

CIRCULAR :

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering degree course vide this office Circular No. UG/347 of dated 17<sup>th</sup> August, 2002 and the Principals of the affiliated Colleges in Engineering are hereby informed that the recommendation made by the Faculty of Technology at its meeting held on 26<sup>th</sup> March, 2008 has been accepted by the Academic Council at its meeting held on 15<sup>th</sup> April, 2008 vide item No.4.37 and in accordance therewith, the Scheme of Examination and syllabi for the Second (Semi.III & IV) leading to the B.E.degree course for the Electronics Engineering is as per Appendix and that the same has been brought into force with effect from the academic year 2008 - 2009.

MUMBAI-400 032  
June, 2008

for REGISTRAR

The Principals of the affiliated colleges in Engineering.

4.37/15.4.2008

UG231-A of 2008,

MUMBAI-400 032

10<sup>th</sup> June, 2008

Copy forwarded with compliments for information to :-

- 1) The Dean, Faculty of Technology,
- 2) The Chairman, Ad-hoc Board of Studies in Electronics Engineering
- 3) The Controller of Examinations,
- 4) The Co-Ordinator, University Computerization Centre,

for REGISTRAR

Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Deputy Registrar (Accounts Section), the Pro-Vice-Chancellor, the Vice-Chancellor, the Executive Secretary to the Vice-Chancellor, the Assistant Registrar, Administrative sub-center, Ratnagiri for information.  
The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (2 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (2 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Director, Institute of Distance Education, the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (PRO) - the Assistant Registrar, Academic Authorities Unit (2 copies) and the Registrar. They are requested to treat this as action taken report on the above Circular and that, no separate Action

# UNIVERSITY OF MUMBAI



Revised Syllabus  
and Scheme of Examination  
For  
The Second Year  
(Sem. III & IV)  
of the  
B.E. Degree Course  
in Electronics Engineering

(With effect from the academic year 2008-2009)

1

**University of Mumbai**  
**Revised Syllabus of Electronics Engineering June 2008**  
**Semester III**

|                                              | L  | P   | TU  | TH  | TW  | PR  | OR  | TOTAL |
|----------------------------------------------|----|-----|-----|-----|-----|-----|-----|-------|
| 1. Engineering Mathematics                   | 4  | --  | 1   | 100 | 25  | --- | --- | 125   |
| 2. Basic of Electronic Circuits              | 4  | 2   | --- | 100 | 25  | 50  | 25  | 200   |
| 3. Digital System Design I                   | 4  | 2   | --- | 100 | 25  | 50  | 25  | 200   |
| 4. Electrical Network Analysis and Synthesis | 4  | 2   | --- | 100 | 25  | --- | --- | 125   |
| 5. Control System                            | 4  | 2   | --- | 100 | 25  | --- | 25  | 150   |
| 6. Presentation and Communication Techniques | 2  | --- | 02  | --- | 50  | --- | --- | 50    |
|                                              | 22 | 08  | 03  | 500 | 175 | 100 | 75  | 850   |

**Semester IV**

|                                                                | L   | P   | TU  | TH  | TW  | PR  | OR  | TOTAL |
|----------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-------|
| 1. Advanced Engineering Mathematics                            | 4   | --- | --- | 100 | --- | --- | --- | 100   |
| 2. Electronic Circuit Analysis and Design                      | 4   | 2   | --- | 100 | 25  | 50  | 25  | 200   |
| 3. Digital System Design II                                    | 4   | 2   | --- | 100 | 25  | 50  | 25  | 200   |
| 4. Basics of Analog and Digital Communication Systems          | 4   | 2   | --- | 100 | 25  | --- | 25  | 150   |
| 5. Electronic and Electrical Measuring Instruments and Machine | 4   | 2   | --- | 100 | 25  | --- | 25  | 150   |
| 6. Electronic Workshop-I                                       | --- | 4   | --- | --- | 25  | --- | 25  | 50    |
|                                                                | 20  | 12  |     | 500 | 125 | 100 | 125 | 850   |

# S.E. ELECTRONICS - SEMESTER -III

## ENGINEERING MATHEMATICS

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            | 4     |       |
|                   | Practical          | --    |       |
|                   | Tutorial           | 1     |       |
| Evaluation System |                    | Hours | Marks |
|                   | Theory Examination | 3     | 100   |
|                   | Practical          | ---   | ---   |
|                   | Oral Examination   | ---   | ---   |
|                   | Term Work          | ---   | 25    |
|                   | TOTAL              | ---   | 125   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                                                   | Lectures/Week                      |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 1                 | Laplace Transform<br>1.1 Existence of Laplace Transform, Properties of L.T, 1 <sup>st</sup> and 2 <sup>nd</sup> shifting theorem, Change of scale Properties, Unit step function, Heaviside, Dirac delta and Periodic function and their L.T<br>1.2 Inverse L. T. with partial fraction and Convolution theorem<br>1.3 Applications to solve initial and boundary value problems involving O.D.E. | 06<br><br><br><br><br>05<br><br>02 |
| 2                 | Fourier series<br>Dirichlet's conditions, Fourier series of periodic function with period $2\pi$ and $2l$ . F.S for even and odd functions. Half range sine and cosine and Parseval's identity.                                                                                                                                                                                                   | 07                                 |
| 3                 | 3.1 Complex form of Fourier series<br>3.2. Fourier integral and Fourier Transform with properties in detail                                                                                                                                                                                                                                                                                       | 02<br>03                           |
| 4                 | Matrices<br>4.1 Types of matrices, Adjoint, inverse and rank of a matrix. Normal form of a matrix<br>4.2. System of Homogeneous and non homogeneous equations and their consistency.                                                                                                                                                                                                              | 06                                 |

|   |                                                                                                                                                                                                                                                                     |                    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 5 | Complex variables<br>5.1. Analytic function-R equation in Cartesian and polar form. Analytic function by Milne-Thompson method, Harmonic function.<br>5.2. Conformal mapping, Bilinear mapping and standard transforms.                                             | 06<br><br>04       |
| 6 | Z-transform & vector analysis<br>6.1 Properties, change of scale, shifting, inverse of z transform.<br>6.2 Initial value and final value.<br>6.3 Vector integration, scalar potential work down Greens theorem, Divergence theorem, Stokes theorem (without proof). | 04<br><br>03<br>08 |

#### Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question 1 will be compulsory and based on entire syllabus.
4. Remaining questions will be mixed in nature (for example Q2 a) from 2.1 then b) will be from 4.1 or 5.1 other than 2.1.
5. In question paper weightage of each chapter will be proportional to number of respective lecture hours mentioned in the syllabus.

#### Recommended Books:

1. P.N. Wartikar/J.N. Wartikar, Text book Applied Mathematics, Vol. I & II, Pune Vidyarthi Griha Prakashan
2. Matrices by Shantinayakan
3. Vector Analysis by Murray R. Spiegel, Schaum series
4. Higher Engg. Mathematics. Dr. B.S. Grewal, Khanna Publication
5. Higher Engg. Mathematics by B.V. Ramana  
Tata McGraw-Hill Publishing company Limited.
6. Advanced Engg. Mathematics by C. Ray wylie & Louis, C. Barrott  
Tata McGraw-Hill Publishing company Limited
7. Advanced Engg. Mathematics 8<sup>th</sup> Ed Erwin kreyszig.  
John Wiley & Sons, Inc.

# S.E. (ELECTRONICS) SEMESTER III

## BASIC OF ELECTRONIC CIRCUITS

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| work per week     | Lecture            | 4     |       |
|                   | Practical          | 2     |       |
|                   | Tutorial           | --    |       |
| Evaluation System |                    | Hours | Marks |
|                   | Theory Examination | 3     | 100   |
|                   | Practical          | 3     | 50    |
|                   | Oral Examination   | ---   | 25    |
|                   | Term Work          | ---   | 25    |
|                   | TOTAL              | ---   | 200   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Lectures/Week |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1                 | <b>Semiconductor Materials and Diodes</b><br>Review of Semiconductor Materials and Properties, The PN Junction. Introduction to Semiconductor Diode Theory. Diode Circuits: DC Analysis and Models. AC Equivalent Circuits, Other Diode Types – Solar Cell, Photodiode, Light-Emitting Diode, Schottky Barrier Diode, Pin Diode, Zener Diode, Zener as voltage Regulator, Temperature Effects, Understanding Manufacturer's Specifications.                                                                                                                                                                                                                                                                | 06            |
| 2                 | <b>Diode Circuits</b><br>Design of Rectifier Circuits:- Full Wave Rectification with 'C', 'L-C' & 'pi' Filter, Ripple-Voltage and Diode Current, Voltage Doubler & Multiplier Circuit, Zener Diode Circuits, Clipper and Clamper Circuits, Multiple-Diode Circuits. Photodiode and LED Circuits.                                                                                                                                                                                                                                                                                                                                                                                                           | 08            |
| 3                 | <b>The Bipolar Junction Transistor</b><br>Basic Bipolar Junction Transistor, PNP & NPN Transistor Structures Device Symbols, Current-Voltage Characteristics, Transistor Biasing – Single Base Resistor Biasing, Voltage Divider Biasing and Bias Stability, DC Analysis of Transistor Circuits in Common Emitter Common Base and Common Collector configurations, Forward-active Mode Operation Load Line considerations, Non ideal Transistor Leakage Currents and Breakdown. Integrated Circuit Biasing, Multistage Circuits. Transistor Applications – As a Switch,                                                                                                                                    | 08            |
| 4                 | <b>Basic BJT Amplifiers</b><br>The BJT Linear Amplifier, Graphical Analysis and AC Equivalent Circuit. Small Signal Hybrid – $\pi$ , ( $g_m r_\pi$ ) Equivalent Circuit of the Bipolar Transistor, Hybrid – $\pi$ ( $g_m r_\pi$ ) Equivalent Circuit Including the Early Effect, Expanded Hybrid – $\pi$ Equivalent Circuit, Other Small – Signal Parameters And Equivalent Circuits, Basic Transistor Amplifier Configurations i.e. Common Emitter Common Base and Common Collector (Emitter Follower. AC Load Line Analysis, The Three Basic Amplifier configurations: Summary and Comparison, Design of Single Stage BJT Amplifier. Multistage Amplifiers, Band-Width and Power Considerations, Thermal | 12            |

| Considerations in Transistor Amplifiers, Manufacturers' Specifications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5. The Field Effect Transistor<br>Junction Field-Effect Transistor, MOS Field-Effect Transistor, MOSFET, Self Biasing Mid-Point Biasing, Biasing for Zero Drain Current-Drift Potential Divider Biasing and DC Circuit Analysis, Basic MOSFET Applications: Switch, Digital Logic Gate and Amplifier. Temperature effects in MOSFETs, Input Protection in MOSFET The Power FET (VMOS).                                                                                                                                                                                               | 12 |
| 6. Basic FET Amplifiers<br>Basic JFET Amplifier Configurations :- Common Source Amplifier, The Source Follower(Common Drain) Amplifier, The Common Gate Configurations. Summary of the Three Basic Amplifier Configurations.AC Circuit analyses of Common Source Amplifier, The Source Follower(Common Drain) Amplifier, The Common Gate Amplifier Configurations. Design of Single Stage JFET Amplifier. MOSFET amplifier Biasing and DC Circuit Analysis.Ac analysis of Single Stage MOSFET amplifier. Single – Stage Integrated Circuit MOSFET Amplifiers, Multistage Amplifiers. | 10 |

