Choice Based Credit System of B.Sc. (Electronics)

(6 Semester Degree Course)

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Mizoram University, Aizawl
June - 2020

CBCS Course Structure of B.Sc.(Electronics)
(6 Semester Degree Course)

Course Structure & Marks Distribution of B.Sc.(Electronics) - 2nd Revision, 2015

Sem	Course No.	Name of Paper	Marks Scale			Credit				Exam(hrs)	
			C/A	End Sem.	Tot	L	T	P	Tot	T	P
1st	ENG/I/FC/01	English I	25	75	100	4	1	0	**5**	*3*	-
	EL/I/EC/01	Electronic Instruments and Circuit Analysis	25	75	100	3	1	0	**4**	3	-
	EL/I/EC/02	Laboratory-I	25	75	100	0	0	2	**2**	-	3
	Elec. Course-1	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
	Elec. Course-2	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
		Total	175	525	**700**				**23**		
2nd	ENG/II/FC/02	English II	25	75	100	4	1	0	**5**	*3*	-
	EL/II/EC/03	Semiconductor Physics	25	75	100	3	1	0	**4**	3	-
	EL/II/EC/04	Laboratory-II	25	75	100	0	0	2	**2**	-	3
	Elec. Course-1	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
	Elec. Course-2	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
		Total	175	525	**700**				**23**		
3rd	HSCI/III/FC/03	History of Science	25	75	100	4	1	0	**5**	*3*	-
	EL/III/EC/05	Electronic Devices and Amplifier	25	75	100	3	1	0	**4**	3	-
	EL/III/EC/06	Laboratory-III	25	75	100	0	0	2	**2**	-	3
	Elec. Course-1	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
	Elec. Course-2	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
		Total	175	525	**700**				**23**		
4th	EVS/IV/FC/04	Environmental Studies	25	75	100	4	1	0	**5**	*3*	-
	EL/IV/EC/07	Pulse Switching Circuits	25	75	100	3	1	0	**4**	3	-
	EL/IV/CC/08	Laboratory-IV	25	75	100	0	0	2	**2**	-	3
	Elec. Course-1	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
	Elec. Course-2	Theory	25	75	100				***4***		
		Practical	25	75	100				***2***		
		Total	175	525	**700**				**23**		
5th	EL/V/CC/09	Transmission Line and Radar System	25	75	100	3	1	0	**4**	3	-
	EL/V/CC/10	Analog Circuits and Modulation	25	75	100	3	1	0	**4**	3	-
	EL/V/CC/11	Computer Fundamentals	25	75	100	3	1	0	**4**	3	-
	EL/V/CC/12	Laboratory-V	25	75	100	0	0	2	**2**	-	3
	EL/V/CC/13	Laboratory-VI	25	75	100	0	0	2	**2**	-	3
	EL/V/CC/14	Laboratory-VII	25	75	100	0	0	2	**2**	-	3
	EL/V/CC/15(a)	**Optional I** (*any one*) Electronics Instrument	25	75	100	3	1	0	**4**	3	-

	EL/V/CC/15(b)	Solid State Electronics									
	EL/V/CC/16	Project - I	25	75	100	0	0	2	**2**	-	3
		Total	200	600	**800**				**24**		
6th	EL/VI/CC/17	Analog and Digital Electronics	25	75	100	3	1	0	**4**	3	-
	EL/VI/CC/18	Computer Organization and Microprocessor	25	75	100	3	1	0	**4**	3	-
	EL/VI/CC/19	Opto-electronic Devices	25	75	100	3	1	0	**4**	3	-
	EL/VI/CC/20	Laboratory-VIII	25	75	100	0	0	2	**2**	-	3
	EL/VI/CC/21	Laboratory-IX	25	75	100	0	0	2	**2**	-	3
	EL/VI/CC/22	Laboratory-X	25	75	100	0	0	2	**2**	-	3
	EL/VI/CC/23(a) EL/VI/CC/23(b)	**Optional II** (*any one*) Power Electronic Devices Fiber Optics & Electronic Communication	25	75	100	3	1	0	**4**	3	-
	EL/VI/CC/24	Project - II	25	75	100	0	0	2	**2**	-	3
		Total	200	600	**800**				**24**		
		Grand Total	**1100**	**3300**	**4400**				**140**		
			Theory Credit						**100**	**(71.4%)**	
			Practical Credit						**40**	**(28.6%)**	

Key Points:

1. In teaching all the courses of Electronics, S.I. units will be followed.
2. Contact hour per Lecture is 1 hour. For Theory, 1 Contact hour is 1 Credit and for Practical, 2 Contact hours is 1 Credit.
3. Internal Tests/Assignments will be conducted as a part of Internal Assessment as per CGS Regulations (UG) of Mizoram University.

C. Core and Elective Papers

The permitted combinations of Core and Elective papers for Electronics are as given below:

Core	**Elective I**	**Elective II**
Electronics	Physics	Mathematics/Geology/Statistics
Physics	Mathematics	Chemistry/**Electronics**/Geology/Statistics
Mathematics	Physics/Statistics	Chemistry/**Electronics**/Geology

D. Examination Pattern

- Internal Tests as per CGS guidelines for UG (MZU)
- In the End Semester examinations, following is the marks distribution and the pattern of setting the questions in Theory and Practical Papers.
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Papers with Marks	**Internal (C1+C2) = 25 marks** **Marks distribution** As per CBCS guidelines for UG	**External (C3)-75 marks**	**Duration of Examn.**
Core & Optional (Theory) 60	**External (C3)** **A.*Objective Type Questions*** (Part A) **-35 marks** No. of MCQ to be set = **10** (**1** marks) No. of MCQ to be answered = **10** **B. *Short Answer Type*** No. of S.A. Qs. to be set= **10** (2 from each Unit with **3** marks) No. of S.A. Qs. to be answered= **5** (1 from each Unit)	**Descriptive Questions** **(Part B) – 40 marks** C. *Descriptive Questions* No. of Qs. to be set = **10** (2 from each Unit with **10** marks) No. of Qs. to be answered = **5** (1 from each Unit	3 hours
Practical 100	**Internal (C1+C2=25 marks)** For EL/1/EC/02, EL /2/EC/04, EL /3/EC/06, EL /4/EC/08, EL /5/CC/12, EL /5/CC/13, EL /5/EC/14, EL /5/CC/16, EL /6/CC/20, EL /6/CC/21, EL /6/CC/22, EL /6/CC/24 **Marks distribution** As per CBCS guidelines for UG	**External (75 marks)** End Semester–**50** marks, Record Book – **10** marks, Attendance – **5** marks, Viva Voce – **10** marks Total = **75** marks	3 hours

E. Internal and External Examination

Examination and Assessment: Each Course, shall be evaluated at the scale of 100. For all courses, irrespective of Theory and Practical, there shall be Continuous (internal) Assessment carrying 25 marks and an End-semester examination carrying 75 marks.

