student design and analyze single stage amplifier and multivibrator using BJT
5. To introduce to student working of FET and MOSFET and its applications

**Course Outcomes:**

1. Student can elaborate working and applications of diode.
2. Student can analyze and design unregulated power supply using diode
3. Student can elaborate working and characteristics of BJT.
4. Student can analyze and design single stage amplifier and multivibrator.
5. Student can evaluate FET and MOSFET parameters.
6. Student can explain applications of FET and MOSFET

**Course Prerequisite:**

Student has completed a comprehensive course in basic electrical and basic electronics and shall have knowledge and the ability to apply electrical theorem and laws. Student should also have very basic conceptual knowledge of active and passive devices.

## SECTION-I

**Unit 1: PN Junction Diode:** **[8 Hrs.]**

PN Junction diode characteristics using Diode Equation, Effect of Temperature on diode characteristics, Diode small signal model, AC and DC Load Line, Junction and diffusion Capacitances, Specifications and Ratings of PN Junction Diode.

**PN Junction Diode as Rectifier:** Half wave rectifier, Full wave rectifier and Bridge Rectifier (Detailed analysis of all circuits include calculations of various parameters such as Io (rms), Vo (rms), Io (avg), Vo (avg), Ripple Factor, Efficiency, TUF, PIV)

**Unit 2: Diode Applications:** **[7 Hrs.]**

**Diode as a switch, Clipping Circuits**–Classification of clipper circuits - Series, Shunt, Positive, Negative and Combinational clippers. Biased clippers, transfer characteristics of different clipper circuits. Design problems

**Clamper Circuits**-Positive and Negative clamper circuits. Design problems.

**Voltage Multipliers**- Analysis of Voltage Doubler and Voltage Tripler circuits.

Study of other semiconductor devices such as Varactor diode, Schottkey diode, Zener Diode (working principle and Characteristics) Specifications and Ratings of Zener Diode, Application of Zener diode as Voltage Regulator, Problems on design of Zener voltage regulator. Calculation of line and load regulation.

**Unit 3: Filters: [3 Hrs.]**

Filter definition, its need and operating principle, Classifications of filter circuits- Capacitor Filter, Inductor filter, LC and $\pi$ Filter (Analysis of all filter circuits and their comparison), design problems.

**Unit 4: Design of Unregulated Power Supply: [6Hrs.]**

Design of unregulated power supply using Rectifier and Filter(design includes selection of Transformer, Diode and Filter Components)

## SECTION-II

**Unit 5:Bipolar Junction Transistor**: **[14Hrs.]**

Different transistor configurations and comparison, I/O Characteristics of CE and CB configuration, Early Effect, Current Components in all three configurations, AC and DC Load Line, Specifications and Ratings of Transistors.

**Biasing of Transistors:** Need of biasing, Thermal Runaway, stability considerations.

Different Biasing circuits – Fixed bias, Collector to base bias and voltage divider bias (Self bias), Comparison between different biasing circuits and derivation for stability factor. Compensation techniques. Design problems

**Hybrid Model of BJT**: Hybrid model for transistor in CE and CB configuration. Approximate h parameter model.

**Single stage RC coupled amplifier**- Amplifier analysis using graphical and AC equivalent Circuit method (using h – parameter), Determination of Amplifier Parameters (Av, Ai, R i, Ro).Application of BJT– Transistor as Switch(different time constants of transistor) Design problems based on transistor application as switch Design of Single Stage RC coupled Amplifier using BJT

**Unit 6: Transistor Amplifier Frequency Response: [4 Hrs.]**

Frequency response of single stage RC coupled amplifier. Low frequency Response- Effect of Cc and Ce, High frequency response- Effect of Junction and diffusion Capacitance

**Unit 7: Field Effect Transistor:** **[6 Hrs.]**

JFET- Construction, working and V-I characteristics, different configurations of JFET, JFET parameters, application of JFET as VVR, JFET as an amplifier - Small signal equivalent circuit and analysis at mid frequency.

Application as a switch and Amplifier MOSFET-Construction, working and V-I characteristics, MOS capacitor, different types. MOSFET amplifier-Mid frequency analysis

**Note:** For selection of components in design **Data Sheet** should be referred.

**Internal Continuous Assessment (ICA):**

**Practicals**: -

Minimum eight experiments from the following (ELECTRONIC CIRCUIT ANALYSIS and DESIGN – I)

1. Full Wave Rectifier circuit design and analysis.
2. Performance, parameters of filter circuit.
3. Clipper, clamper Circuits.
4. Voltage multiplier using diode.
5. V-I Characteristics of Zener diode and its application as Voltage regulator.
6. Design and implementation of Un-regulated power supply using FWR and Capacitor filter.
7. I/O Characteristics of CB configuration.
8. I/O Characteristics of CE configuration.
9. Frequency response of single stage RC coupled CE amplifier.
10. Design and implementation of relay driver circuit.
11. V-I characteristics of JFET.
12. Application of MOSFET as a switch.

Minimum eight experiments from the following (NETWORK THEORY AND ANALYSIS)

1. Verification of superposition theorem.
2. Verification of Maximum Power Transfer Theorems.
3. Frequency response of series resonance circuit.
4. Step response of RC circuit (Transient and steady state).
5. Verification of Z and Y parameters.
6. Verification of H parameters.
7. Design LPF, plot frequency response and find cut off frequency.
8. Design HPF, plot frequency response and find cut off frequency.
9. Design and verification of T-type attenuators.
10. Design and verification of $\pi$-type attenuator.

Any additional experiments based on syllabus.

**Note: -**POE for Electronic Circuit Analysis and Design – I and Network Theory and Analysis is combined.

**Text Books:**


1. Electronic Devices and Circuits Allen Mottershed PHI Publication.
2. Electronic Devices and Circuits- J.B.Gupta 3rd Edition KATSON Books.
3. Electronics Devices and Circuits-S. Shalivahanan,N. SureshKumar, Tata McGraw Hill Publication.
4. Electronic Devices & Circuits-Anil Maini, Varsha Agrawal, Wiley Publication.


**Reference Books:**


1. Electronic Devices Floyd Pearson Education
2. Electronic Devices and Circuit Theory Boylestad Pearson Education
3. Electronic Design Martin Roden Shroff Publication from Concept to Reality
4. Pulse, Digital and Switching Circuits Millman Taub Tata McGraw Hill Publication
5. Electronic Circuit Design, Talbar Sontakke, Sadhu Sudha Prakashan, Nanded.
6. "Microelectronics Circuit" by Sedra Smith, Oxford University Press, 4thEdition.

