ST. THOMAS' COLLEGE (AUTONOMOUS)
THRISSUR, KERALA – 680001

Affiliated to University of Calicut
Nationally reaccredited with 'A' Grade

CURRICULUM AND SYLLABUS
FOR
UNDERGRADUATE PROGRAMME IN
ELECTRONICS

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM
(w.e.f. 2020 Admission onwards)

1. Title of the Programme

This programme shall be called **BACHELOR OF SCIENCE IN ELECTRONICS** under Choice Based Credit Semester System for Undergraduate (UG) Curriculum -2020.

2. Highlights of the Programme

2.1 Aim and objective:

Emerging trends and stimulating developments in the field of science, increasing opportunities and demands at workplace have made it imperative that the undergraduate science courses be redesigned to cater to the professional aspirations of the students. The present world is in need of professionals who are experts in the respective fields and hence restructuring of any science course should possess components as catalyst to achieve the goals. The boundaries between different domains of science are disappearing and more exciting developments are being reported from areas at the crossing point of disciplines. In response to these changes taking place in society, St. Thomas' college affiliated to University of Calicut has embarked on a major restructuring exercise for its science courses by introducing B.Sc courses in alternate pattern.

B.Sc. ELECTRONICS Programme is one such course in science stream under Choice Based Credit and Semester System. This restructured undergraduate science course provides students with a broad exposure to the critical domains of sciences with adequate background of mathematical sciences. The tools and techniques of computer applications, industry automation, electronics and analytical techniques have a major role in the curriculum. The audit courses offered ensure adequate exposure to global and local concerns that explore them any aspects of societal relevance and environmental awareness. It also gives opportunity to explore the multi-disciplinary nature of science.

This course is to equip 10+2 (Science Group) students with the theory of Electronic Science and also to train them in achieving technical expertise in Electronic Application. We aim to provide a solid foundation in all aspects of Electronics and to show a broad spectrum of modern trends in the subject and also to develop experimental, computational and mathematical skills of students. The syllabi are framed in such a way that it generates graduates of the caliber sought by industries and public service as well as academic teachers and researchers of the future.

2.2 Programme Outcomes:

At the end of an Undergraduate Program at St. Thomas College (Autonomous), a student would have obtained the following:

PO1:	**Critical Thinking:** Ability to take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2:	**Effective Communication:** Ability to speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
PO3:	**Effective Citizenship:** Ability to demonstrate empathetic social concern and equity-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO4:	**Environment and Sustainability:** Ability to understand the issues of environmental contexts and sustainable development.
PO5:	**Ethical Living:** Ability to recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6:	**Social Interaction:** Ability to elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO7:	**Problem Solving and Analytical Skills:** Ability to think rationally, analyze situations and solve problems adequately.

2.3 Programme Specific Outcomes:

PSO 1.	**Understand the principles of electronic devices, digital and analog circuits, microwave and communication systems.**
PSO 2.	**Understand the processes in DSP and VLSI Technology.**
PSO 3.	**Understand various methods in control systems, network theory and electromagnetic theory.**
PSO 4.	**Develop the skills in computer programming, computer networking and design of embedded systems.**

2.4 Higher Studies: These students can continue to take up courses such as M.Sc. Electronics, M.Sc. Instrumentation Technology, MCA, MBA, etc.

2.5 Eligibility: Candidate of admission to the B.Sc. Electronics Programme should have passed the Higher secondary / Technical higher secondary / Vocational Higher secondary examinations of Govt. of Kerala or CBSE or IELE or any other examinations recognized as equivalent there to by the University of Calicut with Mathematics or Electronics or Computer Science or Computer Applications as one of the optional subjects.

2.6 Duration of the Programme: Duration of the programme shall be 6 semesters. Each semester should have 90 instructional days with 5 hours of instruction per day 5-days a week system. The college will conduct semester-end examinations.

Programme Structure

Semester	Course No.	Courses	Course Code	Course Title	Contact Hours			Credits
					Theory	Lab	Total	
Semester I	1	Common Course 1		English course I	5	-	5	4
	2	Common Course 2		English course II	4	-	4	3
	3	Common Course 3		Additional Language course I	5	-	5	4
	4	**Core Course 1**	**ELE1B01**	**Basic Electronics and Network Theorems**	1	2	3	2
	5	1st Complimentary Course 1		Mathematics – I	4	-	4	3
	6	2nd Complimentary Course 1		Optional – 1	4		4	2
Total							**25**	**18**
Semester II	1	Common Course 4		English Course III	5	-	5	4
	2	Common Course 5		English Course IV	4	-	4	3
	3	Common Course 6		Additional Language course III	5	-	5	4
	4	**Core Course 2**	**ELE2B02**	**Electronic Circuits**	**1**	**2**	**3**	**2**
	5	**Core Lab 1 (Exam)**	**ELE2B03**	**Basic Electronics and Network Theorems Lab**	1st Sem. Lab Exam.			2
	6	**Core Lab 2 (Exam)**	**ELE2B04**	**Electronic Circuits Lab**	2nd Sem. Lab Exam			2
	7	1st Complimentary Course 2		Mathematics -II	4	-	4	3
	8	2nd Complimentary Course 2		Optional - 2	4	-	4	2
Total							**25**	**22**

Semester	Course No.	Courses	Course Code	Course Title	Contact Hours			Credits
					Theory	Lab	Total	
Semester III	1	General Course-I (Common to LRP group of boards)	**A11**	Python programming	4	-	4	4
	2	General Course-II (Common to LRP group of boards)	**A12**	Data Communication & Optical Fibers	4	-	4	4
	3	**Core Course 3**	**ELE3B05**	**Digital Electronics**	4	2	6	3
	4	**Core Lab 5**	**ELE4B09**	**Skill Development Lab** (I)	-	1	1	-
	5	1st Complimentary Course 3		Mathematics –III	5	-	5	3
	6	2nd Complimentary Course 3		Optional -3	5	-	5	2
Total							**25**	**16**
Semester IV	1	General Course –III (Common to LRP group of boards)	**A13**	Microprocessors – Architecture and Programming	4	-	4	4
	2	General Course –IV (Common to LRP group of boards)	**A14**	Sensors and Transducers	4	-	4	4
	3	**Core Course 4**	**ELE4B06**	**Analog Integrated Circuits**	4	2	6	3
	4	**Core Lab 3 (Exam)**	**ELE4B07**	**Digital Electronics Lab**	3rd Sem. Lab exam			2
	5	**Core Lab 4 (Exam)**	**ELE4B08**	**Analog Integrated Circuits Lab**	4th Sem. Lab exam			2
	6	**Core Lab 5 (3 rd and 4th Sem. Lab exam + Mini Project)**	**ELE4B09**	**Skill Development Lab** (II)	-	1	1	1
	7	1st Complimentary Course 4		Mathematics-IV	5		5	3
	8	2nd Complimentary Course 4		Optional- 4	3	0	3	2
	9	2nd Complimentary Course practical		Optional- practical	0	2	2	4
Total							**25**	**25**

Semester	Course No.	Courses	Course Code	Course Title	Contact Hours			Credits
					Theory	Lab	Total	
Semester V	1	**Core Course 5**	**ELE5B10**	**Electromagnetic Theory**	4	-	4	4
	2	**Core Course 6**	**ELE5B11**	**Microcontroller & Interfacing**	4	3	7	3
	3	**Core Course 7**	**ELE5B12**	**Network Theory**	4	-	4	4
	4	**Open Course (Choose a Course from the List)**	**ELE5D01**	**Computer Hardware**	3	-	3	3
			ELE5D02	**Digital Fundamentals**				
			ELE5D03	**Electronics Fundamentals**				
	5	**Core Lab 6**		**Microprocessor & Microcontroller programming and interfacing Lab** (Microprocessor programming and interfacing Lab) (8085 and raspberry pi)	-	3	3	-
	6	**Core Lab 9**	**ELE6B20**	**Industrial Visit &Project Work**	-	4	4	-
Total							**25**	**14**
Semester VI	1	**Core Course 8**	**ELE6B13**	**Communication System**	4	3	7	4
	2	**Core Course 9**	**ELE6B14**	**Principles of DSP**	4	3	7	4
	3	**Core Course 10**	**ELE6B15**	**Microwave Theory and Techniques**	4	-	4	4
	4	**Core Course (Elective)**	**Choose a Course**		3	-	3	3
			ELE6B16a	**Optical Communication**				
			ELE6B16b	**Industrial Electronics**				
			ELE6B16c	**Control Systems**				
			ELE6B16d	**Verilog & FPGA Based System Design**				
	5	**Core Lab 6 (Exam)**	**ELE6B17**	**Microprocessor & Microcontroller programming and interfacing Lab** (8085,raspberry pi,8051and Arduino)	5th sem. Lab Exam			3
	6	**Core Lab 7 (Exam)**	**ELE6B18**	**Communication system Lab**	6th sem. Lab Exam			2
	7	**Core Lab 8 (Exam)**	**ELE6B19**	**Principles of DSP Lab**	6th sem. Lab Exam			2
	8	**Core Lab 9 (Exam)**	**ELE6B20**	**Industrial Visit** (Report)(1 credit)**& Project Work** (2 credit)(Viva Voce)	-	4	4	3
Total							**25**	**25**

Core Labs

Practical examinations shall be conducted in the even semester (II, IV, and VI)

SEMESTER II	**Core Lab 1**	**ELE2B03**	**Basic Electronics and Network Theorems Lab**
	Core Lab 2	**ELE2B04**	**Electronic Circuits Lab**
SEMESTER IV	**Core Lab 3**	**ELE4B07**	**Digital Electronics Lab**
	Core Lab 4	**ELE4B08**	**Analog Integrated Circuits Lab**
	Core Lab 5	**ELE4B09**	**Skill Development Lab**
SEMESTER VI	**Core Lab 6**	**ELE6B17**	**Microprocessor & Microcontroller programming and Interfacing Lab**
	Core Lab 7	**ELE6B18**	**Communication system Lab**
	Core Lab 8	**ELE6B19**	**Principles of DSP Lab**
	Core Lab 9	**ELE6B20**	**Industrial Visit (Report)& Project Work (Viva Voce)**

Course Evaluation (Theory)

The evaluation scheme for each course shall contain two parts

1) Internal assessment 2) External Evaluation

20% weight shall be given to the internal assessment. The remaining 80% weight shall be for the external evaluation.