1) **Continuous Assessment:**
The outline for Continuous Assessment activities shall be proposed by the teacher(s) concerned before the commencement of the semester. Some suggested parameters of Continuous Assessment are Class Tests, Seminar, Quiz, Home Assignments, Project, and many other methods. However, there shall be series of tests at regular intervals for each course (paper) incorporating various parameters as given above. Final marks shall be calculated for total 25 Marks.
The scheme of awarding marks in Internal Assessment for Theory courses shall be as below:

Component	**Total marks**
Class Tests (Best two out of three)	12 marks
Assignment/Seminar/Project etc.	8 marks
Regularity in the class	5 marks

The scheme of awarding marks in Internal Assessment for Practical courses shall be as given below:

Evaluation in the Lab and Record	8 marks
End-semester Test	12 Marks
Regularity in the class	5 Marks

Attendance evaluation for each course shall be as given in below:

Attendance	**Marks**
90% and above	5
85 to 89.9%	4
80 to 84.9%	3
76 to 79.9%	2
75 to 75.9%	1

2) The End-semester Examination
For each Course (separately for Theory and Practical), End-semester examination shall be conducted for 75 marks each. Finally, the marks obtained in Internal Assessment and End-semester Examination in each course shall be pooled and the % marks obtained shall be calculated by the Examination Department.

First Semester

Electronic Instruments and Circuit Analysis

Course No: EL/I/EC/01

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit-1: (10 Lectures)

Resistor - Classification - wire wound, carbon and metal film resistors, power rating, value of tolerance, variable resistors, potentiometers and rheostats, Resistors colour code,

Capacitors – Capacitance, factor controlling capacitance, Types of capacitor - Electrolytic and non electrolytic capacitors, voltage rating of capacitor. Capacitors in series, capacitors in parallel, Energy stored in capacitor.

Inductors - air core, Iron core and Ferrite core inductor, Inductance of an inductor, Mutual inductance, coefficient of coupling(derivation not necessary), variable inductors, inductors in series or parallel without M, series combination with M, reactance offered by a coil, impedance offered by a coil, Q-factor of a coil.

Unit 2: (10 Lectures)

Measuring Instruments: Introduction, analog and digital instrument, essentials of electronic instrument.

Multimeter - construction, Operation(as voltmeter, as ammeter, as ohmmeter), Sensitivity, advantages and disadvantages, Meter protection.

Electronic Voltmeters – Vacuum Tube Voltmeter (VTVM), Transistor Voltmeter, Bridge Rectifier Voltmeter. Cathode Ray oscilloscope (CRO), Construction, principle of working and applications of CRO.

Unit-3: (10 Lectures)

Alternating Current- Introduction, Types of alternating waveforms, Basic of AC generator, Characteristics of Sine wave, Different values of Sinusoidal Voltage and Current, Phase of an AC, Phase Difference, Vector representation of an alternating quantity, AC through pure resistance only, AC through pure inductance only, AC through pure capacitance only, Non-sinusoidal Waveforms, Harmonics.

Series AC Circuit - RL circuit, Q- factor, skin effect, RC circuit, Coupling capacitor, RLC Circuit, Resonance, resonance curve, Bandwidth, sharpness of resonance, tuning, Parallel Resonance RLC circuit

Filter- Definition, Types of filter, low pass, high pass, band pass, band stop filters, Uses of filters.

Unit-4: (10 Lectures)

Lumped cuircuit, active and passive elements, unilateral and bilateral elements, linear and non-linear elements, loop and mesh, open and short circuit, Kirchoff's current law, Kirchoff's voltage laws, Voltage source, Current Source, Conversion of voltage source into current source, Voltage division law, Current division law. Nodal analysis, mesh analysis using matrices method of circuit analysis, ladder method.

Unit-5: (10 Lectures)

Network Theorems with problems - Superposition Theorem, Thevenin’s Theorem, Norton Theorem, Reciprocity Theorem, Maximum power transfer Theorem, Some applications of network theorems.

Recommended Books :

1. B.L. Theraja: *Basic Electronics Solid State*, S. Chand & Co.
2. Gupta and Kumar: *Handbook of Electronics*, Pragati Prakashan, Meerut.

3. M. L. Gupta: *Electronics and Radio Engineering*, Dhanpat Rai & Sons
4. M.K. Badge & S.P. Singh: *Elements of Electronics*, S. Chand & Co.
5. Vishwanathan, Mehta and Rajaramana: *Electronics for Scientists and Engineers*, PHI
6. V.K.Mehta: *Principles of Electronics*, S.Chand & Co.
7. D.C. Tayal: *Basic Electronics*, Himalaya Publishing House, New Delhi

First Semester

Laboratory-I

Course No: EL/I/EC/02

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. To connect the given capacitors in series and parallel and to find out the total capacitance in each case.
2. To study flow of current/inductance in the coil by connecting them in series and parallel.
3. Experiments with Active filters: (a) High Pass (b) Low Pass (c) Band pass.
4. To study timing characteristic of an RC Circuit during charging of a Capacitor.
5. To study timing characteristic of an RC Circuit during discharge of a Capacitor
6. Experimental verification of Thevenin theorem.
7. Experimental verification of Norton theorem.
8. Verification of Maximum power theorem.

Recommended Books:

1. S.S. Srivastava and M.Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co. (latest edition).

Note: *Experiments may be added or deleted subject to the availability of facilities in the College*.

Second Semester

Semiconductor Physics

Course No: EL/II/EC/03

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)

Atomic Structure, Atomic number, Atomic mass number, Electron orbits or shells,Electron suborbits ior subshells, Valence electron, Enery Bands in Solid, Bonds in Solid, Valence and conduction bands, Conduction in solids, Hole formation and its movement, Classification of solids in terms of energy band, Types of semiconductor- intrinsic and extrinsic semiconductor, *n*-type and *p*-type extrinsic semiconductor, *P-N* Junction diode, Properties of *P-N* junction diode, Forward and Reverse Biasing, V-I Characteristics, junction Breakdown, Junction Capacitance.

Unit 2: (10 Lectures)

Resistance of Semiconductor Diode, Equivalent circuit of semiconductor diode, - Semiconductor Diode as Rectifier - Half wave, Full wave and Full wave bridge Rectifier, construction, operation, efficiency and ripple factor, Filter circuit, Types of filter circuit – capacitor filter, choke input filter, capacitor input filter.

