Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

BoS in Electronics

SEMESTER PATTERN

(w.e.f. Academic Year 2015-16)

SYLLABUS FOR B.Sc.-III EXAMINATION

B.Sc.-III, ELECTRONICS

JUNE -2015

Rajarshi Shahu Mahavidyalaya Latur
(Autonomous)
Department of Physics and Electronics (w.e.f. June 2015-16)
Structure of B. Sc. III Electronics Syllabi

Sr No	Course Code	Title	Credits	Periods /Week	Marks		
					In Sem	End Sem	Total
		Sem V					
1	U-ELE-553	Communication Electronics–IX	2	3	20	30	50
2	U-ELE-554	Op Amp and its Applications-X	2	3	20	30	50
3	U-ELE-555	Electronics Laboratory Course VII	2	3		50	50
4	U-ELE-556	Electronics Laboratory Course VIII	2	3		50	50
		Sem VI					
5	U-ELE-653	Digital Electronics-XI	2	3	20	30	50
6	U-ELE-654	Communication Electronics–XII	2	3	20	30	50
7	U-ELE-655	Electronics Laboratory Course IX	2	3		50	50
8	U-ELE-656	Electronics Laboratory Course X	2	3		50	50
9		Project	2	-		50	50
		Total	18				450

B.Sc. III Year, Sem-V
Course Code: U-ELE-553

Communication Electronics-IX

Credits: 2 **No of periods / wk: 3** **Periods: 45**

Marks: 50, End Sem.: 30 & In Sem.:20 (UT: 15 &AT: 05)

Learning Objectives:

(1) Students should know the basic communication system and its requirements.

(2) Students should be able to study AM, FM, PM and different AM generation methods and required mathematical expressions,

(3) Students should learn the PM and FM with different demodulation methods like balanced slope detectors, ratio detector, phase discriminator and linear diode detectors.

Course Outcomes:

(1) Students studied different types of AM, FM and PM methods. Also they are made familiar with AM detector like balanced slope detectors, ratio detector, phase discriminator and linear diode detectors etc.

Unit I: Communication Systems: **[08 Periods]**

Introduction, Basic Communication system, Classification of electronic communication systems, Classification based on direction of communication, Nature of information signal & technique of signal transmission, Need of modulation, Types of modulation: AM, FM, PM, Demodulation, Concept of Bandwidth. [Book No. 1, Chapter-1]

Unit II: Amplitude Modulation: **[14 Periods]**

Introduction to AM , Mathematical representation of AM wave, waveforms of AM, frequency spectrum of AM waves, Concept of over modulation, Calculation of modulation index using AM wave, Power relations in AM wave, Generation of AM: High level collector modulator circuit. AM detector: simple diode detector, Practical diode detector, Numerical problems.

[Book No. 1, Chapter-2 & 4]

Unit III: Frequency Modulation: **[12 Periods]**

Introduction to FM & Phase Modulation (PM), waveforms of FM and PM, Mathematical representation of FM, Frequency spectrum of FM, Practical bandwidth of FM, Phase modulation, Generation of FM: Transistor reactance modulator & varactor diode modulator. FM demodulator: Balanced slope detector, Numerical Problems. [Book No. 1, Chapter-5 & 6]

Unit IV: Pulse Modulation: **[11 Periods]**

Introduction to pulse modulation, Classification of pulse modulation system, continuous and discrete time signals, Sampling process, Pulse amplitude modulation, Generation of PAM, Types of PAM, Pulse width modulation (PWM), Generation of PWM, Pulse position modulation (PPM), Generation of

PPM, Pulse code modulation (PCM): PCM detector, Transmitter encoder, PCM receiver (detector) , Numerical Problems. [Book No. 1, Chapter 7].

Recommend Books:

1. Communication Engineering, by J.S. Katre. (Second Revised Edition 2011) Tech- Max Publications, Pune.

2. Communication Electronics by Louis E. Frenzel (2 nd edition) Mc-millan / McGraw Hill publications.

Reference Books:

1. Electronics and Radio Engineering by M. L. Gupta, Dhanpat rai & sons (edition 1990)

2. Handbook of Electronics. Gupta and Kumar, Pragati prakashan

3. Electronic Communications by Dennis Roddy, John Coolen, Prentice- Hall of India private limited New Delhi.

4. Electronics Communication Systems, by George Kennedy Third Edition, Tata Mc Graw- Hill Edition.

B.Sc. III Year, Sem-V

Course Code: U-ELE-554

Operational Amplifier and its Applications-X

Credits: 2 No of periods / wk: 3 Periods: 45

Marks: 50, End Sem.: 30 & In Sem.:20 (UT: 15 &AT: 05)

Learning Objectives:

(1) Differential amplifier and its parameter (gain, Ri, Ro, CMRR etc),

(2) After studying the differential amplifier, student should introduce the Operational amplifier. As the differential amplifier, solve many problems.