Internal Assessment

20% of the total marks in each course are for internal examinations. The internal assessment shall be based on a predetermined transparent system involving written tests, Class room participation based on attendance in respect of theory courses and lab involvement/records attendance in respect of Practical Courses.

Components with percentage of marks of Internal Evaluation of Theory Courses are:

Test paper	40%
Assignment	20%
Seminar	20%
Class room participation based on attendance 20%.	

For the test paper marks, two test papers should be conducted. The mark should be calculated by taking the average of two exams, (In accordance with regulations of the college).There shall not be any chance for improvement for internal marks.

The Split up of marks for Test paper and Class Room Participation (CRP) for internal evaluation are as follows.

Split up of marks for Test paper

Split up of marks for Test Paper	Out of 8 (Maximum internal marks is 20)	Out of 6 (Maximum internal marks is 15)
Less than 35%	1	1
35%- 45%	2	2
45% - 55%	3	3
55% - 65%	4	4
65% -85%	6	5
85% -100%	8	6

Split up of marks for Class Room Participation

Range of CRP	Out of 4 (Maximum internal marks is 20)	Out of 3 (Maximum internal marks is 15)
50% ≤CRP <75%	1	1
75% ≤CRP <85%	2	2
85 % and above	4	3

Course Evaluation (Practical)

The practical examinations for the core courses shall be conducted by the college at the end of semesters 2, 4 and 6 respectively. The examiners shall be selected from a panel of experts prepared by the college. For each examination centre there shall be one external examiner (Chief) and one internal examiner (Additional).

For the evaluation of practical examination 20% weightage is given for internal assessment and 80% weightage is given for End semester exam. Record- 60%, lab involvement- 40% as far as internal is concerned. (If a fraction appears in internal marks, nearest whole number is to be taken).

Course Evaluation (Projects)

1. Evaluation of the Project Report shall be done under Mark System.
2. The evaluation of the project will be done at two stages:

a. Internal Assessment (supervising teachers will assess the project and award internal Marks)

b. External evaluation (by external examiner)

3. Marks secured for the project will be awarded to candidates, combining the internal and external Marks

4. The internal to external components is to be taken in the ratio 1:4. Assessment of different components may be taken as below.

Internal (20%)		**External (80%)**	
Components	% of Marks	*Components*	% of Marks
Punctuality and Log Book	20	Relevance of the Topic, Statement of Objectives, Methodology (Reference/ Bibliography)	20
Skill of doing project work	20	Presentation, Quality of Analysis/Use of Statistical tools, Findings and recommendations	30
Scheme/Organization of Report	30		
Viva-Voce	30	Viva-Voce	50

- External Examiners will be appointed from the list of VI semester Board of Examiners in consultation with the Chairperson of the Board.
- The Chairman of the VIth semester examination should form and coordinate the evaluation teams and their work.
- Internal Assessment should be completed 2 weeks before the last working day of semester.
- In the case of courses with practical examination, project evaluation shall be done along with practical examinations.
- Chairman, Board of Examinations, may at his discretion, on urgent requirements, make certain exception in the guidelines for the smooth conduct of the evaluation of project.

PASS CONDITIONS

- Submission of the Project Report and presence of the student for viva are compulsory for internal evaluation. No marks shall be awarded to a candidate if she/ he fail to submit the Project Report for external evaluation.
- The student should get a minimum P Grade in aggregate of External and Internal.
- There shall be no improvement chance for the Marks obtained in the Project Report.

- In the extent of student failing to obtain a minimum of Pass Grade, the project work may be re-done and a new internal mark may be submitted by the Parent Department. External examination may be conducted along with the subsequent batch.

Semester	Credit for					Total	Hours for Core			Hours for			Total Hours per week
	Core	Complimentary	Eng.	SL	General		Theory	Lab	Total	Eng	SL	Complimentar	
I	2	5	7	4		**18**	1	2	**3**	9	5	8	**25**
II	6	5	7	4		**22**	1	2	**3**	9	5	8	**25**
III	3	5			8	**16**	12	3	**15**	-	-	10	**25**
IV	8	9			8	**25**	12	3	**15**	-	-	10	**25**
V	14					**14**	15	10	**25**	-	-	-	**25**
VI	25					**25**	15	10	**25**	-	-	-	**25**
Total	58*	24	14	8	16	**120**							

* *(Including Open Course)*

Work load (Core)					
Semester	**Theory**	**Lab**	**Total**	**Odd Sem. Total**	**Even Sem. Total**
I	1	2x2	5	58	-
III	12	3x2	18		
V	15	10x2	35		
II	1	2x2	5	-	58
IV	12	3x2	18		
VI	15	10x2	35		

Question paper pattern :–

The external question papers may be of uniform pattern with 80/60 marks. The courses with 2/3 credits will have an external examination of 2 hours duration with 60 marks and courses with 4/5 credits will have an external examination of 2.5 hours duration with 80 marks.

Question paper type 1:

Scheme of Examinations:

The external QP with 80 marks and Internal examination is of 20 marks. Duration of each external examination is 2.5 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A&B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2 marks each - 15 questions **Ceiling - 25**

Section B

Paragraph/ Problem type carries 5 marks each - 8 questions **Ceiling - 35**

Section C

Essay type carries 10 marks (2 out of 4) **2 X 10=20**

Question paper type 2:

Scheme of Examinations:

The external QP with 60 marks and Internal examination is of 15 marks. Duration of each external examination is 2 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A& B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2 marks each - 12 questions **Ceiling - 20**

Section B

Paragraph/ Problem type carries 5 marks each - 7 questions **Ceiling - 30**

Section C

Essay type carries 10 marks (1 out of 2) **1 X 10=10**

Ability Enhancement courses/Audit courses:

These are courses which are mandatory for a programme but not counted for the calculation of SGPA or CGPA. There shall be one Audit course each in the first four semesters. These courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At

the end of each semester there shall be examination conducted by the college from a pool of questions (Question Bank) set by the College/University. The students can also attain these credits through online courses like SWAYAM, MOOC etc (optional). The list of passed students must be sent to the University from the colleges at least before the fifth semester examination. The lists of courses in each semester with credits are given below.

Course	Credit	Semester
Environment Studies	4	1
Disaster Management	4	2
*Human Rights/Intellectual Property Rights/ Consumer Protection	4	3
*Gender Studies/Gerontology	4	4

** Colleges can opt any one of the courses.*

Evaluation of Audit courses:

The examination shall be conducted by the college itself from the Question Bank prepared by the College/University. The Question paper shall be of 100 marks of 3 hour duration.

Extra credit Activities:

Extra credits are mandatory for the programme. Extra credits will be awarded to students who participate in activities like NCC, NSS and Swatch Bharath. Those students who could not join in any of the above activities have to undergo Calicut University Social Service Programme (CUSSP). Extra credits are not counted for SGPA or CGPA.

FIRST SEMESTER				
Course code	**ELE1B01**			
Name of the course	**BASIC ELECTRONICS AND NETWORK THEOREMS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
01	**Core Course**	**2:0:0**	**1**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Understand the principles of passive electronic devices**	**6**	**U**	**F**	**PSO 1**	**PO 1**
CO2	**Understand the structure and principles of semiconductor devices**	**18**	**U**	**F**	**PSO 1**	**PO 1**
CO3	**Illustrate series and parallel resistive circuits**	**3**	**Ap**	**C**	**PSO 1**	**PO 7**
CO4	**Understand different network theorems**	**3**	**U**	**C**	**PSO 1**	**PO 7**

Module I **(6 Hrs)**

Introduction to Electronics - Definition, applications, Electric field, Potential, Potential difference, Electric current, Relation between charge and current, Concept of Voltage and Current Sources, AC and DC. Concepts of open and short circuit, Passive components –R,C,L- Types, construction, symbols, specifications, Units, Colour coding, Testing, Electrical Resistance, Factors affecting Resistance, Temperature coefficient, Resistivity, Load Resistance and load current, Power dissipation, Ohm's law.

Module II **(6 Hrs)**

Resistance in series and parallel, Kirchhoff's Voltage Law (KVL), Kirchhoff's Current Law (KCL), Principle of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem, Two Port Networks: h, y and z parameters.

Module III **(9 Hrs)**

Review of Structure of solids - Semiconductor materials, Intrinsic Semiconductors, Extrinsic Semiconductors –Semiconductor Parameters - Intrinsic concentration, Mobility, Conductivity, Mass action law, Energy gap, Drift and Diffusion Current, Semiconductor Diodes – PN junction, Junction Theory, Depletion layer, Barrier potential ,forward and reverse biasing VI characteristics of PN junction diode, Ideal diode, Static and Dynamic Resistance , Diode current equation, Diode notations, diode testing, Special Diodes - Construction, Characteristics and applications of Zener diode, LED.

Module IV **(9 Hrs)**

Bipolar Junction Transistors–Types, Construction, Operation, Common Base configuration-input and output characteristics, Common Emitter configuration- input and output characteristics, Common collector configuration, Limits of operation. Field Effect Transistors – introduction, Types, Construction and Characteristics of JFET, Transfer Characteristics, Metal Oxide Semiconductor Field Effect Transistors – Depletion Type, Enhancement Type.UJT, SCR, - Construction, operation, characteristics and applications.

Self Study topics:

Triac, diac- Construction, operation , characteristics and applications.