Unit 3: (10 Lectures)

Zener Diodes: VI characteristics, Zener diode as voltage regulator, Zener diode as peak clipper, meter protection, Tunnel Diode, Tunnel Diode oscillator, PIN Diode, Schottky Diode, Thermistor, Light Emitting Diode (LED), Shockley Diode, Varactor Diode, Photo-diode.

Unit 4: (10 Lectures)

Transistor- P-N-P and N-P-N transistors, Transistor Biasing, important biasing rule, transistor current, Transistor circuit configuration (CB, CE, CC), Relation between transistor circuits (alpha and beta), leakage current in a transistor (CB,CE), Thermal Runaway, Transistor Static Characteristic (CB,CE) .

Unit 5: (10 Lectures)

Classification of Transistor Amplifiers, Small signal amplifiers – concept of amplification, current gain, voltage gain, power gain input resistance, output resistance, Q point, Load Line, Classification of Amplifier according to the mode of operation (Class A, B, C and AB), Frequency Response Curve of an Amplifier, Bandwidth.

Recommended Books :

1. B.L. Theraja: *Basic Electronics (Solid State),* S. Chand & Co.
2. Gupta and Kumar: *Handbook of Electronics,* Pragati Prakashan, Meerut
3. M. L. Gupta: *Electronics and Radio Engineering,* Dhanpat Rai & Sons
4. M.K. Badge & S.P. Singh: *Elements of Electronics,* S. Chand & Co.
5. Vishwanathan, Mehta and Rajaramana: *Electronics for Scientists and Engineers,* PHI.

6. V.K.Mehta: *Principles of Electronics*, S.Chand & Co.
7. D.C. Tayal: *Basic Electronics*, Himalaya Publishing House
8. Dennis le Croissette: *Transistors*, PHI(P) Ltd.
9. John D. Ryder: *Electronics Fundamentals and Applications* (2nd Ed.), Englewood Cliffs, Prentice Hall of India (P) Ltd.

Second Semester

Laboratory-II

Course No: EL/II/EC/04

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. To study the characteristic of a Junction Diode.
2. To study the characteristic of a Zener Diode.
3. To study the common base characteristics of a P-N-P junction transistor
4. To study the common emitter characteristics of P-N-P junction transistor.
5. To study the voltage regulation and ripple factor of a half-wave rectifier with L-type filter circuits.
6. To study the voltage regulation and ripple factor of a Full-wave rectifier with L-type filter circuits.
7. Determination of energy gap (band gap) of a semiconductor using a P-N Junction Diode.
8. To study Zener diode voltage regulating characteristics.

Recommended Books:

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand & Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand & Co.

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

Third Semester

Electronic Devices and Amplifier

Course No: EL/III/EC/05

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)

Field Effect Transistors – Construction, operation, Output Characteristics, Parameters of FET, FET as an amplifier, advantages and disadvantages of JFET. Metal Oxide Semiconductor FET – Enhancement MOSFET, Depletion MOSFET, Application of FET.

Unit 2: (10 Lectures)

Diodes: Biasing, Energy band diagram, V-I characteristics and applications. Unijunction Transistor (UJT), Construction, Interbase resistance, Intrinsic stand off ratio, Operation and Application. Silicon controlled rectifier (SCR), construction, biasing operation, two-transistor analogy, firing, 90°Phase control, V-I characteristics.

Unit 3: (10 Lectures)

Power amplifier- Transformer coupled Class-A amplifier, its Power diagram and proof, Class- B push-pull amplifier, principle of operation, advantages, uses and Power efficiency.
Tuned Amplifier: Classification of tuned amplifier, tuned coupling, neutralization (derivation not required).

Unit 4: (10 Lectures)

Hybrid equivalent circuit of a transistor and Amplifier using hybrid parameters, current gain, voltage gain, power gain, input impedance and output impedance.
RC coupled Transistor Amplifier- construction, operation, frequency response, Merits and De-merits, Applications. Transformer coupled amplifier- construction, operation, frequency response, Classification, transformer impedance, Auto transformer, Impedance matching. Merits and De-merits, Applications.

Unit 5: (10 Lectures)

Differential amplifiers - Basic Circuit, operation, common mode and Differential mode signal. Common mode rejection ratio(CMRR).
Operational Amplifier – polarity convention, ideal op-amp, virtual ground and summing point, Op-amp application, OP Amp as linear amplifier – inverting and non inverting, Unity follower, Adder, subtractor, integrator and differentiator.

Recommended Books:

1. Dennis le Croissette: *Transistors*, Prentice Hall of India (P) Ltd.
2. Millman and Halkias: *Integrated Electronics*, Tata McGraw Hill
3. John D. Ryder: *Electronics Fundamentals and Applications* (2^{nd} Ed.), PHI (P) Ltd.
4. M.K. Bagde and S.P. Singh: *Element of Electronics*, S. Chand & Co.
5. Gupta and Kumar: *Handbook of Electronics*, Pragati Prakashan, Meerut
6. John Watson: *Mastering Electronics*, Macmillan, London
7. B.L. Theraja: *Basic Electronics*, S. Chand & Co.

Third Semester

Laboratory-III

Course No: EL/III/EC/06

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. To study the characteristics of a FET and determination of its parameters.
2. To study the characteristic of a UJT. To study how a UJT works as an oscillator.
3. To find Common Mode Rejection Ratio (CMMR) of a differential amplifier.
4. To study the close loop gain of an OP Amplifier and CMRR.
5. Study of OP-Amp (IC 741) as
   a) Inverting amplifier.
   b) Non- inverting amplifier.
6. Study of OP-Amp (IC 741) as
   a) Integrator.
   b) Differentiator.
7. Study of the Hybrid Parameters of a Transistor.
8. Study of the frequency response curve of a R-C coupled Transistor amplifier.
9. Study of negative feedback in a R.C. coupled amplifier.
10. To study the characteristics of a SCR.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand & Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand & Co.

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

Fourth Semester

Pulse Switching Circuits

Course No: EL/IV/EC/07

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)

Concept of negative and positive feedback, principle of feedback amplifiers –negative and positive feedback. Advantages of negative voltage feedback – gain stability, reduces non-linear distortion, improves frequency response, increase circuit stability, change in input and output impedance. Classification of negative feedback amplifiers –voltage series feedback, voltage shunt feedback, current-series feedback and current shunt feedback.