#### Text Books:

1. Donald A. Neamen, Electronic Circuit Analysis and Design, Second edition, McGraw Hill International
2. Robert L Boylestad Louis Nashelsky, Electronic Devices and Circuit theory, sixth edition, Pentice Lay India.
3. Martin Roden , Gordon Carpenter, William Wieserman, Electronic Design, Fourth edition, Shroff Publishers,
4. Microelectronics Circuits (Analysis and Design), By Mohammad Rashid, Cengage Learning

#### Reference Books:

1. Electronics Devices and circuits Theodore F. Bogart, Jr. Jeffrey S. Beasley, Guillermo Rico.
2. Donald Schilling & Charles Belove, Electronic Circuits Discrete and Integrated, Third edition, McGraw Hill

#### Termwork:

The termwork shall consist of atleast six laboratory experiments covering the whole of syllabus, duly recorded and graded as well as atleast four computer simulations using EDA tools like PSPICE duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

### SUGGESTED LIST OF EXPERIMENTS

#### Laboratory / Simulation

1. Application of diodes as a (positive / negative and both), a clamper (positive /negative)
2. FWR with different types of Filters and finding its ripple factor.
3. Voltage Regulation using Zener diode.

4. Design and Analysis of BJT Amplifier with fixed bias, Collector bias, Potential divider bias. Determination of DC operating point
5. Input and output characteristic of BJT in CB, CC, CE configuration and its parameters.
6. BJT as a Voltage amplifier. Determination of its performance parameters ( $A_V$ ,  $A_i$ ,  $R_i$ ,  $R_o$ )
7. FET as a Voltage amplifier and determination of its performance parameters.
8. Output characteristics and Transfer Characteristics of JFET. Finding its Parameters, mutual conductance and amplification factor.

# S.E. (ELECTRONICS) SEMESTER III

## DIGITAL SYSTEMS DESIGN I

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            |       |       |
|                   | Practical          | 4     |       |
|                   | Tutorial           | 2     |       |
| Evaluation System |                    | --    |       |
|                   | Theory Examination | Hours | Marks |
|                   | Practical          | 3     | 100   |
|                   | Oral Examination   | 3     | 50    |
|                   | Term Work          | ---   | 25    |
|                   | TOTAL              | ---   | 25    |
|                   |                    | ---   | 200   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                      | Lectures/Week |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1.                | Introduction and Digital Codes:<br>Analog Vs Digital Systems Digital Devices, Binary codes, Gray codes, Character codes. Codes for detecting and correcting errors                                                                                                                                                                                   | 06            |
| 2.                | Logic Circuits:<br>Boolean Algebra, theorems, combinational circuit analysis, combinational circuit synthesis, minimization, Karnaugh Map, Sum of Products, Product of Sums form, and their minimization, Programmed minimization-Quine Mc-Cluskey minimization algorithm, timing hazards-Static, Dynamic Hazards                                    | 14            |
| 3.                | Combinational MSI, LSI Devices:<br>Combinational design using SSI, MSI devices, Decoders (74x139,74x138), Encoders (74x148), Tri state buffers (74x244,74x245), Multiplexers (74x151), Parity circuits(74180), Comparators(7485), Adders (7483) , Subtractors, BCD adders - subtractors , ALU (74181), Combinational Multipliers, Combinational PLDs | 10            |
| 4.                | Logic families:<br>Basics of TTL, CMOS, ECL Circuits for basic logic operations just Circuits and working of them in all above families. No Characteristics of families.                                                                                                                                                                             | 10            |
| 5.                | Sequential Logic Practices:<br>Basic Elements, Latches and Flip flops, S-R, D.T, J-K latches and Flip flops, Flip Flop conversions, Applications of Latches and Flip-Flop in switch debouncing, bus holder circuits, Flip-flop Timing Considerations and Metastability.                                                                              | 08            |
| 6.                | Counters -Asynchronous, Synchronous counters, Up down counters, Mod counters, Ring counters, Shift Registers, Universal Shift register.                                                                                                                                                                                                              | 08            |

*Term Work*  
The term work shall consist of at least eight laboratory experiments covering the whole of syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

### SUGGESTED LIST OF EXPERIMENTS

*The experiments must include:*

1. Verification of basic gates (1 Experiment)
2. Applications like comparators/ parity generators / adders / Subtractors etc using gates or MSI devices (2 Experiments)
3. Use of Decoders, Encoders, Multiplexers (2 Experiments)
4. Flip Flop Conversion (1 Experiment)
5. Applications using of Synchronous / Asynchronous counters, Shift Registers (2 Experiments)

*Text Books*

1. RP Jain: Modern Digital Design, forth edition, Tata McGraw Hill.
2. Morris Mano, Digital Design , Pearson Education .Asia,2002

*Reference Books*

1. John F. Wakerley, Digital Design Principles and Practices, third edition updated, Pearson Education, Singapore, 2002.
2. John M. Yarbrough, Digital Logic :Applications and Design, Thomson Brooks Cole . 2004