Text Books

1. NN Bhargava, DC Kulshreshta, SC Gupta “Basic Electronics and Linear Circuits” Tata McGraw Hill Publishing Company LTD
2. R.S. Sedha “A text book of applied Electronics” S Chand and Company LTD
5. Robert L. Boylestad ,Louis Nashelsky “Electronic Devices and Circuit Theory”,10th edition, Pearson
6. Circuits and Networks – A. Sudhakar, S.P.Shyammohan, TMH Publications

References

1. Jacob Millman, Christos C Halkias, satyabratajit , 2nd edition “Electronic Devices and circuits”
2. B.L. Theraja, “Electrical and Electronic Engineering”, S Chand and Company LTD
3. R.K. Puri , V.K. Babbar, “Solid state physics and Electronics” , S Chand and Company LTD

4. V.K Mehta, "Principles of Electronics", S Chand and Company LTD Tata McGraw Hill Education pvt. Ltd.

5. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill(2004)

6. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill.(2005)

FIRST SEMESTER				
Course code	**ELE2B03**			
Name of the course	**BASIC ELECTRONICS AND NETWORK THEOREMS LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
01	**Core Lab**	**0:0:2**	**2**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Familiarize various electronic components, measuring and testing instruments.**	**4**	**U**	**P**	**PSO 1**	**PO 7**
CO2	**Interpret the voltage, current and resistance of various resistor networks.**	**6**	**U**	**P**	**PSO 1**	**PO 7**
CO3	**Analyse Kirchoffs laws**	**4**	**An**	**P**	**PSO 1**	**PO 1**
CO4	**Understand the characteristics of various active components.**	**16**	**U**	**P**	**PSO 1**	**PO 4**

List of experiments:

1. Familiarization of various measuring and testing equipments and power sources – Voltmeter, Ammeter, Multimeter, LCR meter, CRO, Function Generator, etc.
2. Familiarization and testing of passive and active components.
3. Verification of equivalent resistance of series and parallel resistor networks, Voltage division and Current division Rules

4. Verification of KVL and KCL
5. Diode Characteristics (Si, Ge, LED and Zener)
6. Common base transistor characteristics
7. Common emitter transistor characteristics
8. FET characteristics
9. UJT characteristics
10. SCR characteristics

References

1. N N Bhargava, D C Kulshreshta, SC Gupta "Basic Electronics and Linear Circuits" Tata McGraw-Hill Publishing Company LTD

2. Jacob millman, Christos C halkias, satyabratajit, 2nd edition "Electronic Devices and circuits", Tata McGraw Hill Education pvt. Ltd.

SECOND SEMESTER				
Course code	**ELE2B02**			
Name of the course	**ELECTRONIC CIRCUITS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
02	**Core Course**	**2:0:0**	**1**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Understand rectifier, filter and voltage regulator circuits.**	**8**	**U**	**F**	**PSO 1**	**PO 1**
CO2	**Distinguish various wave shaping circuits**	**4**	**U**	**F**	**PSO 1**	**PO 1**
CO3	**Determine transistor biasing methods and various amplifier circuits.**	**12**	**Ap**	**F**	**PSO 1**	**PO 7**
CO4	**Understand the concepts of various oscillator circuits.**	**6**	**U**	**C**	**PSO 1**	**PO 1**

Module I **(12 Hrs)**

Rectifiers – Half wave, full wave, bridge – average value, RMS value, PIV, Ripple factor, efficiency, Comparison of rectifiers. Filters - C, L, LC Regulators – Zener diode voltage Regulator, Series voltage Regulator, fixed voltage dc power supply circuit, Line and Load Regulation. Wave shaping Circuits -Clipping circuits – Positive, Negative, Biased, Combination. Clamping Circuits – Positive, Negative, Biased, Combination. RC Integrator and Low Pass Filter, RC Differentiator and High Pass Filter.

Module II **(6 Hrs)**

Transistor Biasing – operating point, DC Load Line, Fixed bias, Emitter bias, Voltage Divider bias, Collector feedback, Emitter follower, bias stabilization, BJT AC Analysis – Amplification in the ac domain, BJT modelling, The Hybrid equivalent model – Amplifier analysis, cascaded system, RC coupled BJT amplifier, tuned amplifier.

Module III **(6 Hrs)**

Frequency Response –Logarithm, decibel, general frequency consideration, gain bandwidth product, Concept of power amplifiers – class A, class B, class C – operation – types of distortions in power amplifiers, Complementary Symmetry Push-Pull Amplifier. Feedback - Concepts, types, effect on gain, input impedance, output impedance, frequency distortion, noise, nonlinear distortion, bandwidth and gain stability.

Module IV **(6 Hrs)**

Sinusoidal Oscillators –Criteria for oscillations-Barkhausen - oscillator operations, phase shift oscillator, wein bridge oscillator, colpitts oscillator, Hartley oscillator, crystal oscillators, nonsinusoidal oscillators –classification, transistor as a switch, astable, monostable and bistable multivibrators, Schmitt trigger.

Self Study topics:
Design various Oscillatory circuits.

Text Books

1. Bhargava, Kurukshetra & Gupta,"Basic Electronics and Linear Circuits", Tata McGraw- Hill Publishing LTD.
2. R S Sedha, "Applied Electronics", S. Chand and Company LTD.
3. Boylestad, Louis Nashelsky "Electronic Devices and Circuit Theory", 10th edition, Pearson

References

1. Jacob Millman, Christos C Halkias, Satyabratajit, 2nd edition "Electronic Devices and circuits", Tata McGraw Hill Education pvt Ltd.
2. V.K Mehta, "Principles of Electronics", S Chand and Company LTD
3. Jacob Millman & Halkias "Integrated Electronics", Tata McGraw Hill2009

SECOND SEMESTER				
Course code	**ELE2B04**			
Name of the course	**ELECTRONIC CIRCUITS LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
02	**Core Lab**	**0:0:2**	**2**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand various rectifier and filter circuits.	6	U	P	PSO 1	PO 7
CO2	Familiarize various wave shaping circuits.	4	U	P	PSO 1	PO 7
CO3	Understand the working of voltage regulator.	4	U	P	PSO 1	PO 7
CO4	Apply transistor biasing methods in amplifier circuits.	8	Ap	P	PSO 1	PO 1
CO5	Identify various oscillator circuits	8	U	P	PSO 1	PO 7

List of experiments:

1. Rectifier circuits: Half Wave, Centre tapped and Bridge
2. Different Filter circuits (C,L,pi)
3. Zener Voltage Regulator
4. Diode clippers and Clampers
5. RC differentiator and HPF
6. RC Integrator and LPF
7. Voltage divider biasing circuits
8. Single stage transistor amplifier
9. RC Phase Shift Oscillator
10. Crystal Oscillators
11. Astable Multivibrator and Monostable Multivibrator using BJT

References

1. NN Bhargava, DC Kulshreshta, SC Gupta "Basic Electronics and Linear Circuits" Tata McGraw-Hill Publishing Company LTD
2. Jacob millman, Christos C halkias, satyabratajit, 2nd edition "Electronic Devices and circuits", Tata McGraw Hill Education pvt Ltd.

Semester III

THIRD SEMESTER				
Course code	**A11**			
Name of the course	**PYTHON PROGRAMMING**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
01	**General Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)
CO1	**Familiarize Python IDLE and its features.**	**8**	**U**	**C**
CO2	**Understand basic constructs in python programming.**	**16**	**U**	**C**
CO3	**Express different Decision Making statements and Functions in python.**	**16**	**U**	**F**
CO4	**Implement lists, tuples, and dictionaries in Python program**	**8**	**Ap**	**P**
CO5	**Carryout string operations in python**	**8**	**Ap**	**P**
CO6	**Develop programs in python to reflect real world problems**	**8**	**Ap**	**P**

Module I

Introduction to python, features, IDLE, python interpreter, Writing and executing python scripts, comments,identifiers,keywords,variables,datatype,operators,operator precedence and associativity, statements, expressions, user inputs, type function, eval function, print function.

Module II

Boolean expressions, Simple if statement, if-elif-else statement, compound boolean expressions,

nesting, multi way decisions. Loops: The while statement, range functions, the for statement, nested loops, break and continue statements, infinite loops.

Module III

Functions, built-in functions, mathematical functions, date time functions, random numbers, writing user defined functions, composition of functions, parameter and arguments, default parameters, function calls, return statement, using global variables, recursion.

Module IV

String and string operations, List- creating list, accessing, updating and deleting elements from a list, basic list operations. Tuple-creating and accessing tuples in python, basic tuple operations. Dictionary, built in methods to access, update and delete dictionary values. Set and basic operations on a set.
Files- opening a file, reading and writing to file. OOPS concept and Python – OOPS terminology, defining classes, creating objects, attributes, built in attributes.

References:

1. E. Balaguruswamy, Introduction to Computing and Problem Solving Using Python
2. Richard L. Halterman, Learning To Program With Python
3. Martin C. Brown, Python: The Complete Reference

THIRD SEMESTER				
Course code	**A12**			
Name of the course	**DATA COMMUNICATION AND OPTICAL FIBERS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
02	**General Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)
CO1	**Introduce basic concepts of data communication.**	**16**	**U**	**C**
CO2	**Familiarize multiplexing and its applications.**	**16**	**R**	**F**
CO3	**Recognize data link control and protocols.**	**8**	**U**	**F**
CO4	**Identify LANs, viz., Ethernet, token ring,token bus, FDDI.**	**4**	**U**	**C**
CO5	**Compare switching techniques.**	**4**	**U**	**F**
CO6	**Introduce optical fiber communication and its applications.**	**8**	**R**	**C**
CO7	**Familiarize optical sources and detectors.**	**8**	**R**	**F**

Module I

Introduction- Components, Networks, Protocols and standards, Basic Concepts: Line Configuration, Topology Transmission mode, analog and digital signals, Encoding and modulating- analog-to-digital conversion,digitaltoanalogconversion,digitaldatatransmission,DTE-DCEinterface,modems,cable modems. Transmission media: guided media, unguided media, and transmission impairment.

Module II

Multiplexing: Many to one/one to many, frequency division multiplexing, wave division multiplexing, TDM, multiplexing applications: the telephone system, Error detection and correction: types of errors, detection , VRC, Longitudinal redundancy check, cyclic redundancy check, checksum, error correction.

Module III

Data link Control: Line Discipline, flow control, error control, Data link Protocols: Asynchronous Protocols, synchronous protocols, character oriented protocols, bit – oriented protocols, link access procedures. Local Area Networks: Ethernet, token bus, token ring, FDDI, Comparison, Switching-circuit switching, packet switching, message switching, integrated services digital networks (ISDN): services, history, subscriber access to ISDN.

Module IV

(Derivation not required)
Overview Of Optical Fiber Communication - Introduction, historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, fiber materials, Optical Sources And Detectors- Introduction, LED's, LASER diodes, Photo detectors. Ray theory, cylindrical fiber, single mode fiber, cut off wave length, mode field diameter.

Text Book

1. Behrouz A. Forouzan, Data Communication and Networking, TMH
2. Optical Fiber Communication – Gerd Keiser, 4th Ed., MGH, 2008.