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-I**

# ET213-Network Theory and Analysis

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

**Course Objectives**

1. To develop skills for analysis of linear circuits with dependent and independent AC/ DC excitations.
2. To understand concept of resonance in electric circuits and its applications.
3. To analyze transient and steady state response for linear circuits.
4. To know fundamentals of two port network, passive filters, Attenuators.

**Course Outcomes:**

1. Analyze linear circuit with use of different network theorems and analysis methods.
2. Compute two port network parameters and draw equivalent network.
3. Determine transient and steady state response of linear circuits.
4. Design passive filter and attenuator circuits.

**Course Prerequisite:**

1. KVL, KCL, star-delta transformation, source transformation
2. Rectangular to polar conversion and vice versa.

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## SECTION-I

**Unit 1**: **Circuit Analysis and Network Theorems** **[10 Hrs.]**

**Network Graphs:** Fundamental definitions, Incidence matrix, Fundamental cut set and Tie-set matrix.

**Network Theorems:** Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems.

Numerical problems based on AC and DC analysis.

**Unit 2: Resonance:** **[6Hrs.]**

**Series resonance:** Series resonance, impedance and phase angle of series resonant circuit, voltage and current in series resonant circuit. Effect of resistance on frequency response curve, bandwidth, selectivity and quality factor. Significance of Quality factor.

**Parallel resonant:** Parallel resonant circuit (Tank circuit), resonant frequency, and variation of impedance with frequency, reactance curves. Numerical problems based on above.

**Unit 3: Two Port Networks** **[8 Hrs.]**

**Two port Network:** Open circuit impedance parameters (Z), Short circuit admittance parameters (Y), Transmission parameters (ABCD), Hybrid parameters (h), and reciprocity and symmetry conditions. **Interconnection of two port networks:** Parallel, Series and Cascade connection of two-port networks.

T and π representation, Terminated 2 port networks.

## SECTION II

**Unit 4:Transient Response** **[9 Hrs.]**

**Review of Laplace Transform Basics:** Initial conditions, evaluation and analysis of transient and steady state response of following:

**RL circuit:** RL circuit step voltage response and step current response. **RC circuit:** RC circuit step current response and step voltage response. **RLC circuit:**RLC circuit step voltage response and step current response.

**Unit 5:Network Function** **[6 Hrs.]**

**Complex frequency:** Concept of complex frequency.

**Network function:** network function for one port and two port network. Poles and Zeros of network function. Time domain behavior from poles and zero plot.

****Note: (Do not include Stability concept, Routh Array as it is part of control system syllabus)**

**Unit 6:Filters and attenuators** **[9 Hrs.]**

**Filters:** Characteristic of high pass, low pass and band pass and band stop filter. Constant K type Filters, m-derived filter, section m derived LPF,HPF, BPF and BSF.

**Attenuators**: Relationship between Neperand Decibels, Design of T,π and Lattice attenuators.

**Internal Continuous Assessment (ICA):**

**Note:***Practical's and Oral Examination of Electronic Circuit Analysis and Design – I is combined With Network Theory and Analysis

**List of Practicals (Minimum eight Practicals from List given):**

1. Verification of superposition theorem.
2. Verification of Maximum Power Transfer Theorems.
3. Frequency response of series resonance circuit.
4. Step response of RC circuit (Transient and steady state).
5. Verification of Z and Y parameters.
6. Verification of H parameters.
7. Design LPF, plot frequency response and find cut off frequency.
8. Design HPF, plot frequency response and find cut off frequency.
9. Design and verification of T-type attenuators.
10. Design and verification of π-type attenuator.

**Text Book:**

1. Circuit and network analysis and synthesis by A Sudhakar and Sham Mohan S Palli. TMH publication. 3rd Edition
2. Electric circuit analysis by Ramesh Babu, Scientech Publication
3. Circuit Theory (Analysis and Synthesis) A. Chakrabarti Dhanpat Rai and Co. 6th Edition.
4. Network Analysis & Synthesis- Franklin Kuo, Wiley Publication.
5. Network Fundamentals & Analysis- Kaduskar, Wiley Publication.

**Reference Book:**

1. Network Analysis M.E. Van Valkenburg, PHI publication. 3rd Edition
2. Network and System - D. Roy Choudhary, Wiley Eastern (2nd Edition).
3. Theory and problems of Electric Circuits Joseph Aedminster, Shaum Series
4. Network Analysis F.F.Kuo - John Wiley and Sons (2nd Edition).

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-I**

# ET214-Digital Techniques

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

**Course Objectives**

1. To understand principles, characteristics and operations of combinational and sequential Logic circuits.
2. To develop design and implementation skills of combinational logic circuits.
3. To design, implement and analyze, asynchronous and synchronous sequential circuits Using flip flops.
4. To design and verify VHDL modules for combinational logic circuits.

**Course Outcome**

1. Students will be able to design and realize combinational logic circuits using logic gates, MSI circuits and PLDs.
2. Students will be able to design, implement and analyze asynchronous and synchronous Sequential circuits using flip flops.
3. Students will be able to apply digital concepts in industrial applications.

**Course Prerequisite:**

1. Truth table and symbol of all Basic gates, Universal gates, EX-OR and EX-NOR gates
2. Boolean laws and Demorgan's theorem

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## SECTION I

**Unit 1: Codes and Simplification technique [5 Hrs.]**

Codes- BCD and Gray codes, Seven segment, Principles of combinational logic: Standard representation for Logical Function, canonical forms, don't care conditions, minimization techniques (using K-map up to 4 variables only), static and dynamic Hazards.

**Unit 2: Combinational Circuit Design [9 Hrs.]**

Adder, Subtractor, Code converters (binary to gray and gray to binary, BCD to 7 segment), IC 7447,MUX, DEMUX, encoder, priority encoder, decoder, Multiplexer (Tree) and De-multiplexer (Tree), magnitude comparator, adder with look ahead carry generator, ALU (74181), Parallel adder(IC 7483), parity generator and checker.

**Unit 3: Logic Families** **[4 Hrs.]**

Characteristics of Digital ICs, Input/output profile forTTL and CMOS, TTL logic families-standard TTL, Totem-pole, open collector, tristate (concept andapplication), CMOS (inverter, NAND and NOR), importance of (C, HC), CMOS-TTL interfacing, comparison ofTTL and CMOS.