(3) Types of operational amplifier, gain calculation, Ri and Ro calculation, block diagram study of Op-Amp. Study of Op- Amp (electrical) parameter such as Ri, Ro, Vio, Iio, IB, CMRR, VSRR, AOL, ACL, SR, BW etc.

(4) Linear and Non-linear application of Op-Amp (Adder, Subtractors, unity gain buffer, Integrator, differentiator, Schmitt Trigger comparator, analog complication, logarithmic amplifier and solve many problems),

(5) Applications of IC 741, and IC-555, as RC phase shift, Wien Bridge Oscillator, Astable Multivibrator.

Course Outcomes:

After successfully completion of the curriculum of above course student must known about

(1) Analog electronics, differential amplifier calculations of its gain double ended and signal ended Ri, Ro and CMRR and also diff. gain and common mode gain.

(2) Block diag. and symbol of Op-Amp. Many applications (linear and non-linear),

Of Op-Amp such as Op-Amp as inverting and non-inverting amplifier, gain calculations, Ri, Ro and CMRR, SR, Vio, Iio calculations.

(3) Op-Amp as an analog computer i.e. Op-Amp performs Addition, Subtraction, compare signals, Integration, differential, logarithmic etc . Also it solves differential equations of any order.

(4) Design of RC phase shift, Wien bridge oscillator and Astable Multivibrator using ICs 741 and 555.

Unit I: Differential and Operational Amplifiers [13 Periods]

Differential Amplifier:

Introduction, Differential Amplifier: Theory and Calculation of differential voltage gain, Input and output resistances, Single ended voltage gain, common mode voltage gain and CMRR and problems. [Book no-1, Chapter no-8]

Operational Amplifier: Introduction, Block diagram of Op-Amp, Schematic symbol , Power supplies for Op-Amp IC, The Electrical parameters of Op-Amp such as: Input offset voltage, input offset current, Input Bias current, Input resistance, Output resistance, Common Mode Rejection

Ratio(CMRR), Voltage Supply ,Rejection Ratio, Open-Loop Voltage Gain (Large-Signal Voltage Gain), Closed Loop Voltage Gain, Slew Rate, Bandwidth, Common Mode Voltage Gain, Problems. [Book no.-1 Chapter no.-8]

Unit II: Linear Applications of Op-Amp [10 Periods]

The Ideal Op-Amp, Equivalent circuit of Op- Amp, Open-Loop Op-Amp configuration , The Differential Op-Amp configurations, The inverting Op-Amp configuration, The Non-inverting Op-Amp configuration, Voltage Gain Expression for Inverting and Non- inverting Op-Amps (Book No-2.Ch-2) , The Unity Gain Buffer, The Op-Amp as an Adder and Subtractor, Problems. [Book no-2 Chapter-2 and Book no.-1 Chapter no.-9]

Unit- III Some Non-Linear Applications of Op-Amp [12 Periods]

The Op-Amp Integrator, The Op-Amp Differentiator, (Book no-2 Chapter no- 6) Basic Comparator: Zero crossing detector, Non-Zero reference comparators (Inverting and Non-inverting Op-Amp), Schmitt's Trigger, Analog Computation: Solving Differential Equations (Second and Third order type), Op-Amp as a Logarithmic Amplifier, Problems.

[Book no-1 Chapter no-8 and 9]

Unit IV: Specialized IC (741 and 555) Applications [10 Periods]

Pin Diagram of Op-Amp IC741 and Pin functions, RC Phase shift Oscillator Wien Bridge Oscillator, Square Wave Generator using Op-Amp IC741, The Timer IC 555 and Its Pin Functions, Block Diagram of IC555, IC 555 as Astable Multivibrator, Problems.