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education.
2. William L. Schweber : Data Communication, McGraw Hill.
3. Electronic Communication Systems - Kennedy and Davis, TMH
4. Optical Fiber Communications– – John M. Senior, Pearson Education. 3rdImpression, 2007.
5. Fiber optic communication – Joseph C Palais: 4th Edition, Pearson Educatio

THIRD SEMESTER				
Course code	**ELE3B05**			
Name of the course	**DIGITAL ELECTRONICS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
03	**Core Course**	**3:0:0**	**4**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand different type of codes and number systems	8	U	F	PSO 1	PO 7
CO2	Identify digital IC's in the 74XX Series in detail.	10	R	F	PSO 1	PO 1
CO3	Compare different types of logic families.	12	U	F	PSO 1	PO 1
CO4	Analyze different combinational circuits and working.	16	An	F	PSO 1	PO 7
CO5	Design various sequential circuits.	8	Ap	P	PSO 1	PO 7
CO6	Interpret different ADC, DAC circuits	6	U	F	PSO 1	PO 1

Module I **(18 Hrs)**

Number systems – Decimal, Binary, Octal & Hexadecimal – conversions, Digital codes – BCD, Excess 3, Gray code-conversions, ASCII codes, Boolean algebra & theorems, SOP & POS, De Morgan's theorem, Simplification of Boolean expressions using Boolean Algebra & K Map(up to four variables). Logic gates – AND, OR, NOT, NAND, NOR, XOR, XNOR. Universal Properties of NAND and NOR.

Module II **(12 Hrs)**

Different Logic families: TTL, CMOS, ECL, Open Collector & its characteristics. Combinational circuits: Adders - Half adder and Full adder. Subtractors - Half and Full subtractor. Comparators - 1 bit magnitude & 2 bit magnitude. Decoders - 2 to 4 & 3 to 8. Encoders - Octal to Binary & Decimal to BCD, Code converters - Gray to Binary, Binary to Gray and Binary to BCD.

Module III **(16 Hrs)**

Multiplexers: 2 input, 4 input & 8 input. Demultiplexers: 1 to 4 & 1 to 8. Realization of Boolean expression using multiplexers and demultiplexers. Familiarization of popular ICs: 7483 (4 –Bit Binary

Adder), 74151 (Multiplexer), 74154(De- Multiplexer) and its applications. Sequential circuits: Flip Flops: RS latch, clocked RS, D, JK, T, Preset and Clear operations, Race-around condition in JK Flip-Flop , Master slave JK. Applications – Latches, Shift registers - SISO, SIPO, PISO, PIPO, typical circuits & applications as Ring counter and Johnson counter.

Module IV **(14 Hrs)**

Counters: State diagram & State table. Asynchronous counters: Concepts and Design of 2bit & 4 bit Up/Down counter, MOD counter. Synchronous counters, Familiarization of popular ICs: 7490 (Decade Counter), 4017 (Decade Counter/Divider with 10 Decoded Outputs) and 7446 (BCD to Seven Segment Decoder).
Converters: ADC – Flash, Successive Approximation, Counter Ramp. DAC - Weighted Resistor and R-2R Ladder.Parameters of DAC and ADC.

Self-study topics:
1. Applications of flip flops and counters
2. Signed binary arithmetic, floating point arithmetic

Text Books
1. Digital fundamentals –Thomas LFloyd
2. Anandkumar, Fundamentals of digital circuits, PHI, 2/e, 2012.
3. Digital Principles -Malvino

References

1. John M Yarbrough, Digital logic- Application and Design, Thomson Learning, 2006.
2. John Wakerly, Digital Design Principles and Practice, Pearson, 4/e, 2012.
3. Morris Mano, Ciletti, Digital Design, 4/e, Pearson ,4/e,2009
4. Digital Integrated circuits –Taub and Schilling

THIRD SEMESTER				
Course code	**ELE4B07**			
Name of the course	**DIGITAL ELECTRONICS LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
03	**Core Lab**	**0:0:2**	**2**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Interpret different logic gates	4	U	P	PSO 1	PO 1
CO2	Understand universal property of NAND and NOR gates	4	U	P	PSO 1	PO 1
CO3	Design various combinational circuits	12	Ap	P	PSO 1	PO 7
CO4	Design and implement different sequential circuits	10	Ap	P	PSO 1	PO 7

List of experiments:

1. Logic gates
    a. To verify the truth tables of NOT, AND, OR and XOR gates
    b. To verify Demorgan's theorem for two variables
    c. Realization of SOP and POS expressions using Basic logic gates
2. Universal Gates
    a. To verify the truth tables of NAND and NOR gates
    b. To verify the universal properties of NAND and NOR gates
    c. Realization of SOP and POS expressions using NAND and NOR gates
3. Adders
    a. To realize half adder and Full adder circuits and verify the truth tables
    b. To verify the operation of 7483 four bit parallel adder
4. Subtractors
    a. To realize half subtractor and Full subtractor circuits and verify the truth tables
    b. To construct and verify four bit subtractor using IC7483
5. Comparators
    a. To design and verify two bit magnitude comparator using gates
    b. To verify the operation of 4 bit magnitude comparator IC7485
6. Multiplexers
    a. To verify the truth table of 4 to 1 multiplexer using IC74153
    b. To verify the truth table of 8 to 1 multiplexer using IC74151
    c. To realize a Boolean function (up to 3 variable) using multiplexer IC74153/74151
7. De-Multiplexers and Decoders
    a. To design 1 to 8 De multiplexer using IC74138
    b. To design 3 to 8 decoder using IC74138
    c. To study the operation of 4 line to 16 line Decoder / De-multiplexer IC74154
    d. To study the operation of seven segment decoder ICs
    e. To realize Boolean Expressions using decoders
8. Encoders
    a. To realize 4 to 2 line encoder and verify its truth table

   b. To verify the operation of priority encoder IC74148
9. Latches and Flip Flops
   a. To realize RS latch using gates
   b. To design and verify the operation of Clocked RS flip flop using NAND gates(7400)
   c. To realize JK flip flop using NAND gates (7410 and7400)
   d. To verify the operation of D flip flop IC7474 and JK flip flop IC7476
10. Counters
   a. To design and construct asynchronous decade counter using JK flip flops
   b. To design and construct synchronous decade counter using JK flip flops
   c. To design and verify the operation of counter IC 7490 as MOD 2 Counter, MOD 5 Counter, MOD 8 Counter, MOD 10 Counter
11. Shift Registers
   a. To design and verify the operation of 4 bit SISO,SIPO,PISO and PIPO shift registers using D flip flop
12. Shift Register Counters
   a. To design and verify the operation of 4bit Ring counter using D flip flops
   b. To design and verify the operation of 4bit Johnson counter using D flip flops

** Pin diagrams will be provided during Lab examination.*

THIRD SEMESTER				
Course code	**ELE4B09**			
Name of the course	**SKILL DEVELOPMENT LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
05	**Core Lab**		**1**	

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Understand the basics of PCB designing**	5	U	P	PSO 4	PO 1
CO2	**Analyze different circuits**	5	An	P	PSO 4	PO 7
CO3	**Design circuits using PCB fabrication techniques**	5	Ap	P	PSO 4	PO 1

Course Outline:

1. Simulation and PCB design using software (Minimum Two Experiment)
    a. Rectifier and Filter Circuits
    b. RC Amplifier Circuit
    c. Oscillator Circuits
    d. Combinational Circuits
    e. Counters using flip flops
    f. Shift Registers
2. PCB fabrication - any one circuit
3. Assembling, Soldering and testing of the PCB fabricated circuit

Guidelines:

1. May use any software like SPICE, eSim, KICAD, OrCAD, Proteus, etc.
2. A printed record of laboratory work with schematics, simulation results and PCB layout as print out must be submitted along with the report of Skill Development Lab.
3. Evaluation will be done at the end of 4th semester.

FOURTH SEMESTER				
Course code	**A13**			
Name of the course	**MICROPROCESSORS ARCHITECTURE AND PROGRAMMING**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
03	**General Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)
CO1	**Understanding the General Architecture of 8085 Microprocessor**	**16**	**U**	**C**
CO2	**Identifying basic Addressing modes and Timing Diagram**	**8**	**U**	**C**
CO3	**Familiarising Assembly Language Programming**	**8**	**Ap**	**P**
CO4	**Recognising different Programmable peripheral Devices**	**16**	**U**	**F**
CO5	**Comparison of 8086 and 8088 Microprocessors Architecture**	**16**	**U**	**C**

Module I

General architecture of computer, Introduction to Microprocessor, Memory classification, Introduction to 8085, Microprocessor bus organizations, data bus, address bus, control bus. Memory addressing, memory mapping. 8085 architecture in detail. General purpose registers and special purpose registers, flag register -8085 pins and signals.

Module II

Assembly language programming basics.Opcode, Mnemonics etc. 8085 instruction set,Data transfer, Arithmetic and Logic, Shifting and rotating, Branching/Jump, Program control. Addressing modes.Memory read and write cycle. Timing diagram.Instruction cycle, machine cycle and T-states.Types of I/O addressing .Simple programs.

Module III

Types of programming techniques looping, indexing (pointers), delay generation. Stack in 8085, call and return Instructions. Data transfer between stack and microprocessor. Subroutine and delay programs.Interrupts in 8085. Interrupt driven programs. Interfacing - Programmable peripheral devices - 8255A, 8254, 8237.

Module IV

Introduction to 8086/88 microprocessors – overview, 8086 internal architecture. The execution unit, BIU, Registers, Flags, Segmentation, physical addresses calculation, addressing modes.

Text Book

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Application with 8085, Prentice Hall
2. Doughles V Hall, Microprocessors and Interfacing: Programming and Hardware, Tata McGraw Hill

Reference Book

1. Microprocessor and Microcomputer - Based system Design - M. Rafiquzzman - CRC press
2.A.P Mathur, Introduction to Microprocessors, Tata McGraw-Hill Education
3.The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486,Pentium,Pentium Pro, Pentium II, III, IV and Core 2 with 64 bit Extensions, Barry B. Brey, Prentice Hall Pearson
4. Microprocessors PC Hardware and Interfacing –N. Mathivanan – PHI

FOURTH SEMESTER				
Course code	**A14**			
Name of the course	**SENSORS AND TRANSDUCERS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
04	**General Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)
CO1	**Understand transducers, its types and characteristics.**	**16**	**U**	**C**
CO2	**Familiarize the concepts of Thermal sensors and its types**	**16**	**U**	**C**
CO3	**Summarize Pressure Transducers**	**8**	**U**	**C**
CO4	**Understand Level Transducers and Mass Capacitive Level Gauges**	**4**	**U**	**C**
CO5	**Familiarize the concepts of Flow Transducers and Bernoulli's principle**	**4**	**U**	**C**
CO6	**Comprehend the principles of Sensors and its different types**	**16**	**U**	**C**

Module I

Transducers: Definition, Principle of sensing & transduction, Classification, Characteristics of transducers. Basic requirement of transducers. Resistance Transducer: Basic principle – Potentiometer –Loading effects, Resistance strain gauge– Types.