Unit 2: (10 Lectures)

Oscillator - Classification of oscillators, Damped and undamped oscillations, Oscillatory circuit, Barkhausen criterion for sustained oscillations,
LC Oscillators - Tuned collector oscillator – Operation, derivation of frequency of oscillation and condition for sustaine oscillation. Hartley oscillator - Operation, derivation of frequency of oscillation and condition for sustaine oscillation. Colpitt oscillator Operation, derivation of frequency of oscillation and condition for sustaine oscillation.

Unit 3: (10 Lectures)

RC oscillators - Phase Shift oscillator – operation, advantages and diadvantages. Wien Bridge oscillator - operation, advantages and diadvantages. Negative resistance oscillators, Crystal oscillators - frequency stability, piezo electric effect -problems.

Unit 4: (10 Lectures)

Multivibrators – Type of Multivibrators, uses of multivibrators, Astable Multivibrator – construction, operation, switching time frequency of oscillation. Monostable multivibrator – construction, operation, uses. Bistable multivibrator – construction, operation.
Schmitt trigger – construction, operation, uses.

Unit 5: (10 Lectures)

Number system, Binary to decimal and decimal to binary conversion, Binary operations- Binary addition, Binary subtraction using 1's and 2's complement method, Binary multiplication and division.
Logic gates - AND, OR, NOT, NOR, XOR, NAND logic gates. Half Adder, Full adder, Parallel Binary adders, Half Subtractor and Full Subtractor.

Recommended Books :

1. B.L. Theraja: *Basic Electronics (Solid State),* S. Chand & Co.
2. Gupta and Kumar: *Handbook of Electronics,* Pragati Prakashan, Meerut
3. M. L. Gupta: *Electronics and Radio Engineering*, Dhanpat Rai & Sons
4. M.K. Badge & S.P. Singh: *Elements of Electronics,* S. Chand & Co.
5. V.K.Mehta: *Principles of Electronics,* S.Chand & Co.
6. D.C. Tayal: *Basic Electronics,* Himalaya Publishing House
7. VK Puri: *Digital Electronics:Circuit and Systems,* Tata McGraw Hill

Fourth Semester

Laboratory-IV

Course No: EL/IV/EC/08

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. Study of D.C Power supply and filters.
2. To study AND, OR and NOT gates.
3. Study of single stage RC-coupled amplifier and frequency response.
4. Study of OP-Amp as Wien bridge oscillator
5. Determination of frequency of Astable multivibrator (using IC741 Op- Amp).
6. Determination of pulse width of Monostable multivibrator (using IC 741Op- Amp).
7. Study of AM modulator and Demodulator.
8. To determine the time constant (λ) of LC circuit.
9. Study of OP Amplifier parameter.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co.

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

Fifth Semester

Transmission Line and Radar System

Course No: EL/V/CC/09

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)

Transmission Line I: Distributed parameters, Types of Transmission Lines, Voltage and Current Relation on Radio Frequency Transmission Line, Voltage and Current Relation with Distance from sending end. Voltage and Current Relation with Distance from Load end or Receiving end, Propagation Constant, Line distortion and attenuation, Conditions for Distortionless Transmission, Condition for Low distortion and achievement, Loss free line.

Unit 2: (10 Lectures)

Transmission Line II: Transmission Line termination, Transmission Line Matching, Maximum Power Transfer, line termination by zero load, line termination by infinite impedance, Standing Wave Ratio, Input impedance of dissipationless transmission line, Input impedance of a line terminated with any impedance, with short circuit and open circuit lines, Voltage and Current distribution along a Terminated Line,

Unit 3: (10 Lectures)

Basic antenna principles, co-ordinate system, radiation fields, polarization, the isotropic radiator, power gain of an microwave antennas, antenna, Hertzian dipole, Folded dipole, Rhombee and Yagi antenna and their Radiation pattern, vertical antenna, microwave antennas, antenna equivalence.

Unit 4: (10 Lectures)

Radar System - introduction, Simple radar system, Frequency and Powers used in radar, Range Equation, Factors Influencing maximum range, Target properties major components of a Pulse radar system, Radar Antennas, radar Receiving systems, Indicators for radar receivers.

Unit 5: (10 Lectures)

Satellite Communication – Introduction, Kepler's laws in relation to satellite, Orbits, Polar and Geo-synchronised satellites, power system, Station keeping satellite, attitude control, Antenna look angle, limits of visibility, transmission path, Uplink, downlink and overall link power budget calculations, path loss.

Recommended Books :

1. B.L. Theraja: *Basic Electronics- Solid State*, S. Chand & Co.
2. Gupta and Kumar: *Handbook of Electronics*, Pragati Prakashan, Meerut
3. M. L. Gupta: *Electronics and Radio Engineering*, Dhanpat Rai & Sons
4. Wayne Tomasi: *Advanced Electronic Communication System*, 6th Edn, Pearson.
5. D.C. Tayal: *Basic Electronics*, Himalaya Publishing House

Fifth Semester

Analog Circuits and Modulation

Course No: EL/V/CC/10

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit- 1 (10 Lectures)

Power Supplies: Rectifiers. Half wave, full wave and bridge rectifiers- Efficiency- Ripplefactor- Regulation. Harmonic components in rectified output, Types of filters- Choke input (inductor) filter- Shunt capacitor filter- L section and Pi-section filters, Block diagram of regulated power supply, Series and shunt regulated power supplies

Unit 2: (10 Lectures)

Transistor biasing: Self-Bias, Stability Factor, Operating Points, Push-pull amplifiers; Class A and B Push Pull circuits; Harmonic Distortion; Complimentary Symmetry Amplifier (Qualitative). Construction; Equivalent Circuits; Frequency Response; Auto-transformer, Application in Electronic Circuits.

Unit 3: (10 Lectures)

Operational Amplifiers: Differential amplifier- Block diagram of Op-Amp- Ideal characteristics of Op-Amp, Op-Amp parameters, Input resistance, Output resistance- Common mode rejection ratio (CMMR)- Slew rate- Offset voltages . Input bias current- Basic Op-Amp circuits- Inverting Op-Amp- Virtual ground- Non-inverting Op-Amp- Frequency response of Op-Amp, Interpretation of Op-Amp data sheets.

Unit 4 : (10 Lectures)

Applications of Op-Amps: Summing amplifier- subtractor-Voltage follower- Integrator- Differentiator - Comparator- Logarithmic amplifier- Sine wave [Wein Bridge] and square wave [Astable] generators- Triangular wave generator- Monostable multivibrator- Basic Op-Amp series regulator and shunt regulator.

Unit 5 : (10 Lectures)

Modulation: Need for modulation-Types of modulation- Amplitude, Frequency and Phase modulation. Amplitude modulation-side bands- modulation index- square law diode modulator-Demodulation- diode detector.