**Unit 4: Flip-Flops** **[6 Hrs.]**

NAND Latch, Flip-Flop: D, SR, JK and T (Characteristic table, excitation table and characteristic equation), Race around condition, Master Slave J-K flip-flop, flip-flop conversion.

## SECTION II

**Unit 5: Registers** **[7 Hrs.]**

Asynchronous and synchronous sequential circuits, Shift register (modes of operation), 4-bit bidirectional shift register, universal shift registers, Ring counter, Johnson counter, IC 7495/74195.

**Unit 6: Counters and State machines** **[10 Hrs.]**

Design of ripple counter using flip-flop, IC 7490, 4 bit up/down counter, mod –N counter, Design of Synchronous counter using Flip-Flop, 4 bit up/downcounter, IC 74191.

Moore and Mealy machines, representation techniques, state diagram, state assignment, state reduction, implementation using flip flops, Sequence detector

**Unit 7: PLDs (Programmable Logic Devices)** **[4 Hrs.]**

PLDs- PROM, PAL and PLA Architecture, CPLD, Implementing combinational circuits using PLDs

**Unit 8: Introduction to VHDL** **[3 Hrs.]**

Library, Entity, Architecture, VHDL code for adder, Subtractor and comparator.

**Internal Continuous Assessment (ICA):**

**List of Practicals** (Minimum Ten Practicals)

1. Implementation of SOP and POS logical functions using universal gates.
2. Implementation of full adder, and full subtractor using logic gates.
3. Code conversion using logic gates or logic ICs: BCD to Binary, Binary to Gray, Gray to Binary.
4. Design and implementation of 2 bit digital comparator using logic gates and functional Verification of 4 bit digital comparator using IC 7485.
5. Design and implementation of 1 decimal digit BCD adder using IC 7483.

6. (i) Verification of functionality of multiplexer.
   (ii) Design and implement combinational logic function using multiplexer ICs.
7. (i) Verification of functionality of decoder.
   (ii) Design and implement combinational logic function using decoder IC.
8. Verification of the functionality of BCD to Seven segment decoder/driver.
9. Implement S-R, D, J-K, T flip flops using logic gates.
10. Functional verification of universal shift registers using IC 7495.
11. Design and implementation of Ring counter using shift register.
12. Design and implementation of Johnson counter using shift register.
13. Design and implementation of Pulse train generator using IC 7495.
14. Functional verification of ripple counter using IC 7490
15. Functional verification of synchronous counter using IC 74191
16. Design of synchronous sequence generator using MS JK flip-flop.
17. Design of half adder and half Subtractor using VHDL

**Text Books:**


1. Digital Design - M. Morris Mano - Pearson Education (3rd Edition)
2. Digital Principles – Leach, Malvino, TMH (6th Edition).
3. Fundamental of Digital Circuits- Anand Kumar- Prentice Hall of India Pvt. Ltd.
4. Digital Electronics – Dr. R. S. Sedha – S. Chand Publications (3rd Revised Edition).
5. Digital System, Principles and Applications, Ronald J. Tocci, PHI
6. Circuit Design using VHDL –Volnei Pedroni, PHI Publications.
7. Digital Electronics- Anil K Maini, Wiley Publication.


**Reference Books:**


1. Digital Design Principles and Application - Wakerly – Pearson Education
2. Digital Electronics - Gothman - (PHI)
3. Digital Logic and Computer Design - Morris Mano - Pearson Education
4. The Principles of Computer hardware- Alan Clements (Low Price 2000) (Third Edition), OxfordPress.

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-I**

# ET215-Analog Communication

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Lectures– 3 Hours/week, 3 credits** | **ESE – 70 Marks** |
| **Practical- 2 Hours/week, 1 credit** | **ISE – 30 Marks** |
| **POE- 50 Marks** | **ICA- 25 Marks** |

**Course Objectives**

1. The ability to describe amplitude and frequency modulation and demodulation techniques.
2. To introduce student, basic types and sources of noise in a communication system.
3. To make student understand theory and mathematical background of sampling theorem and minimum sampling rate for an analog signal.
4. The ability to explain properties of half wave dipole, folded and Yagi-uda antennas.
5. The ability to apply MATLAB software for the design and analysis of a simple analog A.M and F.M. modulation techniques.

**Course Outcomes:**

1. Describe, analyze and demonstrate Amplitude modulation and demodulation techniques.
2. Describe, analyze and demonstrate frequency modulation and demodulation techniques
3. Apply the theory and solve problems related to noise.
4. Explain and show the significance of sampling theorem.
5. Illustrate the radiation pattern and calculate the beam width of half wave dipole, folded and Yagi-uda antennas
6. Apply MATLAB software for simulation of A.M. and F.M. modulation and demodulation.

**Course Prerequisite:**

Students should have a basic knowledge of engineering mathematics, basic science and basic working knowledge of MATLAB.

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## SECTION-I

**Unit1: Introduction** **[6 Hrs]**

Introduction of Communication, Element of a communication systems, Modulation and Demodulation, Need of Modulation, Type of modulation, Type of communication Channels (Transmission line, Parallel wires, Coaxial cables, waveguides and optical fibers), Electromagnetic spectrum, Bandwidth, Concept of multiplexing (TDM and FDM), Application of communication.

**Unit 2: Noise** **[7Hrs]**

Sources of Noise, Types of Noise, White Noise, Noise calculations, Noise figure, Noise Temperature, Signal to noise ratio.

**Unit 3: Amplitude Modulation and Demodulation** **[8Hrs]**

Mathematical treatment and expression for AM, Frequency spectrum, Modulation Index, Representation of AM wave, Power relation as applied to Sinusoidal Signals, AM generation Techniques, DSB, SSB generation techniques, ISB and VSB. AM Demodulation, AM radio receiver types, TRF, Super heterodyne, AM receiver Characteristics, Intermediate frequencies and its choice, AGC.

## SECTION II

**Unit 4: Frequency Modulation and Demodulation** **[8Hrs]**

Mathematical analysis of FM and PM, Frequency spectrum analysis of FM, Modulation Index Bandwidth requirements, Narrow Band and wide band FM, Comparison of AM,FM and PM, Direct and indirect methods of FM generation, Need for Pre-emphasis, De-emphasis. FM detection Techniques - Slope Detector, Dual Slope Detector, Foster Seeley Discriminator, Ratio Detector.