Inductance Transducer: - Basic principle – Linear variable differential transformer – RVDT-types. Capacitance Transducer: Basic principle-transducers using change in area of plates–distance between plates- variation of dielectric constants–Types

Module II

Thermal sensors: Resistance change type: RTD - materials, construction, types, working principle, Thermistor - materials, construction, types, working principle, Thermo emf sensors: Thermocouple – Principle and types, Radiation sensors: Principle and types.

Pressure Transducers: basic principle- different types of manometers-u tube manometer-well type manometers.

Module III

Level transducer-continuous level measurement-discrete level measurement-mass –capacitive level gauges

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, nozzle plate, venture tube, Rotameter, anemometers, electromagnetic flow meter, impeller meter and turbid flow meter

Module IV

Hall effect transducers, Digital transducers, Piezo-electric sensors, eddy current transducers, tacho generators and stroboscope, Magnetostrictive transducers

Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive cell types

Force and Torque Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound Transducers: Sound level meter, Microphone.

Text Books

2. D Patranabis, Sensors and Transducers, PHI, 2nd Edition.

3. E. A. Doebelin, Measurement Systems: Application and Design McGraw Hill, New York

4. A.K. Sawhney, - A course in Electrical & Electronic Measurement and Instrumentation, Dhanpat Rai and Company Private Limited.

5. Murthy D.V.S., ―Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Private Limited, New Delhi, 2010.

6. S. Renganathan, ―Transducer Engineering, Allied Publishers,2005

FOURTH SEMESTER				
Course code	**ELE4B06**			
Name of the course	**ANALOG INTEGRATED CIRCUITS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
04	**Core Course**	**3:0:0**	**4**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Understand the characteristics and internal blocks of IC 741 Op-Amp.**	**10**	**U**	**F**	**PSO 1**	**PO 1**
CO2	**Understand the basic working of Op-Amp Amplifiers.**	**10**	**U**	**F**	**PSO 1**	**PO 1**
CO3	**Differentiate the working of Butter worth filters and wave form generators using Op-Amp.**	**14**	**U**	**F**	**PSO 1**	**PO 7**
CO4	**Interpret the working of comparators using IC 741 Op-Amp.**	**8**	**Ap**	**F**	**PSO 1**	**PO 1**
CO5	**Illustrate the working of Multivibrators using IC 555 timer.**	**6**	**Ap**	**F**	**PSO 1**	**PO 1**
CO6	**Compare the basic circuit configuration and characteristics of voltage regulators.**	**12**	**U**	**F**	**PSO 1**	**PO 7**

Module I **(20 Hrs)**

Block Diagram of typical operational Amplifiers – Ideal Op-amp characteristics – Op amp Parameters – Inverting and Non-Inverting Amplifier – Voltage Follower- Summing Amplifier-Differential Amplifier- Instrumentation Amplifier – V to I and I to V converter- Integrator – Differentiator – Typical circuits – Applications.

Module II **(14 Hrs)**

Introduction – First order – Butter worth – Low pass, High pass, Band pass, Band Reject, Notch and All pass Filters – Typical circuits- Applications. Wave form generators – Square wave generator- Triangular and Sawtooth wave generators – sine wave oscillators (Phase shift, Wien Bridge and Quadrature Oscillators).

Module III **(14 Hrs)**

Basic comparator – Characteristics – Typical comparator circuits using op amp – zero crossing detector – Schmitt trigger – Typical Circuits – Operation – Application-Window detector-Peak detector-Sample and Hold circuit-Clippers and Clampers - half wave Rectifier –Precision Rectifier. Introduction to Timer 555 -Monostable and Astable Multivibrator -Application of Monostable and Astable Multivibrator.

Module IV **(12 Hrs)**

Voltage controlled oscillator (VCO), PLL – block diagram, Operating principle, parameters, pin out, function, applications and typical circuits.

Basic circuit configuration and characteristics of voltage regulators – Basic blocks of linear voltage regulator – three terminal fixed regulators (78XX and 79XX), Adjustable Positive voltage Regulator(LM 317) and Adjustable Negative voltage Regulator(LM 337)-variable voltage Regulators (723), Switching regulator, S.M.P.S – Typical circuits (Buck and Boost)–Applications.

Self-study topics:

1. Familiarization of different Op-Amp ICs and packages
2. Log, Antilog amplifiers

Text book

1. Ramakant A. Gayakwad,"Op-amp and Linear ICs", Prentice-Hall of India Private LTD.
2. Botkar," Integrated Circuits"

Reference

1. Mottershed," Electronic Devices and circuits",
2. Millman & Halkias,"Integrated Electronic", Tata McGraw-Hill Publishing LTD.
3. Tobey & Buelsman ,"Op-amp Design and Application",

FOURTH SEMESTER				
Course code	**ELE4B08**			
Name of the course	**ANALOG INTEGRATED CIRCUITS LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
04	**Core Lab**	**0:0:2**	**2**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Design different Amplifier configurations using Op-Amp IC 741**	**8**	**Ap**	**P**	**PSO 1**	**PO 1**
CO2	**Design different filters, wave form generators and comparators using Op-Amp**	**8**	**Ap**	**P**	**PSO 1**	**PO 1**
CO3	**Compare the working of Multivibrators using IC 555 timer**	**6**	**U**	**P**	**PSO 1**	**PO 7**
CO4	**Understand the working and performance of different voltage regulators**	**8**	**U**	**P**	**PSO 1**	**PO 1**

List of Experiments:

1. Inverting and non inverting op-amp configuration and its characteristics.
2. Differentiator and integrator circuit characteristics.
3. Summing and difference amplifiers.
4. Voltage follower and instrumentation amplifier.
5. Low pass and High pass filters and their frequency response.
6. Band pass filter and Band rejection filter and their frequency response.
7. Schmitt trigger-measurement of UTP and LTP.
8. Triangle wave generator.
9. Astable and monostable multivibrator using 555
10. IC fixed voltage regulation and characteristics.
11. IC 723 variable voltage regulator.
12. Oscillators: 1) Wein bridge 2) RC phase shift.

Text book:

1. T.D. Kuryachan & Shyam Mohan S,"Electronics Lab Manual, Vol.II", Ayodhya publications.

FOURTH SEMESTER				
Course code	**ELE4B09**			
Name of the course	**Skill Development Lab**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
05	**Core Lab**	**0:0:1**	**1**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO 4:	**Design and Development of a mini project based on Skill Development Lab 1 and Core Courses 1- 4**	**15**	**U**	**P**	**PSO 4**	**PO 4**

Guidelines:

1. Students should select a problem which addresses some basic home, office or other real life applications.
2. The electronic circuit for the selected problem should have at least 8 to 15components.
3. Students should understand testing of various components.
4. Soldering of components should be carried out by students.
5. Students should develop a necessary PCB for the circuit.
6. Students should see that final circuit submitted by them is in working condition.
7. 5 - 10 pages report to be submitted by students.
8. Group of maximum two students can be permitted to work on a single mini project.
9. The mini project must be hardware based. The software and firmware are not allowed.
10. Department may arrange demonstration with poster presentation of all mini projects developed by the students at the end of 4thsemester.

FIFTH SEMESTER				
Course code	**ELE5B10**			
Name of the course	**ELECTROMAGNETIC THEORY**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
05	**Core Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Understand fundamentals of vector operation.**	**4**	**U**	**F**	**PSO 3**	**PO 1**
CO2	**Illustrate the concept of gradient, divergent and curl in rectangular coordinates**	**6**	**U**	**C**	**PSO 3**	**PO 1**
CO3	**Sketch transformation between various coordinates.**	**4**	**Ap**	**F**	**PSO 3**	**PO 7**
CO4	**Understand the fundamentals of electrostatics**	**16**	**U**	**C**	**PSO 3**	**PO 1**
CO5	**Understand the fundamentals of magnetostatics.**	**15**	**U**	**C**	**PSO 3**	**PO 1**
CO6	**Describe electromagnetic fields and waves**	**5**	**U**	**F**	**PSO 3**	**PO 1**
CO7	**Interpret electromagnetic waves in free space and conducting medium.**	**6**	**U**	**F**	**PSO 3**	**PO 7**
CO8	**Understand the fundamentals of antennas and its parameter**	**4**	**U**	**F**	**PSO 3**	**PO 1**

Module I: Fundamental of Vector Analysis (14 Hours)

Fundamental vector operations, Coordinate systems-unit length, area and volume, Integrals of vector functions, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stokes's theorem, Physical Interpretation of Gradient, divergent and curl, coordinate transformations.

Module II: Electrostatics (16 Hours)

Static Electric Fields; Postulates of electrostatics, Coulomb's law, Gauss's law and applications, Electric potential, dielectrics, flux, boundary conditions, capacitance, capacitors, Electrostatic

energy and forces, Solution of Electrostatic Problems- Poisson's and Laplace's equations-Method of images, Boundary conditions and Boundary value problems.

Module III: Magnetostatics (15 Hours)

Steady Electric Currents; current density, Ohm's law, Boundary condition for current density, Equation of continuity and Kirchhoff's law, Biot-Savart Law, Postulates of Magnetostatics, Vector Magnetic Potential, Force between two current wires, Ampere's Circuit Theorem, Magnetic dipole, Boundary conditions for magnetostatic fields, Magnetic energy, Magnetic forces and torques.

Module IV: Time varying Electromagnetic fields and waves (15 Hours)

Faraday's law of electromagnetic induction, Inconsistency of Amperes law, Maxwell's equations , Integral and differential forms, conduction current and displacement current- Uniform Plane waves- Poynting theorem and Poynting vector- Solution for free space condition-Intrinsic impedance- wave equation for conducting medium- Wave polarization, Reflection and transmission, TE, TM and TEM waves, fundamentals of antennas and parameters.

Self Study Topics:
Basics of Electromagnetic Theory of light.