# S.E. (ELECTRONICS) SEMESTER III

## ELECTRICAL NETWORK ANALYSIS AND SYNTHESIS

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Load per week     | Lecture            |       |       |
|                   | Practical          |       | 04    |
|                   | Tutorial           |       | 02    |
| Evaluation System |                    |       | --    |
|                   | Theory Examination | Hours | Marks |
|                   | Practical          | 3     | 100   |
|                   | Oral Examination   | ---   | ---   |
|                   | Term Work          | ---   | ---   |
|                   | TOTAL              | ---   | 25    |
|                   |                    |       | 125   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                     | Lectures/Week |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1                 | <b>Circuit analysis (ac and dc):</b><br>Kirchoff's law, Loop variable analysis, Node variable analysis, Source transformations, Reference directions for current and voltage, Active element conventions, dot convention for coupled circuits. Linearity, Superposition, Thevenin's and Norton's, Maximum power for ac source and dependent source.                 | 12            |
| 2                 | <b>Linear graphs:</b><br>Introductory definitions. The incidence matrix A, the loop matrix B, relationship between sub matrix of A and B. Cut-sets and cut-set matrix, Fundamental cut-sets and fundamental tie-sets. Planar graphs. A and B matrices, Loop, node, node pair equations. duality.                                                                    | 08            |
| 3                 | <b>Laplace transforms:</b><br>Properties of Laplace transforms, basic theorems, Laplace transform of gate function, impulse function and periodic functions. convolution integral, inverse Laplace transform, application of Laplace transforms to solution of Network problems.                                                                                    | 08            |
| 4                 | <b>Transient and frequency analysis:</b><br>Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for d.c. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform methods of solutions. Transfer function. Concept of poles and zeros. Concept of frequency response of a system | 10            |
| 5                 | <b>Two port networks:</b><br>Concept of two port networks, Driving point and Transfer functions., open circuit and short circuit parameters, transmission and inverse transmission parameters, hybrid parameters, inter-relationship of different parameters. interconnection of two port networks, T and pi representation. terminated two port networks           | 08            |
| 6                 | <b>Fundamentals of network synthesis:</b><br>Realizability concept, Hurwitz property, positive realness, properties of positive real functions, testing positive real functions. Synthesis of R-L, R-C and L-C driving point functions – Foster and Cauer forms.                                                                                                    | 08            |

Textbooks:

1. Franklin F. Kuo, "Network analysis and synthesis", PHI.
2. M. E. Vanvalkenberg, "Network analysis", PHI, third edition.
3. William Hayt and Jack Kemmerly, "Engineering Circuit analysis", TMH.

Reference Books:

1. Circuits and Networks – Analysis and Synthesis: A. Sudhakar and S.P Shyam Mohan.
2. D. Roy Choudhury: Networks and Systems, New Age International Pubs.

Termwork:

The Termwork shall consist of at least four experiments and four assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

SUGGESTED LIST OF EXPERIMENTS

1. Verification of superposition theorem using ac/dc source.
2. Verification of Thevenin's theorem using dependent/independent source.
3. Verification of maximum power transfer theorem using ac/dc source.
4. Verification of source transformation.
5. Charging and discharging of a capacitor.
6. Measurement of h parameters.

# S.E. (ELECTRONICS) SEMESTER III

## CONTROL SYSTEM ENGINEERING

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| marks per week    | Lecture            |       |       |
|                   | Practical          |       | 04    |
|                   | Tutorial           |       | 02    |
|                   |                    |       | --    |
|                   | Theory Examination | Hours | Marks |
|                   | Practical          | 3     | 100   |
| Evaluation System | Oral Examination   | 2     | ---   |
|                   | Term Work          | ---   | 25    |
|                   | TOTAL              | ---   | 25    |
|                   |                    | ---   | 150   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Lectures/Week |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1                 | <b>Introduction to control system analysis</b><br>Introduction, examples of control systems, open loop control systems, closed loop control systems. Transfer function. Types of feed back & feed back control system characteristics -- noise rejection, gain, sensitivity, stability.                                                                                                                                                                                                                                                    | 06            |
| 2                 | <b>Mathematical modeling of systems</b><br>Importance of a mathematical model. Block diagrams, signal flow graphs, Mason's gain formula and its application to block diagram reduction. State space method, solving time-invariant system, transfer matrix.                                                                                                                                                                                                                                                                                | 09            |
| 3                 | <b>Transient &amp; steady state - Response Analysis</b><br>3.1 Impulse response function, First order system, second order system, time domain specifications of systems, analysis of transient-response using Second order model.<br><br>3.2. Classification of control systems according to "Type" of systems. Steady - state errors, static error constants, Steady - state analysis of different types of systems using step, ramp and parabolic input signals.                                                                        | 12            |
| 4                 | <b>Stability Analysis</b><br>Introduction to concept of stability, Stability analysis using Routh's stability criterion, Absolute stability, Relative stability. Root-Locus plots, summary of general rules for constructing Root- Locus, Root-Locus analysis of control systems. Compensation techniques-Log, lead, log-lead.                                                                                                                                                                                                             | 09            |
| 5                 | <b>Frequency-Response Analysis</b><br>Introduction, Frequency domain specifications, resonance peak and peak resonating frequency, relationship between time and frequency domain specification of systems. Bode plots, Polar plots, Log-magnitude Vs phase plots, Nyquist stability criterion, stability analysis. Relative stability, gain margin, phase margin, stability analysis of system using Bode plots. Closed-Loop Frequency Response-Constant gain and phase loci, Nichol's chart and their use in stability study of systems. | 09            |

|                                                                                                                                                                                                                                                                      |        |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|
| Control components & Controller<br>AC servomotors, servoamplifier, potentiometer, synchro transmitters,<br>synchro receivers, synchro control transformer, stepper motors.<br>Discontinuous controller modes, continuous controller modes, composite<br>controllers. | DC and | 09 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|

#### Textbooks:

1. J. Nagrath, M. Gopal, Control system Engineering, Tata McGraw Hill
2. K. Ogata, Modern Control Engineering, Pearson education, third edition.
3. Benjamin C. Kuo, Automatic Control Systems, Pearson education, seventh edition.

#### Reference Books:

1. Madan Gopal, Control Systems Principles and Design, Tata McGraw Hill, seventh edition, 1997.
2. Nise, control system Engineering, John wiley & sons, 3<sup>rd</sup> edition
3. Curtis Johnson, Process Control Instrumentation Technology, Pearson education, fourth edition.