[Book no-2 Chapter no-7 and 9]

Recommended Books:

1. Electronic Fundamentals And Applications Integrated and Discrete systems- John D. Ryder, Prentice _ Hall of India Pvt.Ltd New- Delhi (5th Edition)

2. Op-Amp and Linear Integrated Circuits-By Ramakant A. Gayakwad, PHI Learning Pvt.Ltd. New-Delhi (4th Edition)

Reference Books:

1. Integrated Electronics- By Millman-Halkias, International Students Edition .

2. Handbook of Integrated Circuit Operational Amplifier- By George B. Rutkowski, D.B. Taraporevala Sons and Co. Pvt.Ltd Prentice –Hall,Inc.

3. Electronic Principles –by A Malvino, David Bates (7th Edition).

B.Sc. III Year, Sem-V

Course Code: U-ELE-555

Electronics Laboratory Course-VII

Credits: 2 **No of periods / wk: 3**

Marks: 50, End Sem.: 30 & In Sem.:20 (RB-10 & AT: 10)

Learning Objectives:

(1) To get introduced to Op-Amps and their applications. To construct and study the circuits of Op-Amp as adder, Subtractor, inverting Op-Amp, Non-inverting Op-Amp, RC phase shift oscillator and Schmitt Trigger.

Course Outcomes:

(1) Students design circuits of Op-Amp as adder, Subtractor, inverting Op-Amp, Non-inverting Op-Amp, RC phase shift oscillator and Schmitt Trigger. They note observations and predict results of the same.

List of Experiments

1. Study of Op-Amp Parameters-1(Input offset voltage, input offset current and Input bias current)
2. Study of Op-Amp parameters-2 (Input Resistance, O/P resistance and Unity gain)
3. Determination of CMRR using Op-Amp
4. Study of AC Inverting Op-Amp.
5. Study of DC Inverting Op-Amp.
6. Study of AC non-inverting Op-Amp.
7. Study of DC non-inverting Op-Amp.
8. Study of Adder and Subtractor using Op-Amp.
9. Study of differentiator and integrator using Op-Amp.
10. Study of Schmitt triggers using Op-Amp.
11. Phase shift oscillator using 741.

Note- At Least 06 Experiments Should be Performed by Each Student from this Lab.

B.Sc. III Year, Sem-V

Course Code: U-ELE-556

Electronics Laboratory Course-VIII

Credits: 2 **No of periods / wk: 3**

Marks: 50, End Sem.: 30 & In Sem.:20 (RB-10&AT: 10)

Learning Objectives:

(1) To study the communication electronics , construct the circuits ,tabulate observations and predict results like class C modulation, AM detector, class B amplifier, PWM-555, Astable multivibrator-555, Laser diode characteristics etc.

Course Outcomes:

(1) Students assembled the circuits of class C modulation, AM detector, class B amplifier, PWM-555, Astable multivibrator-555, Laser diode characteristics .Students tabulate the readings and predict the proper results.

List of Experiments

1. Balanced modulator using FET for generation of AM.
2. Balanced modulator using IC1496 for generation of AM.
3. Class C modulator for AM generation.
4. Linear diode detector for AM
5. FM generation using IC565.
6. FM detection using IC 566.
7. RC Phase shift oscillator using IC741.
8. Square wave generator using IC741.
9. Astable multivibrator using IC555.
10. Wein Bridge Oscillator using IC741.

Note- At Least 06 Experiments Should be Performed by Each Student from this Lab.

B.Sc. III Year, Sem-VI
Course Code: U-ELE-653
Digital Electronics-XI

Credits: 2 **No of Periods / wk: 3** **Periods: 45**

Marks: 50, End Sem.: 30 & In Sem.:20 (UT: 15 &AT: 05)

Course Objectives:

(1) To learn and understand basic digital design techniques.

(2) To learn and understand design of combinational and sequential circuits.

Course outcomes:

(1) Have the ability to understand, analyze and design various combinational and sequential circuits.

(2) Understand operation of basic types of flip-flops, registers, counters, decoders, encoders, multiplexers, and de-multiplexers.

(3) Conduct experiments using digital IC's for a given application/problem statement.

(4) Have skill to build and troubleshoot digital circuits.

Unit I: Combinational Circuits: **[13 Periods]**

Introduction, Exclusive-OR (XOR) gate, its symbol and Truth Table, Exclusive - NOR (XNOR) gate, its symbol and truth table.