**Unit 5: Pulse Analog Modulation** **[7Hrs]**

Sampling Theorem, Proof of Sampling Theorem, Nyquist Rate and Nyquist Interval, Sampling Techniques - Natural sampling, Flat Top Sampling, Comparison of Various Sampling Techniques, Analog Pulse Modulation/Demodulation Methods- Pulse Amplitude Modulation, Pulse Time Modulation.

**Unit 6: Antenna and Radio Wave Propagation** **[6Hrs]**

Introduction - Characteristics of antennas, half wave dipole antenna, folded antenna, Yagi Antenna, Horn antenna, Lens antenna. Wave propagation – Introduction, Ground wave, Sky waves, Space waves.

**Internal Continuous Assessment (ICA):**

**List of Practicals:( Minimum 10 Experiments should be performed)**

1. AM Generation Techniques
2. AM Detection Techniques
3. Measurement of Noise Figure
4. FM Generation Techniques
5. FM Detection Techniques
6. SSB Transmission and Reception
7. DSB Transmission and Reception (Super heterodyne Receiver)
8. Antenna Characteristics

9. Verification of Sampling Theorem, PAM Techniques, (Flat top and Natural sampling), reconstruction of original signal. Observe Aliasing Effect in frequency domain.
10. Spectrum Analysis of AM and FM signals
11. Simulation of Analog modulation techniques using MATLAB
12. Simulation of Frequency modulation techniques using MATLAB

**Note:** The visit to communication industries is compulsory and the Visit report should be submitted In Term Work.

**Text Book:**


1. Electronic Communication, Kennedy, Davis TATA McGraw Hill. 5th Edition.
2. Analog and Digital Communication, T.L. Singal, TATA McGraw Hill
3. Communication systems (Analog and Digital),Sanjay Sharma, Katson books, 4th edition
4. Digital & Analog Communication Systems-Shanmugum, Wiley Publication.
5. Introduction to Analog & Digital Communication-Haykin, Moher, Wiley Publication.


**Reference Book:**


1. Electronic Communication System, Dennis Roddy, John Coolen, Pearson Education 4th Edition
2. Electronic Communication Systems, Blake, CENGAGE Learning, 2nd Edition
3. Communication Electronics, Principles and application, Frenzel, TATA McGRAW-HILL, 3rd edition.

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-I**

# ET216-Electronic Software Lab-I

**Teaching Scheme**
**Tutorial – 1 Hours/week, 1 credit**
**Practical -2 Hours/week, 1 credit**

**Examination Scheme**
**ICA- 50 Marks**

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**Course Objectives**

1. To study and implement advanced features of C programming language.
2. To develop the ability of building logic and analyze time and space complexity of the program.

**Course Outcome**

1. Students will be able to implement arrays and structures.
2. Students will be able to use string library functions and array of string.
3. Students will be able to implement dynamic memory allocation.

**Course Prerequisite:** Basic data structure types and elements, logical computation.

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## SECTION-I

**Unit 1: Storage Classes and standard library functions [2 Hrs]**

Automatic, Register, Static, External storage classes and standard library functions such as arithmetic functions, data conversion functions, character classification functions and time related functions.

**Unit 2: Introduction to Arrays, Structures, & Functions in 'C': [2 Hrs.]**

1-D array, 2-D array, structure, Functions: Call by Value and Call by Reference, variable scope, creating records using array and structure.

**Unit 3: String Processing [2 Hrs.]**

Declaration and initialization of strings, Display strings with different formats, string library functions, Array of strings.

## SECTION II

**Unit 4: Pointers [3 Hrs.]**

Introduction, Pointer to Pointer, Pointers to an Array, Array of Pointers, Pointer and Strings, Pointer and Structures, Dynamic memory allocation using malloc function.

**Unit 5: Files [3 Hrs.]**

Introduction, Streams and file types, File operations, Different File I/O Functions, other file functions, command line arguments.

**Unit 6: Algorithm Analysis** **[2 Hrs.]**

Introduction to Asymptotic Big–O notation, Omega Notation, Time complexity and space complexity.

**Internal Continuous Assessment (ICA):**

**Students should perform minimum 10 experiments based on the following preferably conducted on Unix / Linux platform**

1. Programs to demonstrate storage classes and functions like atoi(), itoa(), clock() etc.
2. Represent Sparse Matrix using arrays and perform Matrix Operations such as Addition and Multiplication.
3. Program to implement Magic Square by taking the size from user.
4. Program to implement concepts of functions such as call by value and call by reference.
5. Program to create a student table of size 10 using structure to perform insert and display operations.
6. Program to perform different string operations using string library functions.
7. Program to sort the strings alphabetically.
8. Programs to demonstrate: Array of Pointers, Pointer and Structures
9. Program to create a student database at run time using structure and pointer to perform different operations.
10. Program to simulate string library functions using pointers.
11. Menu driven program for performing the following operations on Files: Insert, Delete, Modify and Display records.
12. Program to demonstrate file copy operation using Command Line Arguments.

**Text Books:**

1. Let Us C by Yashwant Kanetkar
2. Pointers in C by Yashwant Kanetkar

**Reference Books:**

1. Data Structures Using C & C++ by Rajesh Shukla.
2. Data Structures A Pseudocode Approach with C by Richard F. Gilberg & Behrouz A. Forouzan

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-II**

# ET221-Electronic Circuit Analysis and Design-II

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

**Course Objectives:**

1. To make student analyze transistorized multistage amplifier.
2. To make student design and analyze feedback amplifiers.
3. To make student analyze power amplifiers.
4. To make student design and analyze oscillators.
5. To make student design and analyze timer circuit using IC555.
6. To make student design and analyze transistorized series voltage regulators.
7. To make student design and analyze voltage regulator using IC's.

**Course Outcomes:**

1. Student can analyze multistage amplifier.
2. Student can analyze and design feedback amplifier.
3. Student can analyze power amplifiers.
4. Student can analyze and design oscillators.
5. Student can design and analyze timer circuits using IC 555 and some of its applications.
6. Student can analyze and design transistorized series voltage regulators.
7. Student can analyze and design voltage regulator using ICs.