#### Termwork:

The Termwork shall consist of at least ten experiments and three assignments based on the whole syllabus. It will be duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

### SUGGESTED LIST OF EXPERIMENTS

#### Laboratory / Simulations

1. Transient response of 1<sup>st</sup> order & 2<sup>nd</sup> order system
2. Frequency response of 1<sup>st</sup> order & 2<sup>nd</sup> order system
3. Steady state error analysis of different types of systems
4. D.C. servomotor
5. A.C. servomotor
6. Synchro Transmitter and Receiver
7. Potentiometer

#### Simulation

1. Block diagram reduction
2. Time response analysis
3. Frequency response analysis
4. Stability analysis

# S.E. (ELECTRONICS) SEMESTER III

## PRESENTATION AND COMMUNICATION TECHNIQUES

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            | 2     |       |
|                   | Practical          | --    |       |
|                   | Tutorial           | 2     |       |
|                   |                    | Hours | Marks |
| Evaluation System | Theory Examination |       |       |
|                   | Practical          | ---   | ---   |
|                   | Oral Examination   | ----  |       |
|                   | Term Work          | ---   | 50    |
|                   | Total              | ---   | 50    |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Lectures/Week |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1.                | <b>Communication in a business organization:</b><br>Internal and external communication, Types of meetings, strategies for conducting successful business meetings, documentation (notice, agenda, minutes, resolution) of meetings. Introduction to modern communication techniques (e-mail, internet, video-conferencing, etc.) Legal and ethical issues in communication (Intellectual property rights: patents, TRIPS, Geographical indications)                                                                                                   | 06            |
| 2                 | <b>Advanced technical writing:</b><br>Report writing: Definition and importance of reports, qualities of reports, language and style in reports, types of reports, formats (letter, memo, project-reports). Methods of compiling data for preparing report.<br>A computer-aided presentation of a technical project report based on survey-based or reference based topic. The topics are to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages.<br>Technical paper-writing<br>Writing business proposals. | 08            |
| 3                 | <b>Interpersonal skills:</b><br>Introduction to emotional intelligence, motivation, Negotiation and conflict resolution, Assertiveness, team-building, decision-making, time-management, persuasion                                                                                                                                                                                                                                                                                                                                                    | 03            |
| 4                 | <b>Presentation skills:</b><br>Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis, Language: Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation.                                                                                                                                                                                                                                                                                                                | 04            |

|   |                                                                                                                                                                                                                                                                                                                                 |    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5 | <b>Career skills:</b><br>Preparing resumes and cover letters. Types of Resumes, Interview techniques: Preparing for job interviews, facing an interview, verbal and non-verbal communication during interviews, observation sessions and role-play techniques to be used to demonstrate interview strategies (mock interviews). | 04 |
| 6 | <b>Group discussion:</b><br>group discussions as part of selection process. Structure of a group discussion, Dynamics of group behavior, techniques for effective participation, Team work and use of body language                                                                                                             | 03 |

#### Term work:

##### Assignments:

- 2 assignments on communication topics
- 3 assignments on report-writing
- 3 assignments on interpersonal skills
- 2 assignments on career skills
- At least one class test (written)

Distribution of term work marks will be as follows:

Assignments: 10 marks

Written test: 10 marks

Project report presentation: 20 marks

Group discussion: 10 marks

#### Books recommended:

1. Fred Luthans: Organizational behavior, McGraw Hill
2. Lesikar and Petit, Report writing for business, Tata McGraw Hill
3. Huckin & Olsen, Technical writing and professional communication, McGraw Hill
4. Wallace & Masters, Personal development for Life & work, Thomson Learning.
5. Heta Murphy, Effective Business Communication, McGraw Hill
6. Raman and Sharma, Report writing.

#### Additional Readings

1. Lewicki, Saunders & Minton: Essentials of negotiation, McGraw Hill
2. Hartman Lemay, Presentation Success, Thomson Learning
3. Kitty O. Locker, Stephen Kyo Kaczmarek: Business Communication, Building Critical skills, McGraw Hill
4. Vikas Gupta: COMPDEX Computer Course kit, IDG Books Pvt. Ltd.
5. Heller & Handle, The Essential Manager's manual, Dorling Kindersley
6. The Sunday times "Creating Success Series" 1. Develop your assertiveness 2. Make every minute count 3. Successful Presentation skills 4. How to motivate people? 5. Team building
7. Daniel Goleman, Emotional Intelligence.

# S.E. (ELECTRONICS) SEMESTER IV

## ADVANCED ENGINEERING MATHEMATICS

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            | 4     |       |
|                   | Practical          | --    |       |
|                   | Tutorial           |       |       |
|                   |                    | Hours | Marks |
| Evaluation System | Theory Examination | 3     | 100   |
|                   | Practical          | ---   | ---   |
|                   | Oral Examination   | ----  | ---   |
|                   | Term Work          | ---   | ---   |
|                   | Total              | ---   | 100   |

| Detailed Syllabus |                                                                                                                                                                                                                                                         | Lectures/Week          |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1                 | Random variables:<br>1.1 Discrete and continuous random variable, Probability mass and density function for random variables.<br>1.2 Expected value, Variance, Moments and moment generating functions<br>1.3 Relation between Raw and central moments. | 02<br><br>03<br><br>02 |
| 2                 | Probability distributions:<br>2.1. Binomial, Poisson and Normal distribution<br>2.2. Introduction to distribution such as 't' and ' $\chi^2$ ', central limit theorems and problems based on this theorem.                                              | 06<br><br>04           |
| 3                 | Sampling theory:<br>3.1 Large and small samples, Test of significance for both samples.<br>3.2 paired 't' test<br>3.3 Application for $\chi^2$ distribution                                                                                             | 05<br><br>01<br>02     |
| 4                 | Discrete Structure<br>4.1 Relation and function (Equivalence relation, Injective, surjective and bijective functions)<br>4.2. Poset, Lattice (Bounded, complemented and distributive lattice)<br>4.3. Algebraic structure: Group, Ring, Field           | 04<br><br>04<br>04     |
| 5                 | Matrices<br>5.1. Cayley Hamilton theorem, eigen values and eigen vectors (without proof)<br>5.2. Similar matrices, orthogonally similar matrices, reduction to the diagonal form.                                                                       | 04<br>04               |

|                                                                                                                                                                 |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Complex variables<br>6.1 Cauchy's theorem and Cauchy's integral formula<br>6.2 Taylor's and Laurent's formula, Singularities and poles.<br>6.3 Residue theorem. | 03<br>04<br>03 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|