Binary Adders: Half adder, full adder, half Subtractor, full Subtractor, serial and parallel addition, parallel adder, BCD(8421) adder, Excess-3 adder, encoder, decimal to BCD (diode matrix) encoder, decoder, BCD-to-decimal decoder, BCD-to-7-segment decoder, Multiplexer, Demultiplexer.[Book No. 1, Chapter-6]

Unit II: Flip – Flops: **[10 Periods]**

Introduction, Sequential Circuits: The Flip-Flop, The Basic Flip – Flop Circuit(The Latch), The RS Flip-Flop, The Clock, The level-Clocking Vs. Edge Triggering, The Clocked RS Flip-Flop, JK- Flip-Flop, Master – Slave JK Flip-Flop, D-Flip-Flop, T- Flip-Flop, Asynchronous Inputs (PRESET and CLEAR),, Flip-Flop Timing Considerations, Flip-Flop Applications.

[Book No. 1, Chapter 7]

Unit III: Digital Counters (Binary Counters): **[15 Periods]**

Introduction, Basic Flip-Flop Counter, Modulus of a Counter, Types of Counter Asynchronous (Ripple) Counter, Mod-8 Ripple Counter, Mod-6 Ripple Counter, Asynchronous Mod-8 Down Counter, Asynchronous Up/Down Counter, Asynchronous Mod-10 (Decade) Counter, Example Asynchronous BCD Counter, Disadvantages of Asynchronous Counter, Synchronous Counters, Synchronous Mod -16 Counter (Serial Carry), Synchronous Mod-10 counter (Decade)(Parallel Carry), Applications of Counters. [Book No. 1, Chapter 8]

Unit IV: Shift Registers: **[7 Periods]**

Introduction, Basic Shift Register Operations, Serial In / Serial out Shift Registers, Serial In / Parallel out Shift Registers, Parallel In/ Serial out shift Registers, Parallel In /Parallel Out Shift Registers, Shift Register Counters: The Johnson Counter, The Ring Counter. [Book No. 2, Chapter 9]

Recommend Books:

1. Digital Principles and Circuits- Dr. C. B. Agarwal, Himalaya Publishing House (1st Edition)

2. Digital Fundamentals (10th Edition) Thomas L. Floyd – Pearson.

Reference Books:

1. Digital Principle and Applications- By Donald P. Leach, Albert Paul Malvino Gautam Saha (Seventh Edition)Tata McGraw Hill Education Private Limited New Delhi

2. Digital Fundamentals (Eighth Edition)- Floyd and Jain Pearson Education.

3. Modern digital Electronics (25th Ann. Edition Fourth edition, -TATA Mc Graw Hill) by R. P .Jain.

4. Digital Electronics-(Second Edition) In introduction to theory and Practice by William H. Gothmanm.

B.Sc. III Year, Sem-VI
Course Code: U-ELE-654

Communication Electronics-XII

Credits: 2 **No of periods / wk: 3** **Periods: 45**

Marks: 50, End Sem.: 30 & In Sem.:20 (UT: 15 &AT: 05)

Learning Objectives:

(1) To study basic communication system to provide strong back ground of the communication electronics, to impart knowledge about existing digital communication system.

(2) Students should learn pulse communication like PAM, PWM, PPM and multiplexing. Radiation and propagation of the EM waves like ground wave propagation, sky wave propagation etc.

(3) Students should be familiar about RADAR system, its range equations and factors affecting RADAR range.

(4) Students should learn the satellite communication system.

Course Outcomes:

(1) Students learnt pulse modulation as PAM, PWM and PPM methods.

(2) After completion of this course Students learnt the radiation and propagation of waves. They are also made familiar about RADAR systems.

(3) Students studied the modern digital satellite communication.

Unit I: Radio Receivers: **[12 Periods]**

Introduction, AM radio receivers, Function of a receiver, Types of AM receiver, the tuned radio frequency (TRF) receiver, the super-heterodyne Radio receiver, Characteristics of radio receiver: Sensitivity, Selectivity, fidelity, Image frequency and its rejections, double spotting, FM receivers: Block diagram of FM Radio receiver, Numerical Problems.

[Book No. 1, Chapter 2 &6]

Unit II: RADAR Systems: **[10 Periods]**

Introduction, Simple radar system, radar range equation, factors influencing maximum range, Target properties, Major components of a pulsed radar system, Duplexers, Moving target indicators (MTI), Continuous wave radar (CW), Numerical Problems.