Frequency modulation working of simple frequency modulator- Radio detection of FM waves- Advantages of frequency modulation. AM and FM radio receivers [block diagram approach].

Recommended Books:

1. Millman and Halkias: *Electronic Devices and Circuits*- Tata McGraw Hill
2. J. Millman and A. Grabel: *Microelectronics*- TMH
3. Ramakant A. Gayakwad: *Operational Amplifiers and Linear Integrated Circuits*- Prentice Hall of India (PHI).
4. K. Lalkishore: *Operational Amplifiers and Linear Integrated Circuits*- Pearson Education
5. L.K. Maheswari and M.M.S. Anand: *Analog Electronics*- PHI
6. V.K. Mehta and Rohit Mehta: *Principles of Electronics*- S Chand &Co

7. George Kennedy & Bernard Davis: *Electronic Communication Systems* - TMH.
8. D. Roddy & J. Coolen: *Electronic Communication* - PHI
9. Louis E. Frenzel: *Principles of Electronic Communication Systems* –TMH

Fifth Semester

Computer Fundamentals

Course No: EL/V/CC/11

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)
Number System: The unitary system, the decimal system, Binary system, Binary to decimal and decimal to binary conversion, Arithmetic binary operations- Binary addition, subtraction using 1's and 2's complement method, Binary multiplication and division, Related problems. Analog to Digital and Digital to Analog conversion, Digital Voltmeter, Digital speedometer, Digital Odometer.

Unit 2: (10 Lectures)
Introduction to Boolean Algebra, De Morgan's Theorems, AND, OR, NOT, NOR, XOR, NAND logic gates. Half Adder, Full adder, Binary adders, Half Subtractor, Full Subtractor and Binary Subtractor, De–Morgan's 2nd Theorem : Bubbled OR gate, more than two inputs, Exclusive-OR Gates: Two inputs, logic symbol and Boolean sign, four inputs, Any number of inputs, parity, Controlled Inverter Exclusive-NOR Gates.

Unit 3: (10 Lectures)
Sequential Circuits, Flip-Flops: RS Flip-Flops, Clock RS Flip-Flops, D Flip Flops, Clock Data Latches, Positive Edge-Triggered Data Flip-Flop,Positive Edge Triggered J-K Flip-Flop, T Flip Flop, J.K. Master-Slave Flip-Flop, Registers and Counters: Shift Registers– Shift Left Registers and Shift Right Registers, Ripple Counters, Synchronous Counters, Ring counters.

Unit 4: (10 Lectures)
Hard DISK, CD-ROM, Cache Memory, Virtual Memory, ROMS, PROMs, and EPROMs RAMs, Secondary Storage Devices : Sequential and Direct-Access Devices; Magnetic Tape Basic Principles of Operation, Types of Magnetic Tapes: Advantages and Limitations, Uses of Magnetic Disks; Optical Disk :Advantages and Limitations, CD ROM, DVD, Floppy

Unit 5: (10 Lectures)
I/O Interfacing, Memory Mapped I/O, Asynchronous data transfer, Synchronous Data transfer, Baud rate, Modes of transfer (Interrupt initiated, Programmed I/O, DMA), DMA Technique, DMA Controller, DMA Transfer.

Recommended Books :

1. M.Morris Mano: *Digital Logic and Computer Design*, PHI
2. V. Rajaman: *Introduction to Computers*, PHI.
3. Morris M. Mano: *Computer System Architecture*, Prentice Hall of India
4. Malvino & Brown: *Digital Computer Electronics*, 3rd Edition
5. VK Puri: *Digital Electronics-Circuit and Systems*, Tata McGraw Hill
6. P.K.Sinha and Priti Sinha: *Computer Fundamentals*, BPB Publications(2003)

Fifth Semester

Laboratory-V

Course No: EL/V/CC/12

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 5 experiments is to be performed by the students.

1. Op-Amp 741C as an inverting and non- inverting amplifier.
2. Op-Amp 741C as adder and Subtractor.
3. Op-Amp as Voltage Comparator.
4. Op-Amp as Differential and Instrumentation Amplifier.
5. Op-Amp as Integrator and Differentiator.
6. AM Modulation and Detection
7. FM Modulation and Detection
8. Alignment of satellite receiver
9. Study of TV / Radio / Mobile Receiver.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co.

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

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Fifth Semester

Laboratory-VI

Course No: EL/V/CC/13

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 5 experiments is to be performed by the students.

1. Study of Basic Logic Gates and Universal Gates.
2. Verification of Demorgan's Theorem.
3. Study of Binary Half and Full Adder Circuit.
4. Study of Binary Half and Full Subtractor Circuits.
5. Study of Multiplexer and Demultiplexer Circuits.
6. Study of Decoder and Encoder Circuits.
7. Study of R-S, D and J-K flip flop.
8. Study of 4 - Bit Ripple Up/Down Counter.
9. Study of Left and Right Shift Registers.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co.

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

Fifth Semester

Laboratory-VI

Course No: EL/V/CC/14

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 5 experiments is to be performed by the students.

1. Amplitude modulator and Amplitude demodulator
2. Study of Sensitivity, Selectivity and Fidelity of an AM radio receiver
3. Two stage RC coupled Amplifier-Determination of mid - band gain of individual stages, overall gain and the concept of loading effect.
4. Study of Digital Comparator.
5. Study of D/A Conversion.
6. Study of A/D Conversion.
7. Study of Ring Counter and Decade Counter.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co.

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

Fifth Semester
Optional Paper I (*any one*)
Electronics Instrument
Course No: EL/V/CC/15(a)

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)
Electronic Voltmeter**:** VTVM, differential amplifier, difference amplifier type Electronic Voltmeter, DC Voltmeters with direct coupled amplifier, AC Voltmeters, RMS Voltmeters, Electronic multimeters, Electronic ohmmeters, D.C. and A.C. current measurements using electronic instruments, diode sensor based instruments, measurement of power at radio frequency.

Unit 2: (10 Lectures)
Regulated Power Supply: Use of Filters in Rectifiers; Principle of Regulation;
Regulated Power Supply using Zener and Transistors; Regulated Power Supply using ICs; short Circuit Protection; Constant Current Supply; Positive and Negative Supplies, LCR Bridges: General form of AC Bridges; Scherring Bridges; Maxwell Bridges; Anderson's Bridge, Waveform Generator: Generation of Triangular and Square Wave and Single Pulse (Monostable) by IC 741 Chip; Introduction to Signal Generator.