**Theory Examination:**

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question 1 will be compulsory and based on entire syllabus.
4. Remaining questions will be mixed in nature( for example Q2 a) from 2.1 then b) will be from 4.1 or 5.1 other than 2.1.
5. In question paper weightage of each chapter will be proportional to number of respective lecture hours mentioned in the syllabus.

**Recommended Books:**

1. P.N.Wartikar/J.N.Wartikar, Text book Applied Mathematics,Pune Vidyarthi Griha Prakashan
2. Theory of complex variable by Shantinakaran
3. Engineering Mathematics by S.S.Sastri
4. Fundamental of Mathematics Statistics By S.C.Gupta and V.K Kapoor
5. Probability and Statistics Schum series
6. Discrete Mathematics By Kolman,Busby,Sharon Rus
7. Function of discrete Mathematics by K.D.Joshi

# S.E. (ELECTRONICS) SEMESTER IV

## ELECTRONIC CIRCUITS ANALYSIS AND DESIGN

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            | 4     |       |
|                   | Practical          | 2     |       |
|                   | Tutorial           | ---   |       |
|                   |                    |       |       |
| Evaluation System |                    | Hours | Marks |
|                   | Theory Examination | 3     | 100   |
|                   | Practical          | 3     | 50    |
|                   | Oral Examination   | ----  | 25    |
|                   | Term Work          | ---   | 25    |
|                   | Total              | ---   | 200   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Lectures/Week |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1                 | <b>Frequency Response of Amplifiers</b><br>High frequency parameters of BJT. Amplifier Frequency Response, System Transfer Functions, S – Domain Analysis, First – Order Functions, Bode Plots, Short-Circuit and Open-Circuit Time Constants, high Frequency Response of BJT, FET and MOSFET amplifier analysis.                                                                                                                                                                                                                                                                                | 09            |
| 2                 | <b>OSCILLATORS-</b><br>Analysis and Design of phase shift, Quadrature, Wien bridge, Hartley, Colpitt and Crystal Oscillator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 09            |
| 3                 | <b>Power Amplifiers</b><br>Power Amplifiers, Power Transistors – Power BJTs, Power MOSFETs, , Design of Class- A, Class- AB Push Pull Class- B Transformer Coupled Push Pull Amplifier, Complementary Class B Power Amplifier. Heat Sinks, Design of heat sinks, for power Amplifier Devices                                                                                                                                                                                                                                                                                                     | 09            |
| 4                 | <b>Differential Amplifiers</b><br>BJT, FET & MOSFET Differential Amplifier Analysis and Design, Design of CMOS, Differential Amplifier with Active Load (Ref:- Donald Neamen).                                                                                                                                                                                                                                                                                                                                                                                                                   | 09            |
| 5                 | <b>Multistage Amplifiers</b><br>Design Two Stage BJT, JFET and MOSFET Amplifiers and Design of CASCODE Amplifiers. Design of BJT-JFET hybrid amplifier.                                                                                                                                                                                                                                                                                                                                                                                                                                          | 12            |
| 6                 | <b>Feedback and Stability</b><br>Introduction to Basic Feedback Concepts, Ideal Close-Loop Gain, Gain Sensitivity Bandwidth Extension, Noise Sensitivity, Reduction of Nonlinear Distortion, Ideal Feedback Topologies. Analysis of Series – Shunt, Series-Series, Shunt-Shunt Shunt – Series Amplifiers, Loop Gain, Stability of the Feedback Circuit, The Stability Problem, Bode Plots Of One – Pole, Two – Pole, and Three – Pole Amplifiers, Nyquist Stability Criterion, Phase and Gain Margins, Frequency Compensation Basic Theory, Closed Loop Frequency Response, Miller Compensation. | 08            |

#### Text Books:

1. Microelectronics Circuits (Analysis and Design) By Mohammad Rashid, Cengage Learning
2. Donald A. Neamen, Electronic Circuit Analysis and Design, Second edition, McGraw Hill International edition 2001
3. Martin Roden, Gordon Carpenter, William Wieserman, Electronic Design, Fourth edition, Shroff Publishers, 2002

#### Reference Books:

1. Donald Schilling & Charles Belove, Electronic Circuits Discrete and Integrated, Third edition, McGraw Hill International edition, 1989
2. Adel Sedra & Kenneth Smith, Microelectronic Circuits, Fourth edition, Oxford University Press, 1998

#### Termwork:

The term work shall consist of atleast six laboratory experiments covering the whole of syllabus, duly recorded and graded as well as at-least four computer simulations using EDA tools like PSPICE duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

### SUGGESTED LIST OF EXPERIMENTS

#### Laboratory / Simulations

1. To Study frequency Response of Cascode Amplifier
2. To study RC phase shift Oscillator and Calculate threshold & practical frequency.
3. To Study Current Series negative feedback amplifier and plot gain with feedback & without feedback.
4. To study Wein Bridge Oscillator
5. To study Class AB and B Pushpull Amplifier.
6. To study Hartley Oscillator. Calculate theoretical & practical frequency.
7. To study Colpitts Oscillator. Calculate theoretical & practical frequency.
8. To study frequency response of two stage RC coupled Amplifier.