Text Books

1. Engineering Electromagnetics – Haytt (McGraw-Hill Education)
2. Elements of Electromagnetics--Matthew N. O. Sadiku (Oxford University Press)
3. Electromagnetic Field Theory and Transmission Lines--G. SN. Raju(Pearson Education)

FIFTH SEMESTER				
Course code	**ELE5B11**			
Name of the course	**MICROCONTROLLER & INTERFACING**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
06	**Core Course**	**3:0:0**	**4**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand the architecture of 8051 microcontroller	14	U	F	PSO 4	PO 1
CO2	Understand bus organization, memory organization, addressing modes and instruction set of 8051 microcontroller	20	U	F	PSO 4	PO 1
CO3	Identify different timers and serial modes of 8051 microcontroller	8	U	F	PSO 4	PO 1
CO4	Understand the interrupts of 8051 microcontroller	5	U	F	PSO 4	PO 1
CO5	Describe the architecture of arduino	5	U	F	PSO 4	PO 1
CO6	Interpret different data types and variables in embedded c and arduino IDE.	8	U	F	PSO 4	PO 4

Module I: **(17** Hrs)

Comparison between microprocessor and Microcontroller.The 8051 Microcontroller .Architecture of 8051 microcontroller. Internal memory (ROM) organization. Important Registers. Internal RAM organization. Register banks, Byte and bit addressable area. Flags and flag register (PSW) .Program counter and data pointer. Stack and Stack pointer. Special Function Registers. 8051 Ports and I/O pins, control signals. External memory interfacing signals.

Module II: **(17** Hrs)

8051 instruction set, Data transfer (internal and external), Arithmetic and Logic, Shifting and rotating, Branching/Jump. Bit related instructions and operations. Addressing modes. External memory related instruction. Stack and subroutine. Call and return instructions. Push and Pop instructions. Delay generation, calculation and programs.8051 Interrupts.

Module III: **(13** Hrs)

Counters and Timers: Timer / counter interrupt – Delay using Timer - Modes of Operation - Counting .RS232 Communication standard. Serial data input of serial data output : Serial datainterrupt - Data transmission Data reception - serial data transmission interrupts : Times Flag interrupt - Serial port interrupt - External interrupt - Reset - Interrupt concept - interrupt priority - interrupt destination - software generated interrupts.

Module IV: **(13** Hrs)

Introduction to Arduino - Pin configuration arduinoUno and architecture, Device and platform features, Concept of digital and analogports.
Introduction to Embedded C and Arduino IDE -Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions. Input Output - Pins Configuration, Pull-up Resistors, Functions - pinMode(), digitalWrite(), analogRead(), analogWrite() and Arduino Interrupts. Time Functions - delay(), delayMicroseconds(),millis(), micros().
Interfacing -UART, Serial monitor. Interfacing an 8 bit LCD to Arduino, Arduino LCD Library, Humidity Sensor, Temperature Sensor (LM35), Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor.

Self-Study Topics:
Key board interfacing program, Display Interfacing, A/D and D/A interfacing, Stepper Motor interfacing, Relay interfacing,

Text Book:

1. The 8051 microcontroller and embedded systems using assembly and C - Kenneth.J.Ayala–CengageLearning.
2. The 8051 microcontroller and applications – AliMazidi
3. Microprocessors and micro-controllers (8085, 8051) – Krishna Kant –PHIIndia
4. Arduino For Dummies by John Nussey
5. Arduino-Based Embedded Systems: By Rajesh Singh, Anita Gehlot, Bhupendra Singh and Sushabhan Choudhury.
6. Arduino Made Simple by Ashwin Pajankar
7. https://www.arduino.cc

FIFTH SEMESTER				
Course code	**ELE5B12**			
Name of the course	**NETWORK THEORY**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
07	**Core Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand the assumptions and concepts of circuit analysis	10	U	C	PSO 3	PO 1
CO2	Analyze series and parallel passive networks	4	Ap	F	PSO 3	PO 7
CO3	Illustrate different methods for solving networks and circuits	6	U	C	PSO 3	PO 7
CO4	Understand the DC Transient analysis of RC,RL and RLC circuits	12	U	F	PSO 3	PO 1
CO5	Understand the Sinusoidal Circuit Analysis for RL, RC and RLC Circuits	13	U	F	PSO 3	PO 1
CO6	Understand the concept of series resonance	3	U	C	PSO 3	PO 1
CO7	Understand the concept of parallel resonance	3	U	C	PSO 3	PO 1
CO8	Design passive filters for different pass band characteristics	9	Ap	P	PSO 3	PO 7

Module 1 **(20 Hrs)**

Basic circuit elements and waveforms - introduction - circuit components - assumption of circuit analysis - sources of electrical energy - standard input signals -sinusoidal signals parallel and series parallel networks - source transformation - Mesh and nodal analysis, Star-Delta Conversion, network equation for RLC network -magnetic coupling.

Module 2 **(12 Hrs)**

DC Transient Analysis: Initially charged RC circuit, RL circuit with initial current, time constant, RL and RC circuits with sources, DC response of series RLC circuits (using differential equations).

Module 3 **(13 Hrs)**

AC Circuit Analysis: Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance, Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor. Sinusoidal Circuit Analysis for RL, RC and RLC Circuits

Module 4 **(15 Hrs)**

Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth. Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.

Self-study topics:

1. Review of KVL, KCL, voltage division rule, current division rule.
2. Review of Network theorems- Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, superposition theorm, Millman's theorem, substitution theorem, reciprocity theorem, compensation theorem
3. Y parameters, Z parameters, ABCD parameters, h- parameters of 2-port network
4. T and Π representation of networks
5. Image impedances and characteristic impedance of 2-port network

Text Books

1. Roy Choudhary, Networks and Systems, New Age International
2. Sudhakar and Shyam Mohan, Circuits and Networks- Analysis and Synthesis,TMH
3. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw-Hill
4. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, TataMcGraw-Hill
5. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill(2004)
6. Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008)

References

1. VanValkenburg, Network Analysis, PHI, 3/e,2011
2. Franklin F. Kuo, Network Analysis and Synthesis, Wiley India, 2/e,2012
3. Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education(2004)

FIFTH SEMESTER				
Course code	**ELE6B17**			
Name of the course	**MICROPROCESSOR & MICROCONTROLLER PROGRAMMING AND INTERFACING LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
06	**Core Lab**	**0:0:3**	**2**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Remember the fundamentals of assembly level programming of microprocessor 8085	20	U	p	PSO 4	PO 1, PO 4
CO2	Familiarize Python using Raspberry Pi.	25	U	P	PSO 4	PO 1, PO 4
CO3	Understand the programming strategies and select proper mnemonics and run their program on training boards and interfacing modules of 8051 microcontroller	25	U	P	PSO 4	PO 1, PO 4
CO4	Familiarize with Arduino IDE, programming to provide knowledge of Arduino boards and basic components.	20	U	P	PSO 4	PO 1, PO 4

PART A –Microprocessor programming and Interfacing Lab

List of experiments:

Section A: (Microprocessor 8085)

1. Addition – 8 bit, 16 bit
2. Subtraction – 8 bit, 16bit
3. Block data transfer
4. Array addition (multibyte)
5. Logical operators – AND, ORNOT
6. Multiplication & Division
7. Decimal to ASCII and ASCII to Decimal
8. Decimal to Hex and Hex to Decimal

9. Ascending Order & Descending order
10. Largest &smallest
11. Interfacing with LED's
12. square wave Generation

Section B: (Python Programming with Raspberry Pi)

1. Interfacing LED
2. Relay Interfacing
3. Temperature monitoring
4. IR interfacing
5. Water level controller
6. Moisture sensing

PART B – Microcontroller programming and Interfacing Lab

List of experiments:

Section A: (8051)

1. Addition – 8 bit, 16 bit.
2. Subtraction – 8 bit, 16bit.
3. Multiplication &Division
4. Array addition (multibyte)
5. Logical Operations – AND, OR,NOT
6. Decimal to ASCII and ASCII to Decimal.
7. Decimal to Hex and Hex to Decimal.
8. Interfacing with LED's

Section B: (Arduino)

1. Familiarization of Arduino IDE
2. Interfacing LEDs and Switches
3. Traffic Light Controller
4. Automatic Guided Vehicle
5. Water Level Controller using float sensors
6. Interfacing LCD
7. Digital Thermometer using ICLM35
8. Distance Measurement using Ultrasonic Sensor
9. LED brightness control using PWM

- Opcode sheet will be provided during Lab examination.

FIFTH SEMESTER				
Course code	**ELE6B20**			
Name of the course	**Industrial Visit & Project Work**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
09	**Core Lab**		**4**	

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand the practical applications of instruments handled during course curriculum.	5	U	P	PSO1, PSO2, PSO3, PSO4	PO1, PO4, PO6, PO7
CO2	Relate about Industry Practices and career opportunities.	5	U	P	PSO1, PSO2, PSO3, PSO4	PO4, PO6
CO3	Acquaint Students with Interesting Facts and Newer Technologies to generate new entrepreneurs.	5	Ap	P	PSO1, PSO2, PSO3, PSO4	PO4, PO6, PO7
CO4	Develop the ability in creative thinking and finding viable solutions to real life problems	10	Ap	P	PSO4	PO1, PO4, PO7

INDUSTRIAL VISIT:

Guide Lines:

- Two days visit to National research Institutes, Laboratories, places of scientific importance, Industries or plants. OR
- one week Industrial Training / internship at any industry.
- The Industrial visit should complete with in the fifth semester.

- A 10 – 20 page Industrial visit / Training report have to be submitted with certificate from industry / institute, sufficient photos and analysis along with Project for evaluation in the sixth semester.
- Industrial visit report must be certified by the tour coordinator and head of the department and that are only considered for final evaluation.
- Evaluation of industrial visit is solely based on report submitted without any oral examination.

Distribution of Marks (External Evaluation)

Sl. No.	Item	Mark (%)
1	Report	50%
2	Analysis	25%
3	Photos (minimum 5 photos)	25%

- *There is no internal evaluation for industrial visit*

PROJECT WORK

Guide Lines

- Project work is for duration of two semesters and is expected to be completed in the sixth semester.
- Each student group consisting of not more than four members is expected to design and develop a complete system addressing a real life problem in the relevant area.
- The project may be implemented using only hardware, or a combination of both hardware and software.
- Project monitoring committee consisting of the guide and other faculties of the department.
- Each project group should submit project synopsis within five weeks (20 project Hours) from start of fifth semester to the project monitoring committee.
- Project monitoring committee shall study the feasibility of each project work before giving consent.
- Each project group should maintain a log book of activities of the project. It should have entries related to the work done, problems faced, solution evolved etc.
- Literature survey is to be completed in the fifth semester.
- Students should execute the project work using the facilities of the institute. However, external projects can be taken up in reputed industries or institutes, if that work solves a technical problem of the external firm. Prior sanction should be obtained from the head of department before taking up external project work and there must be an

internal guide for such projects.