Unit 3: (10 Lectures)
Cathode Ray Oscilloscope: Basic CRO Operation; Block Diagram of a CRO; Cathode Ray Tube; Construction; Brief Idea about Principle of Focusing and Deflection of Electron Beam; CRT Screens; Vertical Defection Systems; Basic Elements, Attenuator, Vertical Amplifier, Delay Line; Horizontal Deflection Systems; Sweep Generator; Synchronization of Sweep, Horizontal, Horizontal Amplifier. CRO probes; Application of CRO; Dual Trace and Dual Beam CRO, Q-Meter and Frequency Counter: Basic Q- Meter Circuits; Q-Measurement Method.

Unit 4: (10 Lectures)
Transducer - General measurement system – characteristics - definition –
static & dynamic transducers – different types - resistive transducer - strain gauge – capacitive - inductive transducers-LVDT (variable inductive transducers) piezo electric transducer – temperature transducers, thermo couple, thermistors – ultrasonic temperature transducer - photoelectric transducers.

Unit 5: (10 Lectures)
Biomedical instrumentation; Introduction - origin of bioelectric signals -
Resting & Action potential–propagation, physiological transducers – active & passive transducer for medical application - diagnostic & Analytical equipments - ECG–EEG-PH meter colorimeter - therapeutic & imaging equipments - Ventilator,
defibrillators - pace makers, X–ray machine - CT –ultrasound - principles of MRI -
Laser applications.

Recommended Books:

1. Sawhney: *Electrical & Electronic Measurement & Instrumentation*, Dhanpat Rai & Sons
2. Khandpur: *Handbook of Biomedical Instrumentation* – TMH
3. Hellfrick &Cooper: *Modern Electronic Instrumentation & Measuring Technique*, PHI
4. Leslie Chronell : *Biomedical Instrumentation*

5. Morris M Mano: *Digital Design*, Prentice Hall.
6. D.R. Chaudhury: *Digital Circuits* (Vol.I and II), Platinum
7. Tocci: *Digital Systems: Principle and Application*, Prentice Hall
8. TL Floyd: *Digital Fundamentals*, Prentice Hall.
9. R.P.Jain: *Modern Digital Electronics*, Tata McGraw Hill.
9. Salibahanan : *Digital Systems*
10. H.S.Kalsi: *Electronic Instrumentation and Measurement Techniques*, Tata, McGraw Hill.

Fifth Semester
Optional Paper I (*any one*)

Solid State Electronics

Course No: EL/V/EC/15(b)

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)
Crystal Properties of Semiconductors: Semiconductor Materials, Crystal Lattices, Periodic Structures, Cubic Lattices, Planes and Directions, The Diamond Lattice, Energy Bands and Charge Carriers in Semiconductors: Bonding Forces in Solids, Energy Bands, Metals, Semiconductors, and Insulators, Direct and Indirect Semiconductors, Variation of Energy Bands with Alloy Composition.

Unit 2: (10 Lectures)
Charge Carriers in Semiconductors: Electrons and Holes, Effective Mass, Intrinsic Material, Extrinsic Material, The Fermi Level, Electron and Hole Concentrations at Equilibrium, Temperature Dependence of Carrier Concentrations, Compensation and Space Charge Neutrality,
Drift of Carriers in Electric and Magnetic Fields: Conductivity and Mobility, Drift and Resistance, Effects of Temperature and Doping on Mobility, High-Field Effects, Invariance of the Fermi Level at Equilibrium

Unit 3: (10 Lectures)
Metal-Semiconductor Contacts: Formation of Barrier, Current Transport Processes, Measurement of Barrier Height, Device Structures, Ohmic Contact, Metal-Insulator-Semiconductor Capacitors: Ideal MIS Capacitor, Silicon MOS Capacitor

Unit 4: (10 Lectures)
Tunnel Devices: Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode, IMPATT Diodes: Static and Dynamic Characteristics, Power and Efficiency,
Noise Behavior, Device Design and Performance, BARITT Diode, Transferred-Electron Device, Thyristor Characteristics, Thyristor Variations.

Unit 5: (10 Lectures)
Integrated Circuits: Scale of integration, Classification of IC by structure and function, Linear ICs, Digital ICs, IC Terminology, Fabrication of IC Components, Monolithic IC Circuits, Popular applications of ICs, MOS Integrated Circuits

Recommended Books:

1. C. Kittel: *Introduction to Solid State Physics*, 8th Edition, John Wiley and Sons, New York, (1996)
2. S.O. Pillai: *Solid State Physics*, New Age International (2001).
3. BG Streetman and SK Banerjee, *Solid State Electronic Devices*, Prentice Hall of India (2006)
4. D.A. Newman, *Semiconductor Physics and Devices*, 3rd Ed. Tata McGraw Hill Co., (2007).
5. S.M. Sze: *Physics of Semiconductor Devices*, 2nd Ed, John Wiley & Sons (2003).
6. Gupta, Kumar, Sharma: *Handbook of Electronics*, Pragati Prakashan,Meerut
7. B.L. Theraja: *Basic Electronics (Solid State)*, S. Chand & Co.

Fifth Semester

Project – I

Course No: EL/V/CC/16

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

Project work based on Electronics to be assigned/ supervised by teachers, which is to be completed before End Semester examination.

Sixth Semester

Analog and Digital Electronics

Course No: EL/6/CC/17

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)
Wave shaping in R.C. Circuit, Response of an R-C Circuit to different voltage wave forms, effect of source output resistance, and variation of output waveform with different source frequency.

Unit 2: (10 Lectures)
Diode switching Circuit, Zener diode for wave shaping, UJT transistor circuit as a pulse source, circuit with SCR, input output circuits of a transistor for switching and pulse formation equivalent circuit to represent switching, R-C, Circuit.

Unit 3 : (10 Lectures)
De – Morgan's Second Theorem : Bubbled or gate, more than two inputs.
Exclusive-OR Gates: Two inputs, logic symbol and Boolean sign, four inputs, Any number of inputs, parity, Boolean Algebra and Karnaugh Maps: Booleans relations, sum-of-product Method, Algebraic simplification, Karnaugh Maps, Pairs, Karnaugh simplification, don't care conditions.

Unit 4: (10 Lectures)
Main Logic families: Saturated and Non-saturted logic circuits, Characteristics of Logic families, RTL, DTL, TTL Circuits, ECL, I2L Circuits, MOS Family, PMOS Circuit, NMOS Circuit and CMOS Circuit.