# S.E. (ELECTRONICS) SEMESTER IV

## Electronic and Electrical Measuring Instruments and Machine

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            | 4     |       |
|                   | Practical          | 2     |       |
|                   | Tutorial           | ---   |       |
|                   |                    | ---   |       |
| Evaluation System | Theory Examination | Hours | Marks |
|                   | Practical          | 3     | 100   |
|                   |                    | ---   | ---   |
|                   | Oral Examination   | ----  | 25    |
|                   | Term Work          | ---   | 25    |
|                   | Total              | ---   | 150   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Lectures/Week |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1                 | <b>Electronic and Digital Voltmeters:</b><br>Principles of operation, advantages over conventional type analog voltmeters, basic voltmeter, peak reading, average reading true RMS reading, sampling type, FET voltmeters, sensitivity considerations & calculations. Methods of analog-to-digital and digital-to-analog conversion, principles of operation and typical specifications of a digital voltmeter, description of various types of DVMs with block diagrams, Resolution and Sensitivity of a digital meter, digital displays for meters. | 08            |
| 2                 | <b>Frequency meters, phase meters and signal generators:</b><br>Analog-schematic & operational details, limitations. Digital Frequency meters, Phase measurement by voltage addition method, balanced modulation type, phase meters using flip-flops, digital meters, advantages & limitations of each type. Requirement of a good laboratory type signal generator, A.F. signal generators, Beat frequency oscillator & its advantages.                                                                                                              | 09            |
| 3                 | <b>Oscilloscopes:</b><br>Block diagram study of C.R.O., Description of panel layout & implementation of controls. Requirement of time base, triggered time base, delayed time base, external triggering etc. Lissajous patterns, use of these in phase & frequency measurements. Frequency time base, Wobbler scope & its applications, Dual trace, multi trace, Double beam. Sampling: Storage, Digital read-out oscilloscopes. Use of CRO in square wave testing of amplifiers, tracing of diode & transistor characteristics.                      | 09            |
| 4                 | <b>Basic measuring instruments:</b><br>Essentials of indicating instruments – deflecting, controlling and damping torque. Construction and working principles of moving iron and moving coil ammeters and voltmeters, electro-dynamometer watt-meters, induction type energy meters, power factor meters, instrument transformers.                                                                                                                                                                                                                    | 12            |
| 5                 | <b>Measurement of R, L and C:</b><br>Measurement of low, medium, high resistances: Ohmmeter, Kelvin's double bridge, Wheatstone's bridge, Megger. Measurement of inductance: Maxwell's, Hay's and Anderson's bridge. Measurement of capacitance: Schering bridge.                                                                                                                                                                                                                                                                                     | 08            |

|   |                                                                                                                                                                                                                                             |    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 6 | <b>6.1 DC Motors :</b><br>Back e.m.f., voltage equation, characteristics of series, shunt and compound motors, torque equations, speed control of dc shunt/series motors, three point and four point starter and applications of dc motors. | 04 |
|   | <b>6.2 Three phase induction motors:</b><br>Construction and principle of operation, slip, rotor frequency, torque equation, torque-speed characteristics, starting methods of induction motors.                                            | 03 |
|   | <b>6.3 Stepper motors:</b><br>Construction, working principle and applications of variable reluctance, permanent magnet and hybrid stepper motors.                                                                                          | 03 |

#### Text books:

- 1) Cooper W. D. & Helfrick A.D., Electronics Instrumentation & Measurement Techniques, third edition Prentice Hall of India, 1985
- 2) Kalsi H.S., Electronic Instrumentation, first edition, Tata McGraw Hill, 1997.
- 3) Electrical and electronic measuring instruments: A.K.Sawhney.

#### Reference Books:

- 1) Electrical Measurements and measuring instruments: Golding and Widdis.
- 2) Electric Machines: Nagrath and Kothari.

#### Termwork:

The Termwork shall consist of at least eight experiments and three assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

### SUGGESTED LIST OF EXPERIMENTS

- 1 Study of dual integrating DVM.
- 2 a) Measurement of frequency using intensity modulation.  
b) Design and implementation of digital phase meter.  
c) Design and implementation of digital frequency meter.
- 3 a) Measurement of frequency using Lissajous patterns.  
b) Measurement of phase difference using X Y mode of CRO.  
c) Application of CRO for component testing.
- 4 a) Calibration of single phase energy meter.  
b) Conversion of galvanometer into ammeter/voltmeter.
- 5 a) Measurement of unknown resistance using Kelvin's double bridge.  
b) Measurement of unknown capacitance using Schering's bridge.  
c) Measurement of unknown inductance using Anderson's bridge.
- 6 a) Speed control of dc shunt motor using armature and field control.  
b) Starting of three phase induction motor using auto transformer starter.