- Each student has to submit an interim report of the project at the end of the 5th semester.
- Members of the group will present the project details and progress of the project before the committee at the end of the 5th semester.
- 50% of the internal Mark is evaluated and published on the notice board at the end of 5th semester.

FIFTH SEMESTER				
Course code	**ELE5D01**			
Name of the course	**COMPUTER HARDWARE**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
01	**Open Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand the evolution and knowledge of computer hardware	4	U	C	PSO4	PO1
CO2	Classify the concepts of number systems and logic gates.	15	U	F	PSO4	PO7
CO3	Identify different hardware components such as processor, memory, hard disk, mother board, input and output devices used in computers.	16	U	C	PSO4	PO7
CO4	Distinguish the features of the hardware components of a computer.	10	U	C	PSO4	PO1

Module I **(15 Hrs)**

Evolution of Computers and Computer Generations, Computer Classification Processing speed of a computer, Technology Trends, Measuring Computer Performance, Architecture, Functional Units and Components in Computer Organization, Computers – Block diagram, Memory addressing capability of a CPU, Word length of a computer, Basic components of a Digital Computer - Control unit, ALU, IO Subsystem of a Computer, Bus Structures, Uses of Program Development Tool, Editor, Compiler, Assembler, Interpreter.

Module II **(15 Hrs)**

Number systems – Decimal Number system, Binary number system and Hexa-decimal number system,1's& 2's complement, Representation of Positive and Negative Numbers
Binary Fixed- Point Representation, Arithmetic operation on Binary numbers, Codes, ASCII, Logic Gates, AND, OR, NOT GATES and their Truth tables.

Module III **(15 Hrs)**

Input Devices - Keyboard, Mouse, Output Devices - CRT Monitor, LCD Displays, Touch Screen Displays Print Devices, Multiprocessor and Multi core Architecture

Text Book

Computer Fundamentals – B. Ram – New Age International Publishers

Reference BOOKS

1. Rashid Sheikh, "Computer Organization & Architecture"
2. Computer Organization – Hamacher, Vranesic and Zaky, McGraw Hill.
3. Digital Logic and Computer Design – Morris Mano, PHI
4. Computer Organization and Architecture -William Stallings, Pearson Education Asia.
5. Computer Organization and Design – Pal Chaudhuri, PH

FIFTH SEMESTER				
Course code	**ELE5D02**			
Name of the course	**DIGITAL FUNDAMENTALS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
02	**Open Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand the advantages of digital electronics.	2	U	C	PSO1	PO1
CO2	Describe the concepts of number systems and logic gates.	18	U	C	PSO1	PO7
CO3	Compute and evaluate Boolean expression and its reduction using k-map	10	U	C	PSO1	PO7
CO4	Understand the basic concepts of latches and flip flops	8	U	C	PSO1	PO7
CO5	Analyse different registers and counters	7	U	C	PSO1	PO7

Module I **(20 Hrs)**

Number System and Codes: Decimal, Binary, Hexadecimal, Octal, BCD, conversion of one code to

another, Complements (one's and two's), Addition and Subtraction, Multiplication Logic Gates and Boolean Algebra: Truth Tables, OR, AND, NOT, XOR, NOR, NAND, Universal (NOR and NAND) Gates, Boolean Theorems, DeMorgan's Theorems.

Module II **(10 Hrs)**

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Karnaugh map minimization. Adder (half and full) and subtractor.

Module III **(15 Hrs)**

Sequential logic design: Latch, Flip flop (FF), SR FF, JK –master slave FF, T and D type FFs, Clocked FFs, Registers, Counters (synchronous and asynchronous)

Self study topics:
Code converters, Encoders, Decoders, Mux, Demux, ADCs, DACs

References

1. R.L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill (1994)
2. Donald P. Leach, Albert Paul Malvino, Digital Principles and Applications, Tata McGraw Hill (1995)
3. M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education Asia, (2007)
4. Thomas L. Floyd , Digital Fundamentals, Pearson Education Asia (1994)
5. S.P. Bali , Solved Problems in Digital Electronics, Sigma Series, Tata McGraw-Hill, (2005)
6. W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice

FIFTH SEMESTER				
Course code	**ELE5D03**			
Name of the course	**ELECTRONIC FUNDAMENTALS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
03	**Open Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

Course Outcomes:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Distinguish the basic components in electronics.	5	U	C	PSO1	PO1
CO2	Understand the basics of testing and	10	U	C	PSO1	PO7

	measuring instruments in the circuit assembling					
CO3	**Apply and evaluate troubleshooting of circuits**	**5**	**Ap**	**C**	**PSO1**	**PO7**
CO4	**Understand AC and DC fundamentals of circuits**	**25**	**U**	**C**	**PSO1**	**PO, PO7**

Module I. **(15 Hrs)**

Voltage and Current : Concepts of emf, potential difference and current, resistance, capacitance and inductance, S.I. units of work, power and Energy, concept of Kilo Watt Hour, Batteries and cells, their types, primary cells and secondary cells, Lead Acid, Ni-Cd, Ni-MH and Li-ion batteries, current capacity and cell ratings, charging and discharging of batteries, importance of initial charging, maintenance procedure, series and parallel battery connections.

Module II. **(15 Hrs)**

D.C. Circuits : Resistance in Series and Parallel circuits, Shorts and Opens in series and Parallel circuits, Ohm's law, Kirchhoff's Voltage and current laws, Determination of direction of current and voltage sign, applications, Simplifications of networks using series and parallel combinations.

Module III. **(15 Hrs)**

AC fundamentals : Generation of alternating voltages and currents, Transformer, Equations of AC voltage and current, Simple wave forms, concept of time period, frequency, amplitude and phase, Peak value and RMS value of amplitude, AC through resistance inductance and capacitance.

Reference

A text book of Electrical Technology, B L Theraja and A K Theraja

SIXTH SEMESTER				
Course code	**ELE6B13**			
Name of the course	**COMMUNICATION SYSTEM**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
08	**Core Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO 1	**Interpret the fundamentals of basic communication system, types of noise affecting communication.**	**8**	**U**	**C**	**PSO1**	**PO1**
CO 2	**Illustrate the need of modulation, modulation process and different amplitude modulation schemes**	**7**	**U**	**C**	**PSO1**	**PO1, PO7**
CO 3	**Interpret FM modulation techniques, its generation and detection**	**8**	**Ap**	**C**	**PSO1**	**PO1, PO7**
CO 4	**Identify the various radio receivers with their parameters.**	**7**	**U**	**C**	**PSO1**	**PO1**
CO 5	**Understand various modes of wave propagation**	**8**	**U**	**C**	**PSO1**	**PO1**
CO 6	**Infer the generation and detection of pulse modulation techniques and multiplexing.**	**7**	**U**	**C**	**PSO1**	**PO1, PO7**
CO 7	**Exploring the need of sampling and different sampling techniques.**	**8**	**U**	**C**	**PSO1**	**PO1**
CO 8	**Identify the Digital modulation techniques**	**7**	**U**	**F**	**PSO1**	**PO1**

Module I **(15 hrs)**

Communication Systems- Modulation – Need for modulation, Amplitude Modulation- Frequency spectrum of AM wave – Representation of AM wave, Power relation in AM wave, Generation of AM- DSBSC- Balanced Modulator, SSB Techniques –- Filter system, Phase shift method, Third method.

Module II **(15 hrs)**

Frequency Modulation – Theory of Frequency and Phase modulation, Mathematical representation of FM, FM-Noise Triangle, De-emphasis, Pre-emphasis, Comparison of Wide band and Narrowband FM, FM Generation and Detection-Generation of FM – Direct method, Indirect method, discriminator circuits.

Module III **(15 hrs)**

Radio receivers- Receiver types, TRF, super heterodyne receiver, Sensitivity, Selectivity, Image frequency and its rejection, image frequency and IF amplifiers, AGC- diode detector, AFC, FM receivers – Amplitude limiting, Stereo-phonic FM multiplex system. Propagation of waves in free space –Ground wave propagation, surface wave propagation, ionospheric propagation – critical frequency, MUF, Skip distance.

Module IV **(15 hrs)**

Sampling - reconstruction - aliasing - PAM, PWM, PPM – TDM – FDM-CDMA - noise in pulse modulation, Pulse code modulation. Quantization noise - Companding law - The PCM system. Digital modulation technique ASK, FSK, PSK, DPSK

Self Study topics:

VSB modulation techniques, Spectrum analysis

Text book:

1. Communication systems- A. Bruce Carlson, Paul B. Crilly 2.Electronic Communication Systems - Kennedy and Davis
3. Communication Systems: Simon Haykins, John Wiley & Sons, Inc., 4th Edition, 2001
4.Principles of Communication: Taub and Schilling
5. Electromagnetic wave propagation, KD Prasad

References

1. Digital Communications Fundamentals and Applications: Bernard Sklar, Person Education, 2nd edition
2. Modern Digital and Analog communication system: B. P. Lathi, Oxford University Press,3rd edition

SIXTH SEMESTER				
Course code	**ELE6B14**			
Name of the course	**PRINCIPLES OF DSP**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
09	**Core Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO 1	Understand various types of signals and their representations.	5	U	C	PSO2	PO7
CO 2	Identify the properties of signals.	5	U	C	PSO2	PO1, PO7
CO 3	Differentiate various classification of systems	10	U	C	PSO2	PO1, PO7
CO 4	Compute convolutions	10	Ap	F	PSO2	PO7
CO 5	Compute FFT	10	Ap	F	PSO2	PO7
CO 6	Compute discrete Fourier transform.	10	Ap	F	PSO2	PO7
CO 7	Compare different IIR systems	5	U	C	PSO2	PO1, PO7
CO 8	Compare different of FIR systems	5	U	C	PSO2	PO1, PO7

Module I **(10 Hrs)**

Signals – Various types and classifications – Uni-dimensional and multi dimensional-Analog, Discrete and Digital Signals- Energy and power signals, Causal and non causal signals- even and odd signals-Representation methods-Functional, Graphical, Tabular and Sequential Important test signals.
Mathematical operations on discrete time signals- signal as summation of impulses.

Laplace transformation-definition-properties- Fourier transform on discrete signals (DTFT) - definition-properties-Z transform-definition and its properties.