**Course Prerequisite:**

Student has completed a comprehensive course in basic electronics and electronic circuit analysis and design and shall have an understanding and the ability to analyze circuits containing semiconductor devices

## SECTION-I

**Unit1**:**Multistage Transistor Amplifiers** **[5Hrs.]**

Need of cascading, different coupling schemes, Analysis of two stage RC coupled Amplifier. Low Frequency and high frequency response of two stage RC coupled amplifier and Transformer coupled amplifier. Design of two stage RC coupled and Direct coupled amplifier. Low frequency and High frequency response of two stage MOSFET amplifiers.

**Unit2: Feed Back Amplifier** **[6 Hrs.]**

Theory of negative feedback, Types of negative feedback. Effect of negative feedback on stability, Band width, noise, distortion, i/p resistance and o/p resistance. Merits and demerits of negative feedback. Darlington pair amplifier and its analysis. Design of R-C coupled amplifier involving voltage series and current series feedback.

**Unit3: Sinusoidal Oscillators** **[7Hrs.]**

Oscillator startup mechanism, Operating principal (Barkhausen's criteria) Classification of oscillators based on frequency range, components used, operating principle, shape of output waveform generated etc. RC oscillators- RC phase shift Oscillator, Wein bridge oscillator.LC oscillators–Colppits oscillator, Hartley oscillator Derivations for frequency of oscillations of above oscillators. Crystal oscillator- Piezo electric effect, electrical equivalent circuit of a crystal, derivations for resonant frequencies. Design of RC oscillator.

**Unit4 :Power amplifiers** **[6Hrs.]**

Classification of Power amplifiers-class A, B and AB Analysis of Class A, BandAB power amplifiers. Distortion in power amplifiers- Cross over distortion, Harmonic distortion (three point and five point methods) Complementary symmetry power amplifier Design of Class A, Class Band Complementary system Power Amplifier.

## SECTION-II

**Unit 5: Transistorized Voltage Regulators:** **[4Hrs.]**

Voltage regulator parameters such as line regulation, load regulation and ripple rejection etc. Design of Series voltage regulator with and without Pre Regulator. Short circuit and thermal shut down protection circuits.

**Unit 6:IC Regulator** **[6 Hrs.]**

Classification and features of IC regulators, Fixed voltage regulator using IC 78XX and 79XX series, variable voltage regulator using IC LM 317 and LM 337. Dual regulated power supply, Current boosting in voltage regulator. Design of voltage regulators using above ICs.

**Unit 7: Multivibrators using Transistors:** **[6Hrs.]**

Classification of Multivibrator- Astable,Monostable, Bistable and Schmitt Trigger(analysis of all circuits), Design of astable and monostable multivibrators with triggering circuit design..

**Unit8: Waveform generator using IC 555** **[8 Hrs.]**

Features, functional pin configuration and internal block diagram and applications of IC 555 Configuration of IC 555 in Monostable, Astable and Bistable, Schmitt trigger mode Power ON delay circuit using IC 555 Design of Astable and Monostable Multivibrator circuits using IC 555.

**Internal Continuous Assessment (ICA):**

**List of the experiments**

Minimum eight experiments from 1 to 12 (Electronic Circuit Analysis And Design – II)

1. Frequency response of two stage RC coupled amplifier.
2. Voltage series feedback amplifier.
3. RC Phase shift oscillator.

4. Wein-Bridge oscillator.
5. Class A Power amplifier
6. Complimentary Symmetry Power amplifier.
7. Fixed Voltage Regulator Using 78xx and 79xx.
8. Variable voltage regulator using LM317 and LM 337.
9. Astable Multivibrator using transistor
10. Monostable Multivibrator using transistor
11. Astable Multivibrator using IC 555.
12. Monostable Multivibrator using IC 555.

Minimum six experiments from 13 to 23 (**ELECTRONIC SOFTWARE LAB-II**).

13. Voltage series feedback amplifier/ RC Phase shift oscillator.
14. Fixed Voltage Regulator Using 78XX and79XX.
15. Variable voltage regulator using LM317 and LM 337.
16. Monostable Multivibrator using IC 555.
17. V-I characteristics of JFET.
18. Working with Arithmetic, Exponential, logarithmic, Trigonometric operation in Matlab.
19. Working with Matrix, Vectors and arrays.
20. Plot of Basic test Signals using plot, stem, fplot, and subplot.
21. Program for Sampling Theorem using Matlab
22. Program for finding Z transform using Matlab.
23. Design of single sided PCB using Eagle Cad.

Any additional experiments based on syllabus.

**Note: POE** for Electronic Circuit Analysis And Design – II And Electronics Software lab-II is Combined.

**Text Books:**


1. Electronic Devices and Circuits Allen Mottershed PHI Publication
2. Electronic Devices and Circuits- J.B.Gupta 3rd Edition KATSON Books
3. Electronics Devices and Circuits- S. Shalivahanan,N Suresh Kumar, Tata McGraw Hill Publication
4. Electronic Devices & Circuits- Anil Maini, Varsha Agrawal, Wiley Publication.


**Reference Books:**


1. Electronic Devices – Floyd, Pearson Education
2. Electronic Devices and Circuit Theory – Boylestad, Pearson Education
3. Electronic Design from Concept to Reality – Martin Roden Shroff Publication
4. Op Amp and Linear Circuits – Ramakant Gaikwad PHI Publication
5. Microelectronics Circuit – Sedra Smith, Oxford University Press, 4thEdition.

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-II**

# ET222-Data Structure

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

**Course Objectives:**

1. To provide an in-depth knowledge in problem solving techniques and data structures.
2. To understand the different methods of organizing data.
3. To implement the different Data Structures.

**Course Outcome:**

1. Student can implement stack, queues, and linked list.
2. Student can use recursion
3. Student can select non linear structures for autonomous realization of simple programs or program parts
4. Student can implement different searching and sorting technique

**Course Prerequisite:**

Basic Knowledge of C programming

## SECTION – I

**Unit 1: Stacks, Queues: [8Hrs.]**

Stack-Definition, representation, operations, implementation and its applications (converting infix to postfix expression using algorithm, evaluating postfix expression using algorithm) Queue- Definition, representation, operations, implementation of simple Queue and Circular Queue and its applications, Definition and concept of DEQUE and Priority Queue.

**Unit 2: Linked List: [8 Hrs.]**

Definition, Representation, operations, and applications of singly linked list (Polynomial representation using Algorithm), Doubly linked list, Circular linked list, Concept of Avail list.