# S.E. (ELECTRONICS) SEMESTER IV

## BASIC OF ANALOG AND DIGITAL COMMUNICATION SYSTEM

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            | 4     |       |
|                   | Practical          | 2     |       |
|                   | Tutorial           | ---   |       |
|                   |                    | Hours | Marks |
| Evaluation System | Theory Examination | 3     | 100   |
|                   | Practical          | ---   | ---   |
|                   | Oral Examination   | ----  | 25    |
|                   | Term Work          | ---   | 25    |
|                   | Total              | ---   | 150   |

| Detailed Syllabus |                                                                                                                                                                                                                                                                                                                                             | Lectures/Week |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1.                | <p>Elements of Communication System :</p> <p>Basic block diagram of communication system, Modulation and Demodulation concept, channels Noise in Communication System, Signal-to-Noise ratio, noise factor and Noise Figure, equivalent Noise Temperature</p> <p>Electromagnetic Waves Propagation : Propagation terms and Definitions.</p> | 06            |
| 2.                | <p>Amplitude Modulation :</p> <p>Principles of DSB Full Carrier AM, envelope detector, practical diode detector. Different types of AM : DSB-SC, SSB-SC, VSB, ISB</p>                                                                                                                                                                       | 12            |
| 3.                | <p>Angle modulation</p> <p>Principles of Frequency Modulation and Phase Modulation.</p> <p>FM Modulators, types of FM: NBFM and WBFM, FM Transmitter, noise triangle, pre-emphasis and de-emphasis circuits.</p> <p>FM Detection : frequency discriminator and phase discriminator</p>                                                      | 12            |
| 4.                | <p>Radio Receivers</p> <p>Receiver Characteristics, TRF Receivers, and Super heterodyne Receivers : choice of IF, AGC, AFC In AM and FM receivers.</p>                                                                                                                                                                                      | 07            |
| 5.                | <p>Analog Pulse Modulation</p> <p>Sampling Theorem for Low pass signals, Aliasing error, Sampling techniques, Principles, generation, Demodulation &amp; Spectrum Of PAM, PWM, PPM</p>                                                                                                                                                      | 07            |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 6. | <b>Digital Pulse Modulation</b><br>Comparison of digital signal transmission over analog signal transmission, significance of regenerative repeaters .<br>Pulse- coded modulation (PCM) : sampling ,quantizing , encoding technique, PCM bandwidth,<br>Necessity of companding, PCM Waveform formats: Uni-polar and polar NRZ , RZ , AMI<br>Delta modulation ( DM ) , Adaptive Delta Modulation( ADM).<br>Multiplexing: TDM, FDM- Principles & applications. | 12 |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

#### Text Books:

1. Wayne Tomasi "Electronics communication system" Pearson education, Third edition 2001.
2. Kennedy and Davis "Electronics communication system", Tata Mcgraw Hill
3. R.P. Sing and S.D. Sapre, "Communication systems Analog and Digital", Tata Mcgraw Hill
4. Taub and schilling "principles of communication systems", Tata Mcgraw Hill

#### Reference Books:

1. Roy Black, "Electronics communication system", Cengage learning, second edition.
2. B.P. Lathi "Modern Digital and analog Communication system" Third edition, OXFORD
3. Robert J. Schoenbeck "Electronics communications modulation and transmission".
4. Lean W couch "Digital and Analog communication system", Pearson education, Sixth edition.

#### Term Work:

The term work shall consists of at least eight Laboratory experiments covering the whole of syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

### SUGGESTED LIST OF EXPERIMENTS

1. Amplitude Modulation And Demodulation
2. DSB-SC & SSB-SC Modulation ,demodulation
3. Frequency Modulation and Demodulation
4. Study of Superhetrodyne Receiver characteristics
5. Sampling and Reconstruction of sampled signals
6. Pulse Modulation (PAM, PWM, PPM)
7. Delta Modulation
8. Time Division Multiplexing of PCM signals
9. Line codes ( NRZ , RZ ,AMI-RZ )
10. Simulation on AM,FM / Multiplexing

# S.E. (ELECTRONICS) SEMESTER IV

## Electronics Workshop-I

|                   |                    |       |       |
|-------------------|--------------------|-------|-------|
| Period per week   | Lecture            |       |       |
|                   | Practical          | 4     |       |
|                   | Tutorial           |       |       |
| Evaluation System |                    | Hours | Marks |
|                   | Theory Examination | ---   | ---   |
|                   | Practical          | ---   | ---   |
|                   | Oral Examination   | ----  | 25    |
|                   | Term Work          | ---   | 25    |
|                   | Total              | ---   | 50    |

### Detailed Syllabus

This syllabus is designed to encourage students to design and implement innovative ideas. The syllabus will give them in depth practical knowledge from design to the final verification stage. Documentation of any project is an important part of the project and students are expected to document their work properly in standard IEEE format.

Every group of students should select different projects. Number of students should not be less than TWO and not more than THREE in one group.

#### 1. Study of Soldering Techniques and PCB Design

Students are expected to select any experiment\* that they have already performed in earlier semester. Soldering and testing is to be done for the selected experiment. Perform simulation of the same experiment by using CAD tools. Schematic as well as PCB design is to be carried out using CAD tools.

#### 2. Design, Simulation and Implementation of Analog Project

Students are expected to design any\* analog application of their choice. Perform simulation using software tools. PCB design, fabrication of PCB, testing and implementation should be done. Documentation of the project is to be done preferably in standard IEEE format using Latex/WinTex. Project report should include abstract in maximum 100 words, keywords, introduction, design, simulation, implementation, results, conclusion and references.

#### 3. Digital Project

Students are expected to design any\* digital application of their choice. Perform simulation using software tools for hardware description. Design should be synthesized using FPGA/CPLD. Documentation of the project is to be done preferably in standard IEEE format using Latex/WinTex. Project report should include abstract in maximum 100 words, keywords, introduction, design, simulation, implementation, results, conclusion and references.

\* To be approved by the subject Teacher

#### References:-

1. Roberts G. W. and Sedra A.S., "SPICE", 2<sup>nd</sup> ed, USA
2. Rashid M.H. "SPICE for circuits and electronics using pSpice", Prentice Hall

3. Tuinenger P.W., "SPICE: A Guide to circuit simulation and analysis using pSpice", Prentice Hall
4. Bosshart, "Printed Circuit Boards: Design and Technology", Tata McGraw Hill
5. Orcad/PCBII, "User's Guide".
6. [www.xilinx.com](http://www.xilinx.com)