Unit 5: (10 Lectures)
The Controlled Inverter Exclusive-NOR Gates, TTL-Circuit: Introduction to digital integrated circuits, 7400 devices, standard TTL, TTL characteristics, Floating inputs compatibility, standard loading Rules, TTL overview, buffer-driver, Encoders, Decoder, Schmitt Triggers, And-OR Invert Gates, TTL devices, Expandable AND-OR Invert Gates, Expanders, open-collector gates, Multiplexer, Data selection, Boolean Function generator.

Recommended Books :

1. G.N. Navneeth, V M. Gokhale, R.G. Kale: *Digital and Analog Technique*, Kitab Mahal
2. John D. Ryder: *Electronics Fundamentals and Application*, PHI (5^{th} Edition)
3. Gupta and Kumar: *Handbook of Electronics*, Pragati Prakashan, Meerut.
4. V.K.Mehta: *Principles of Electronics*, S.Chand & Co.
5. Malvino: *Digital Computer Electronics*, PHI
7. M. Morris Mano: *Digital Logic and Computer Design*, PHI
8. V.Rajaraman: *Introduction to Computers*, PHI

Sixth Semester

Computer Organization and Microprocessor

Course No: EL/VI/CC/18

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1: (10 Lectures)
CPU Organization: ALU Organization, Floating point ALU, Control Unit, Operand data type, Register Organization, Micro-operation, Control Memory Organization, Register transfer operation, Instruction Sequencing, Instruction Cycle, Machine Cycle, Process, Parallel Processing, Multiprocessing, Multi-threading, Types of Interrupts.

Unit 2: (10 Lectures)
Processor : The Central Processing Unit (CPU) (The Control Unit, The Arithmetic Logic Unit (ALU), Instruction Set, Registers, Processor Speed, Types of Processors), The Main Memory: Main Memory Organization, Main Memory Capacity, RAM, ROM, PROM and EPROM, Cache Memory, Memory Hierarchy, Memory Mapping of cache memory, Virtual Memory

Unit 3 : (10 Lectures)
Memory Organization: Parallel In – Parallel Out Register (Buffer register & Controlled buffer register), Shift Registers, Ring Counter, Asynchronous Counter (Ripple Counter), Synchronous Counters, Controlled synchronous Counter, Three state switch, Three state buffer registers, Paging, Page file, Swapping technique, Memory Addressing schemes, Stack Memory Organization.

Unit 4: (10 Lectures)
Microprocessors: History of development, Introduction to Intel 8085 microprocessor, block diagram of Intel 8085A, Timing and Control unit, Registers, Data and Address bus, Pin configuration, Intel 8085 instructions, Opcode and Operands, Instruction word size, Timing and Control signals, Instruction and Data flow, system timing diagram, Instruction set for Intel 8085, Addressing modes, Basic 8085 instructions

Unit 5: (10 Lectures)
Computer Languages: Machine Language, Advantages and Limitations, Assembly Language, Assembler, Advantages over Machine Language, Limitations of Assembly Language, High-Level Language: Compiler, Linker, Interpreter, Advantages and Limitations; Structure/modular programming, Object-Oriented Programming Languages, High-Level Languages, Characteristics of a Good Programming Language, Subprogram.

Recommended Books :

1. Morris M. Mano: *Computer System Architecture*, Prentice Hall of India
2. Malvino & Brown: *Digital Computer Electronics*, Tata McGraw Hill, New Delhi, Third Edition
3. Douglas V. Hall: *Microprocessors and Interfacing – Programming and Hardware*, Tata McGraw Hill, New Delhi.
4. A.B. Bhattacharya: *Electronic Principles and Applications*, New Central Book Agency, Kolkata (2006)

Sixth Semester

Opto-electronics Devices

Course No: EL/VI/CC/19

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1 : (10 Lectures)
Optical properties of semiconductors: Dipolar elements in direct gap semiconductors, Optical susceptibility of a semiconductor, Absorption and spontaneous emission, Conditions for optical amplification in semiconductors, Optical index of semiconductors

Unit 2: (10 Lectures)
Semiconductor quantum wells: Envelope function formalism, The quantum well, Density of states and statistics in a quantum well, Optical inter band transitions in a quantum well, Hole states in the valence bands, Optical transitions between the valence and conduction bands, Optical absorption and angle of incidence, Quantum wires and boxes (basic ideas).

Unit 3 : (10 Lectures)
Photodetectors: Current and Voltage in an illuminated Junction, Gain, Bandwidth, and Signal-to-Noise Ratio of Photodetectors, Light-Emitting Diodes, Light-Emitting Materials, LED Displays, Photoresistors, Photodiodes, Solar Cells, Phototransistor, Photo-FET

Unit 4 : (10 Lectures)
Laser: Einstein's A and B coefficients, Optical pumping, Population inversion, Optical resonators, Ruby Laser, High power laser, Raman laser, applications of lasers

Unit 5 : (10 Lectures)
Semiconductor Lasers: Population Inversion at a Junction, Emission Spectra for p-n Junction Lasers, The Basic Semiconductor Laser, Heterojunction Lasers, Materials for Semiconductor

Recommended Books :

1. BG Streetman and SK Banerjee: *Solid State Electronic Devices*, Prentice Hall of India (2006)
2. D.A. Newman: *Semiconductor Physics and Devices*, 3rd Ed. Tata McGraw Hill Co., (2007).
3. S.M. Sze: *Physics of Semiconductor Devices*, 2nd Ed, John Wiley & Sons (2003).
4. Gupta, Kumar, Sharma: *Handbook of Electronics*, Pragati Prakashan,Meerut
5. Emmanuel Rosencher, Borge Vinter: *Optoelectronics*, Cambridge University Press (2004)
6. A.B. Bhattacharya: *Electronic Principles and Applications*, New Central Book Agency, Kolkata (2006)

Sixth Semester

Laboratory-VIII

Course No: EL/VI/CC/20

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. To draw V-I characteristics for forward bias and calculation of impedance.
2. To study load and line regulation of a Full Wave power supply.
3. To study ripple factor of Half-Wave and Full-Wave rectifier with Π type filters; to study waveform on CRO.
4. To study forward bias and reverse bias characteristics of a Zener diode.
5. To study load and line regulation of a Zener diode as voltage regulator.
6. To study load regulation of power supply with Zener or IC as voltage regulator.
7. Largest & smallest from a set of numbers
8. Sorting (Ascending & descending)

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co..

Note: *Experiments may be added or deleted subject to the availability of facilities in the College*.