Book No. 2, Chapter 28]

Unit III: Introduction to Optical fibre: [12 Periods]

Introduction, Importance of optical fibre, Generations of telephone system and optical fibre, Propagation of light in different media, Propagation of light waves in an optical fibre, Basic structure of an optical fibre and propagation of light wave through it, Acceptance angle & cone of a fibre, Numerical aperture (general), Classification of Optical fibre: Stepped index fibre, stepped index monomode fibre, graded index multimode fibre, Numerical problems.

[Book No. 3, Chapter: 1, 2, and 3]

Unit IV: Modern communication Applications: [11 Periods]

Introduction to satellite communication systems, modems: Digital data transmission, Block diagram of FSK modem. Introduction to networks: Simple communication network, Star LAN configuration, A ring LAN configuration, a bus LAN configuration. Light wave communication system: Basic elements of a fiber optics communications system, Facsimile, Cellular radio system, General Black diagram of cellular radio.

[Book No. 4, Chapter 11.2, 12.2, 12.4, 13.1, 14.1, 14.2]

Recommend Books:-

1. Communication Engineering, by J.S. Katre. (Second Revised Edition 2011) Tech- Max Publications, Pune.

2. Radio Engineering –by M.L Gupta Dhanpatrai & Sons 1990.

3. Optical Fiber & fiber optic communication system- Subhir kumar Sarkar 2 S. Chand co. 2003.

4. Communication Electronics by Louis Frengel, 2nd edition Mc-Grew Hill.

Reference Books:-

1. Microwave Engineering by Sanjeeva Gupta and Khanna Publishers, 1998.

2. Electronics communication systems, third edition by George kennedy , tata Mc Grew Hill edition.

3. Electronics communication by Dennis Roddy and John coolen, Prentice-Hall of india private limited New Delhi.

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B.Sc. III Year, Sem-VI

Course Code: U-ELE-655

Electronics Laboratory Course-IX

Credits: 2 **No of periods / wk: 3**

Marks: 50, End Sem.: 30 & In Sem.:20 (RB-10&AT: 10)

Learning Objectives:

(1) Students should study digital electronics and practical's like Ex-OR and EX-NOR gate, Half/full adder, Laser diode, BCD 8421, RS, T, D flip-flops, Mod counters, Mux and Demux. Assemble the circuit, tabulate and predict the results, truth tables.

Course Outcomes:

(1) Students will be able to design the circuits, inputs are given to the circuits and results are tabulated.

List of Experiments

1. Binary verification of truth table of EX-OR and EX- NOR gate.
2. Binary half adder and full adder using NAND gate
3. Binary half Substractor and Full Substractor using NAND gates.
4. BCD 8421 Adder.
5. Study of RS, JK, T and D types Flip flops.
6. Mod 8- Asynchronous Counter.
7. Mod 8- Synchronous Counter.
8. Asynchronous BCD Counter.
9. Ring Counter using Flip flop.
10. Johnson's counter using Flip flop.
11. Study of Multiplexer.
12. Study of De-Multiplexer.
13. BCD to decimal decoder

Note- At Least 06 Experiments Should be Performed by Each Student from this Lab.

B.Sc. III Year, Sem-VI

Course Code: U-ELE-656

Electronics Laboratory Course-X

Credits: 2 **No of periods / wk: 3**

Marks: 50, End Sem.: 30 & In Sem.:20 (RB-10&AT: 10)

Learning Objectives:

Students should construct the circuits for communication electronics like laser diode characteristics, IF amplifier, Audio amplifier- IC810, Class B push-pull amplifier, PWM, Class C modulator, Diode detector and tabulate the observations and predict results.

Course Outcomes:

Students will be able to assemble circuits, tabulate observations and predict the results and necessary graphs will be drawn.

List of Experiments

1. Determination of numerical aperture of given optical fibre.
2. Study of bending loss of given optical fibre.
3. Study of LASER diode characteristics.
4. Study of photo detector.
5. Study of IF amplifier.
6. Study of radio receiver, characteristics of such as selectivity, sensitivity, fidelity.
7. Study of Audio amplifier using IC810.
8. Study of Class B Push pull Amplifier using IC on Transistor
9. PWM generation using IC555.
10. PPM generation using IC555.
11. Schmitt Trigger using transistor.
12. Class 'C' Modulator.
13. Diode detector.

Note- At Least 06 Experiments Should be Performed by Each Student from this Lab.