**Unit 3: Recursion: [4 Hrs.]**

Definition, recursive flow chart, programs using recursive functions (factorial, GCD, Multiplication of two numbers, Fibonacci sequence)

## SECTION – II

**Unit 4: Non-Linear Data structures: [8 Hrs.]**

Trees- Basic Terminology, Binary tree, Traversal methods and program implementing tree Traversal methods, Binary Search Tree- Definition, Representation, Inserting and Deleting Algorithm, Introduction to B Tree, B+ Tree and AVL Tree.

Graphs- Basic concepts of graph theory, storage representation, Traversal Methods.

**Unit 5: Searching Techniques: [4 Hrs.]**

Linear Search, Binary Search, Definition of hashing, Hash Functions, Hash Collision, Collision Resolving Techniques- open Addressing and closed Addressing.

**Unit 6: Sorting Techniques: [8 Hrs.]**

Bubble Sort, Insertion Sort, Selection Sort, concept of Merge Sort, Quick Sort, Radix sort, Analysis of sorting techniques based on time complexity

**Internal Continuous Assessment (ICA):**

**List of Practicals (Minimum Twelve Practicals)**

1. Implementation of stack using array.
2. Implementation of Queue using array.
3. Implementation of circular Queue using array.
4. Implementation of stack using Linked list.
5. Implementation of Queue using Linked list.
6. Implementation of Circular Queue using Linked list.
7. Implementation of singly Linked list.
8. Implementation of Josephus problem using Circular Linked list.
9. Find Factorial of a given no, by defining recursive function.
10. Find GCD of given no, by defining recursive function.

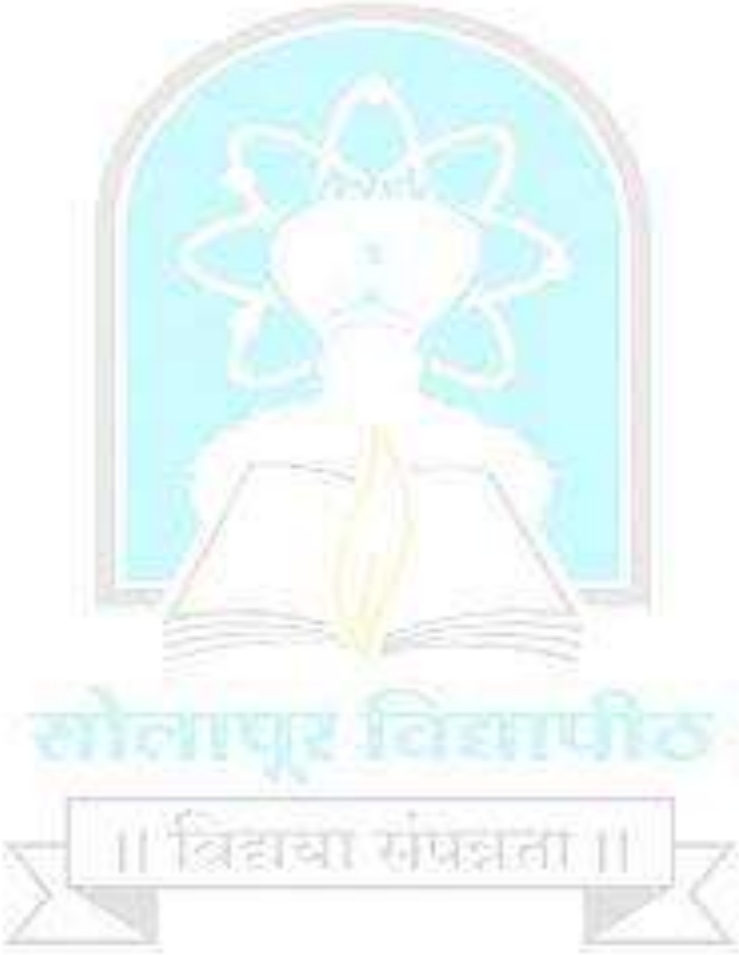
**Text Books:**


1. Data Structures Using C and C++, Y.Langsam, M.J. Augenstein, A.M Tanenbaum Pearson Education Second Edition
2. Data structures using C, Rajani Jindal Umesh Publication
3. Data structures through C in Depth, S.K.Srivastava, Deepali Srivastava, BPB Publication.
4. Data Structures using C, ISRD Group, TMH
5. Data Structures- Venkatesen, Wiley Publication.


**Reference Books:**


1. Fundamentals of Data Structures, Ellis Horowitz, SartajSahani (Galgotic Book Source)
2. Data Structures and Program design, Robert L. Kruse (PHI).
3. Data structure and algorithm, mark Allen Weiss (Pearson Publication, Second edition)
4. Data Structures using C and C++, Rajesh K. Shukla, Wiley Precise.

11. Find multiplication of n Natural no by defining recursive function.
12. Implementation of Tree Traversal Methods.
13. Search element from list using linear search and Binary search method.
14. Write the program to Sort the given list using Bubble sort method
15. Write the program to Sort the given list using Selection sort method
16. Write a program to Sort the given list using Insertion sort method



# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-II**

# ET223-Control Systems

| **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 give knowledge about the systems and Control systems.
2. To introduce mathematical Modeling of systems.
3. To introduce Systems reduction techniques using different methods.
4. To analyze the stability of system in time domain and frequency domain.

**Course Outcomes:**

1. Explain applications of control system
2. Model the Mechanical and Electrical systems.
3. Solve the problems on system reduction.
4. Compute the stability of system.
5. Plot Bode plot, Root Locus for given system.

**Course Prerequisite:** Students will have some background in dynamics and Laplace transform. Also students must know the plotting of the frequency response.

## SECTION-I

**Unit 1 Introduction to control system [4Hrs]**

System, Control system, Types of control systems, concept of feedback, Liquid level control system, Automobile driving system, residential heating system, heat exchange, Servomechanism for steering of antenna, Robotic control system. Transfer function of closed loop system.

**Unit 2 Mathematical Modeling [6Hrs]**

Mathematical modeling concept, Mathematical modeling of mechanical systems –translation and rotational systems, problems. Mathematical modeling of Electrical systems using R, L and C, Transfer function of RLC series and parallel circuits, problems. Analogy Systems-Mechanical (Translation and rotational systems) to Electrical circuits, problems.

**Unit 3 Block diagram reduction Techniques [6Hrs]**

Block diagram representation, Block diagram reduction rules, problems. Signal Flow Graph- Properties, Terminologies, problems. Mason's Gain formula- Introduction, Mason's Gain formula problems, Working principle, construction, types and applications of Stepper motor.