Sixth Semester

Laboratory-IX

Course No: EL/VI/CC/21

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. Study of commercially available power amplifier(IC).
2. Study of effect of negative feedback on frequency response and gain of amplifier.
3. Design and test FET amplifier.
4. Design and testing of Wien bridge oscillator.
5. To study percentage regulation and ripple factor of stabilized variable power supply.
6. Using Astable Multivibrator:
   a) To generate square wave and to see waveform on CRO.
   b) To measure the frequency of square wave on CRO.
   c) To study the effect of changing base resistor or coupling capacitor on the frequency of the square wave.
7. Using Monostable Multivibrator:
   a) To generate square wave and to see waveform on CRO.
   b) To measure the frequency of square wave on CRO.
   c) To study the effect of changing base resistor or coupling capacitor on the frequency of the square wave.
8. Using Bistable Multivibrator:
   a) To generate square wave and to see waveform on CRO.
   b) To measure the frequency of square wave on CRO.
   c) To study the effect of changing base resistor or coupling capacitor on the frequency of the square wave.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co..

Note: *Experiments may be added or deleted subject to the availability of facilities in the College*.

Sixth Semester

Laboratory-X

Course No: EL/VI/CC/22

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

One (1) experiment is to be performed within 3 hours in the End Semester examination. A minimum of 4 experiments is to be performed by the students.

1. BCD addition & subtraction
2. Up / down counter
3. To observe the output wave shape of differentiating and integrating circuit on CRO.
4. Measurement of phase and frequency with CRO.
5. Design and testing of Colpitt's oscillator.
6. Design and testing of Phase shift oscillator.

Recommended Books :

1. S.S. Srivastava and M. Gupta: *Experiments in Electronics*, S. Chand & Co.
2. College Laboratory Manuals and Semiconductor Manuals.
3. C.L.Arora: *B.Sc. Practical Physics*, S. Chand &Co.
4. H.Singh: *B.Sc. Practical Physics*, S. Chand &Co..

Note: *Experiments may be added or deleted subject to the availability of facilities in the College.*

Sixth Semester
Optional Paper II (*any one*)

Power Electronic Devices

Course No: EL/VI/CC/23(a)

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1 : (10 Lectures)
Introduction to power electronic system, Power electronic converter, Requirements of Power switches, Ideal switch, Classifications of power electronic devices, Power Semiconductor Devices: Diodes, Schottky diodes, Zener diodes, Tunnel Diodes, UJT, Diacs, Photodiodes, LEDs

Unit 2 : (10 Lectures)
Thyristors: Silicon Controlled Rectifiers, Triggering, Thyristor gate characteristics, Turn off, Ratings and Protection of Thyristor, Triac, Light Activated SCR, Asymmetrical SCR

Unit 3 : (10 Lectures)
AC Voltage Regulators: Principle of Phase Controlled Switching, Full wave with R Load, Harmonic analysis of converter, AC Voltage Regulator with R Load, Full wave with RL Load, AC Regulators with pure inductors, Three phase Regulators, Electronic Tap Changer, AC Chopper Regulator.

Unit 4 : (10 Lectures)
Phase Controlled Converter(AC to DC): Converter rectifier, Half wave and Full wave converter (uncontrolled & controlled), Analysis of converters, Three phase and Multiple converters, DC to DC Convereter: DC Choppers, Forced and Load Commutated Chopper, Linear DC power supplies, DC to DC Converter (without isolation & with isolation)

Unit 5 : (10 Lectures)
Inverters: Classification, Thyristor based Inverter, Single phase- Half bridge and Full bridge inverters, Pulse width modulated inverters, Three phase inverters, Current source inverters, UPS and SMPS: Disturbances in Commercial power supply, Uninterrupted Power Supplies, Storage batteries, Switch Mode Power Supplies, Power Factor correctors.

Recommended Books:

1. M.S. Jamil Ashgar: *Power Electronics*, PHI Learning(P) Ltd. (2008)
2. V.K.Mehta: *Principles of Electronics*, S.Chand & Co.
3.B.L. Theraja: *Basic Electronics (Solid State)*, S. Chand & Co**.**

Sixth Semester
Optional Paper II (*any one*)

Fiber Optic and Electronic Communication

Course No: EL/VI/CC/23(b)

Marks Scale: 100 marks **Credit: 4**
(End Sem.: 75+ Int.: 25) **(3- 1- 0)**

Unit 1 : (10 Lectures)
Optical fiber communication: Optical fibers – structures & wave guiding fundamentals, fiber types – step index fiber structure - ray optics representation – wave equation for step index fiber, graded index structure - modes in graded index fibers optical communication & block diagram – overview attenuation – attenuation units - scattering & absorption losses – core & cladding losses – fiber materials & properties .

Unit 2: (10 Lectures)
Television Broadcasting: Elements of television systems – scanning composite video signals – camera tubes – different types – principles of operation –picture tubes – vestigial side band - TV broadcasting –TV receivers –TV transmitters –sound & picture signal transmission - TV receivers – color Television, color TV camera–luminance signal - color picture tubes -Basic principle of color picture transmission & reception – concept of PAL systems.

Unit 3 : (10 Lectures)
Optical Resonators: Modes of a rectangular cavity and the open planar resonator, Quality, Ultimate linewidth of laser, Transverse and Longitudinal mode selection, Q switching, Mode locking, Confocal resonator, Planar resonator, General spherical resonator.
Noise – Frequency domain representation – source of noise –Thermal noise– shot noise - concept of noise band – width, noise figure - noise temperature – concept of information entropy – information rate – Shannon's thermo – signal to noise ratio

Unit 4 : (10 Lectures)
Noise – Frequency domain representation – source of noise –Thermal noise– shot noise - concept of noise band – width, noise figure - noise temperature – concept of information entropy – information rate – Shannon's thermo – signal to noise ratio

Unit 5 : (10 Lectures)
Converters: A/D and D/A Converters, Potentiometric A/D converter, Voltage to time A/D converter, Voltage to Frequency converter, Integration and Differentiation Using R.C. Circuits- Low Pass A. C. filter as an integrator, High Pass R. C. filter as an differentiator, clipper circuits, clamper circuits

Recommended Books:
1. Kennedy: *Electronic Communication Systems*
2. R.R Gulathi: *Monochrome of Color Television*
3. B.C. Agarwal: *Satellite Communication*
4. Keiser : *Optical Fiber Communication.*
5. A.K. Sawhney: *A Course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Sons: (latest edition)
6. K.Thyagarajan and A.K.Ghatak: *Lasers: Theory and Applications*, Macmillan India (1997)

Sixth Semester

Project – II

Course No: EL/VI/CC/24

Marks Scale: 100 marks **Credit: 2**
(End Sem.: 75+ Int.: 25) **(0- 0- 2)**

Project work based on Electronics to be assigned/ supervised by teachers, which is to be completed before Final Semester examination.