**Unit 4 Stability Analysis [4Hrs]**

Stability Criterion, Types of stability- absolute stability, critically or marginally stability, conditional stability, relative stability, poles and zeros of system.

Routh – Hurwitz criterion for stability, problems.

## SECTION-II

**Unit 5 Time Domain analysis [7Hrs]**

Time response, Standard test signals. Time domain specifications and its derivations (Derivations of rise time, peak time, maximum peak overshoot, and delay time), problems. Time response of first order systems to step, ramp and impulse input, time response of second order system, impulse response of second order system,

Steady state errors and error constants, Effect of inputs on steady state errors.

Types of feedback control system systems, steady state errors of Type0, Type 1 and Type 2 system, Problems.

**Unit 6 Frequency domain analysis [5Hrs]**

Frequency response specifications, co-relation between time domain and frequency domain response,

Bode plot: asymptotic Bode plot, Stability analysis using Bode plot**.**

**Unit 7 Root Locus [5Hrs]**

Concept of root locus, Construction of root locus, stability analysis using root locus. Problems of root locus, Evans condition.

**Unit 8 Compensators [3Hrs]**

Introduction to Compensators, Types of compensating networks- Series, parallel, feedback networks, Need of compensator, Lead, lag and lead-lag compensator.

**Internal Continuous Assessment (ICA):**

**Practicals :**

Maximum 8 experiments must be conducted (All MATLAB experiments must be compulsory)

1. To verify potentiometer as transducer and error detector.
2. To verify Synchro as transducer.

3. To verify Synchro as error detector.
4. AC position control system.
5. DC position control system.
6. Effect of type of feedback on control system.
7. Time response of first order using MATLAB.
8. Time response of Second system using MATLAB.
9. Bode plot using MATLAB.
10. Root Locus using MATLAB.

**Text Books: -**


1. Control Systems Engineering- Rameshbabu, Scitech publications
2. Control Systems - GoyalBakshi, Technical publications
3. Control System Engineering- Hasan Sayyud, McGraw Hill Publication
4. Automatic Control Systems- KuncheSridher, Wiley Publication.
5. Control Systems Engineering- Norman Nise, Wiley Publication.


**Reference books :**


1. Control Systems -M Gopal, McGraw Hill Publication
2. Control Systems Engineering- Nise, Wiley willson publications
3. Control Systems Engineering- Ogata, PHI publications

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-II**

# ET224-Linear Integrated Circuits

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Lectures– 4Hours/week, 4 credits** | **ESE – 70 Marks** |
| **Practical -2 Hours/week, 1 credit** | **ISE – 30 Marks** |
| **POE- 50 Marks** | **ICA- 25 Marks** |

**Course Objectives:**

1. To make student understand principles, configurations and specifications of ideal and practical op amp
2. To make student understand frequency response of op amp
3. To make student understand linear and non linear applications of op amp
4. To enable student design active filters using op amp and analyze waveform generators
5. To introduce to student working of PLL

**Course Outcome:**

1. Explain working of op amp and characteristics of ideal and practical op amp
2. Describe frequency response of op amp
3. Design and analyze different linear applications of op amp and understand non-linear applications of op-amp
4. Design first and second order active filter and can analyze waveform generators
5. Describe PLL and its applications.

**Course Prerequisite:** Student shall have knowledge of circuit theory, BJT and FET devices.

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## SECTION – I

**Unit 1: Operational Amplifier Fundamentals [8 Hrs.]**

Differential amplifiers: AC and DC analysis of Dual Input Balanced Output configuration, Comparative study of other configurations, CMRR, current mirror. Op-Amp Fundamentals: Op-amp block diagram, equivalent circuit of Op-amp, ideal voltage transfer curve, open loop op-amp configurations- differential amplifier, inverting amplifier and non inverting amplifier, Op amp parameters- ideal and practical, measurement of Op-amp parameters, study of IC 741, power supplies for Op-amp,

**Unit 2: Frequency Response of OP-AMP [4 Hrs.]**

Frequency Response of Op-Amp, high frequency equivalent circuit, compensation techniques, Slew rate consideration and its importance.

**Unit 3: OP-AMP with negative feedback** **[6 Hrs.]**

Block diagram representation of feedback configurations, Voltage-Series feedback amplifier, Voltage-Shunt feedback amplifier, Virtual ground concept, Differential amplifier with one Op-amp, Differential amplifier with two Op-amps.

**Unit 4: General linear applications of OP-AMP** **[6 Hrs.]**

AC amplifiers, Summing, scaling and averaging amplifier (in inverting and non-inverting mode), Instrumentation Amplifier, V to I and I to V convertors, 4 to 20 mA interfacing. Op-Amp as differentiator and Integrator including study of frequency response.

## SECTION II

**Unit 5: OP-AMP as Comparators** **[5 Hrs.]**

Basic comparator, Zero Crossing Detector, Schmitt Trigger, window detector, clippers, clampers, peak detectors, Sample and Hold circuit.

**Unit 6: Waveform Generators** **[7 Hrs.]**

Oscillators- principle, Phase shift, Wien Bridge, Quadrature oscillators. Square, Triangular saw tooth wave generators using Op-Amp. Function generator IC 8038.

**Unit 7: Non Linear and special Applications** **[8 Hrs.]**

Log–antilog amplifiers, Precision rectifiers, Multipliers and dividers. VCO, PLL: operating principle, block diagram, IC 565, Applications of PLL as frequency multiplier and FSK demodulator.

**Unit 8: Active Filters** **[4 Hrs.]**

Basic filter definitions, Advantages of active filters, First and second order low pass and high pass Butterworth filters

**Internal Continuous Assessment (ICA):**

**Practicals:**

1. Measurement of parameters – Vio, Iio, IB etc
2. Op-Amp as Inverting and Non-inverting amplifier, Voltage follower.
3. Frequency response of Inverting and Non-inverting amplifiers.
4. Implementation of Op-Amp as adder and subtractor.
5. Op-Amp as Integrator and Differentiator.
6. Op-Amp as Schmitt trigger.
7. Op-Amp as window detector.
8. Op-Amp as peak detector.
9. Op-Amp as waveform generators (Square, triangular, Saw tooth)
10. RC oscillator.
11. Op-Amp as Precision rectifier.

12. Phase Lock Loop 565.
13. Op-Amp as Clippers and Clampers.
14. V to I convertor with grounded load.
15. Implementation of first and second order low pass Butterworth filer.
16. Implementation of first and second order high pass Butterworth filer.

**Note:** Simulate results using simulation software for at least two experiments.

**Text Books:**


1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gaikwad, PHI Learning Pvt. Ltd., Third and Fourth edition
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco,Tata McGraw-Hill Publishing Company Ltd., Third edition
3. Linear Integrated Circuits, D. Roy Choudhary, Shail B. Jain, New age International Publishers, Third edition
4. Analysis & Design of Analog Integrated Circuits-Lewis, Wiley Publication.
5. Linear Integrated Circuits-B. Somnath Nair, Wiley Publication.


**Reference Books:**


1. An introduction to Operational Amplifiers, Lucas M. Faulkenberry, John Wiley and Sons, Second edition
2. Operational Amplifiers, G.B. Clayton, English Language Book Society, Second edition
3. Operational Amplifiers and Linear Integrated Circuits, Robert F. Coughlin, Frederick F. Driscoll, Prentice Hall of India Pvt. Ltd., Fourth edition

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-II**

# ET225-Signals and Systems

**Teaching Scheme**
**Lectures– 3 Hours/week, 3 credits**
**Tutorial -1 Hours/week, 1 credit**

**Examination Scheme**
**ESE –70 Marks**
**ISE – 30 Marks**
**ICA - 25 Marks**

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**Course Objectives:**

1. To analyze the types of basic signals , its transformations, systems and it's properties.
2. To understand concept of convolution.
3. To represent and realize LTI System by differential and difference Equations.
4. To understand the concept and applications of Fourier Transform and Z transform.

**Course Outcome:**

1. Students are able to represent different signals and systems mathematically and are able to perform simulation using MATLAB.
2. Students are able to model LTI system.
3. Students can determine system stability using z transform.

**Course Prerequisite:** Basics of Laplace Transform and mathematics.

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## SECTION-I

**Unit 1–Signals and Systems** **[09hr]**

Introduction to signal and systems, Types of Signals, Elementary Continuous time and discrete time Signals, Transformations of independent Variable, Classification of Signals, Properties of System.

**Unit 2–Continuous time systems** **[06hr]**

Introduction, The Representation of Signals in Terms of Impulses, Convolution integral, Block diagram representation of LTI Systems described by Differential Equations.

**Unit 3–Discrete time system** **[05hr]**

The Representation of Signals in Terms of Impulses, Convolution Sum, and Block diagram representation of LTI Systems described by Difference Equations, Interconnections of systems.

## SECTION – II

**Unit 4-Sampling** **[04hr]**

Introduction, Representation of a Continuous- Time Signal by Its Samples, The Sampling Theorem, Reconstruction of a signal from its Samples using different methods (Interpolation, Zero order hold, low pass filter), The Effect of Under-sampling (Aliasing).

**Unit 5-Fourier Analysis for Continuous-Time Signals and Systems** **[08hr]**

Introduction, The Response of LTI Systems to Complex Exponentials, Fourier series Representation of Continuous-Time Periodic signals, Convergence of Fourier Series, Representation of Aperiodic Signals: The Continuous -Time Fourier Transform, Properties of Fourier Transform, Application of Fourier Transform in LTI systems.

**Unit 6-Z-Transform** **[08hr]**

Introduction, The Z-Transform, The Region of Convergence for the Z-Transform, Properties of Z-Transform, The Inverse z-Transform (Power Series method and Partial Fraction Expansion Method), Application and Characteristics of LTI System Using Z Transform, Stability, Frequency Response.

**Text Books:**


1. Signals and Systems A.V. Oppenheim and A. S. Wilsky, 2nd edition [Pearson Education]
2. Signals and Systems Simon Haykin and Barry Van Veen, 2nd edition [Wiley and Sons]
3. Signals and Systems, I. Ravi Kumar, PHI


**Reference Books:**


1. Signals and Systems M. J. Roberts [TMH]
2. Signals and Systems by V. Krishnaveni and A. Rajeswari [Wiley India]
3. Signals and Systems by P. Ramesh Babu and R. Anand Natarajan [Scitech]

# Solapur University, Solapur

**S.E. (Electronics and Telecommunication Engineering) Semester-II**

# ET226-Electronic Software Lab-II

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

**Examination Scheme**
**ICA-50 Marks**

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**Course Objectives:**

1. To develop fundamentals of simulation software for simulation of different linear, non-linear electronic applications
2. To understand the concept of MATLAB software and its signal processing toolbox.
3. To understand PCB Designing process and implement design using PCB design software.

**Course Outcomes:**

1. Students will be able to use electronic circuit design software.
2. Students will able to use signal processing toolbox for signal processing application.
3. Students will design PCB using PCB designing software which is the production domain for various small firmwares.

**Course Prerequisite:** Basics of Passive and active components and MATLAB software.

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**Unit 1**: **Circuit Simulation**

Simulation of Electronic Circuits studied in ECAD-II using Simulation software like Orcad Capture 9.2, Proteus, Multisim etc.

**Unit 2: MATLAB simulation**

Introduction to MATLAB, Signal Processing Toolbox

**Unit 3: PCB Design**

Design of Single sided PCB using PCB Design Software like Orcad, Eagle etc

**Internal Continuous Assessment (ICA):**

Minimum six experiments:

1. Voltage series feedback amplifier/ RC Phase shift oscillator.
2. Fixed Voltage Regulator Using 78XX and79XX.
3. Variable voltage regulator using LM317 and LM 337.
4. Monostable Multivibrator using IC 555.

5. V-I characteristics of JFET.
6. Working with Arithmetic, Exponential, logarithmic, Trigonometric operation in Matlab.
7. Working with Matrix, Vectors and arrays.
8. Plot of Basic test Signals using plot, stem, fplot, and subplot.
9. Program for Sampling Theorem using Matlab
10. Program for finding Z transform using Matlab.
11. Design of single sided PCB using Eagle Cad.

Any additional experiments based on syllabus.

**Note: POE** for Electronic Circuit Analysis and Design – II and Electronics Software lab-II is Combined.

**Text Books:**


1. Getting Started with MATLAB – Rudra Pratap
2. Mastering MATLAB 7 – Hanselman, Pearson Education
3. Modelling and Simulation using MATLAB Simulink – Dr. Jain Shailendra, Wiley India