Module II **(20 Hrs)**

Definition-various classifications-Static & Dynamic, Time invariant & Time variant, Linear & Nonlinear, Causal & Non causal, Stable & Unstable, FIR & IIR, Recursive & Non recursive-

Excitation, response and Impulse response of system-their relations- transfer functions and its properties-Convolution- Linear and circular-their properties-sectioned convolution-overlap add and overlap save method.

Module III **(20 Hrs)**

DFT-definition-properties- relation between Z transform and DFT-computation techniques-FFT-radix 2 FFT-DIT FFT and DIF FFT- butterfly diagram- computation techniques.

Module IV **(10 Hrs)**

Filters: Comparison between Analog and Digital filters – comparison between FIR and IIR filters - IIR Filter Design by Impulse Invariance and Bilinear Transformation. Realization of IIR systems - Direct form I, Direct form II, Cascade representation and Parallel representation. Realization of FIR systems - Direct form representation and Cascade representation.

Self study topics:
Basics of MATLAB

Text Book

1. Digital Signal Processing by A.Nagoor Kani
2. Digital signal processing – Ramesh Babu.
3. Digital signal Processing by S Salivahan

References

1. Digital Signal Processing by Proakis & Manolokis

SIXTH SEMESTER				
Course code	**ELE6B15**			
Name of the course	**MICROWAVE THEORY AND TECHNIQUES**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
10	**Core Course**	**4:0:0**	**4**	**100** (Internal 20+ External 80)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand about microwave bands, spectrum and their applications.	10	U	C	PSO3	PO1
CO2	Identify different wave guides and principles of wave propagations.	10	U	F	PSO3	PO1, PO7
CO3	Understand the basics of transmission lines	5	U	C	PSO3	PO1
CO4	Compare Waveguide Tees	5	U	C	PSO3	PO1
CO5	Understand different microwave tubes	7	U	C	PSO3	PO1
CO6	Understand about velocity modulation and beam bunching	8	U	C	PSO3	PO1
CO7	Understand the principle of operation and performance of diodes	8	U	C	PSO3	PO1
CO8	Understand about Gunn effect and Gunn diode	7	U	C	PSO3	PO1

Module I **(20 Hrs)**

An introduction to Microwaves: Introduction, Frequency spectrum, Micro wave bands, Applications of microwaves in different fields, Plane waves and free space propagation, Guided waves-slow waves and fast waves- wave guides, rectangular wave guides, TE and TM waves, Transverse electromagnetic waves, group and phase velocities.

Module II **(10 Hrs)**

Basics of transmission lines and waveguides: Transmission lines and wave guides, Review of

transmission lines, Telegraph equations, group and phase velocities, characteristic impedance-open circuit, closed circuit, quarter wavelength and half wavelength lines, Standing wave ratio, VSWR, Reflection coefficient, Impedance matching, strip/microstrip transmission lines, microwave guides, propagation through wave guides, cut off frequency
and dispersion-wave and group velocity, Ridged waveguides-applications, cavity resonators design equations, Waveguide Tees, Magic Tees, Rat Race, Directional couplers, Isolators and circulators.

Module III **(15 Hrs)**

Microwave Linear beam tubes and Cross field devices: Microwave tubes, Introduction, limitations of conventional tubes, Transit time effects, Multi cavity Klystron, reentrant cavities, Velocity modulation and beam bunching, bunching diagrams, reflex klystron, magnetron, working of magnetron, travelling wave tubes-slow wave structures amplification mechanism, Forward and backward wave Cross field amplifiers-principle of operation-microwave characteristics.

Module IV **(15 Hrs)**

Transferred Electron devices and transit time devices: Microwave Semiconductor devices, Tunnel diodes- negative resistance-band theory for forward and reverse biasing, Schottky diodes, Point contact diodes, Varactor diodes, IMPATTT diode-structure-negative
Resistance-efficiency and output power, TRAPATT diode-principle of operation and performance, Gunn effect and Gunn diode-modes of operation-oscillation modes-, Applications.

Self-study topics:
Scattering matrix representation of microwave networks, properties of scattering matrices.

Text books

1. Microwave devices and circuits, Samuel Y. Lio (Prentice Hall)
2. Fundamentals of microwave engineering –Collins (Wiley India)
3. Electronic communication systems – Kennedy and Davis (Tata McGraw Hill)

SIXTH SEMESTER				
Course code	**ELE6B18**			
Name of the course	**COMMUNICATION SYSTEM LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
7	**Core Lab**	**0:0:2**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Construct the basic circuits of communication system.	5	Ap	P	PSO1	PO1,PO7
CO2	Design various pulse modulation schemes	15	Ap	P	PSO1	PO1,PO7
CO3	Analyze different analog modulation schemes.	15	Ap	P	PSO1	PO1,PO7
CO4	Design basic circuits using IC 555 and IC 741	10	Ap	P	PSO1	PO1,PO7

List of experiments:

1. Amplitude modulation and demodulation
2. Frequency Response of IF Amplifier
3. Mixer
4. Frequency Modulation and Demodulation
5. Pre-emphasis and De-emphasis
6. Pulse Amplitude Modulation & Demodulation
7. Pulse width Modulation and Demodulation
8. Pulse Position modulation and Demodulation
9. Voltage Controlled Oscillator using 555.
10. Study of TDM using IC
11. Amplitude Shift Keying
12. Frequency Shift Keying

SIXTH SEMESTER				
Course code	**ELE6B19**			
Name of the course	**PRINCIPLES OF DSP LAB**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
08	**Core Lab**	**0:0:2**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Familiarize DSP simulation software (MATLAB).	15	U	P	PSO2	PO1
CO2	Understand discrete time systems and their properties.	10	U	P	PSO2	PO1, PO7
CO3	Understand AM and FM signals	10	U	P	PSO2	PO1
CO4	Design FIR and IIR filters.	10	Ap	P	PSO2	PO1, PO7

List of experiments:

1. Familiarization with DSP simulation software
2. Generation Continuous time signals
3. Generation of AM and FM signals
4. Generation of Discrete time signals
5. Sampling and reconstruction
6. Mathematical Operations on discrete time signals
7. Discrete Time Systems - Checking for Linearity,Time invariance, and stability
8. Linear convolution and Circular convolution
9. Impulse response of LTI system
10. Impulse response from transfer function of the system
11. Computation of n-point DFT and IDFT
12. FIR and IIR filter design – Low pass, High Pass, Band Pass and Band Stop

SIXTH SEMESTER				
Course code	**ELE6B20**			
Name of the course	**INDUSTRIAL VISIT & PROJECT WORK**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
09	**Core Lab**	**0:0:3 (Industrial visit – 1 credit) (Project work- 2 credit)**	**4**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO5	**Compare the innovations in design of products, processes or systems.**	**10**	**U**	**P**	**PSO4**	**PO1, PO4, PO7**
CO6	**Manage the conduct of the research study and the ability to work in teams**	**25**	**C**	**M**	**PSO4**	**PO1, PO4, PO7**

PROJECT WORK:

Guide Lines

- This project work is the continuation of the project initiated in 5th semester.
- The performance of the students in the project work shall be assessed on a continuous basis by the project monitoring committee through progress seminars and demonstrations conducted during the semester.
- There shall be at least an Interim Evaluation (after 20 project hours of 6th semester) and a final evaluation of the project in the 6thsemester.
- Each project group has to submit an interim report in the prescribed format for the interim evaluation.

- Each project group should complete the project work within 45 project hours of the6th semester.
- Each student is expected to prepare a report in the prescribed format, based on the project work. Project report certified by the internal guide and head of the department is the eligibility for appearing end semester examination.
- Members of the group will present the relevance, design, implementation, and results of the project before the external and internal examiner.
- A committee of External examiner, Internal Examiner and Guide may conduct a viva – voce to examine the knowledge acquired by the student during their project work (not programme viva voce).

Distribution of Marks

Internal (20%)		**External (80%)**	
Components	**% of Marks**	***Components***	**% of Marks**
Punctuality and Log Book	20	Relevance of the Topic, Statement of Objectives, Methodology (Reference/ Bibliography)	20
Skill of doing project work	20	Presentation, Quality of	30
Scheme/Organization of Report	30		
		Analysis/Use of Statistical tools, Findings and recommendations	
Viva-Voce	30	Viva-Voce	50

SIXTH SEMESTER				
Course code	**ELE6B16a**			
Name of the course	**OPTICAL COMMUNICATION**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
01	**Elective Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand the basic optical fiber communication technology	15	U	C	PSO 1	PO 4
CO2	Understand attenuation, dispersion and weakening of optical signal	10	U	C	PSO 1	PO 1
CO3	Differentiate passive fiber optic devices	10	An	C	PSO 1	PO 4, PO 7
CO4	Classify different active fiber optic devices	10	U	C	PSO 1	PO 4

Module I **(15 Hrs)**

Advantages of optical Communication-Recollection of basic principles of optics transmitting light on a fiber, light propagation in fibers and characteristics, Critical angle - Total internal reflection.Classification of Fibers: Single mode and multimode Fibers, Step index and Graded index Fibers – Refractive Index profile - Effect of index profile on propagation - Acceptance angle - acceptance cone – Numerical aperture - Mode field diameter, Cut off wavelength

Module II **(10 Hrs)**

Signal degradation in optical fibers: Attenuation in single mode and multimode fibers- Absorption loss, scattering loss, Bending loss - Dispersion - Material dispersion, Waveguide dispersion, modal dispersion, Polarization mode dispersion - Band Width limitation.

Module III **(10 Hrs)**

Optic fiber couplers: types of couplers – Fiber to fiber joints: Splicing techniques- Fusion splice, V groove splice, Elastic tube splice - Optical fiber connectors -Structure of a connector Optical Communication System, point to point transmission systems, modulation, transmission system limits and characteristics, optical systems engineering.

Module IV **(10 Hrs)**

Optical sources and detectors: light production, LEDs, characteristics, lasers, DFB lasers, tunable DBR lasers, photoconductors, photodiodes, and phototransistors, Optical receiver - Optical amplifiers- SOAs – EDFAs

Text Books

1. G. Keiser, Optical Fiber Communications, 3/e, MGH2000
2. John M senior, Optic Fiber Communication, PHI.

References:

1. J.R. Dutton, Understanding Optical Communications, Prentice Hall, 1999.
2. D K Myabaev& L LScheiner, Fiber Optics Communications Technology, Pearson Education, 2001.
3. G.P. Agrawal, Fiber Optic Communication, John Wiley &Sons.
4. J H Franz & V.K Jain, Optical Communication, Narosa Publishing House, 2001.
5. Subir Kumar Sarkar, Optical Fibre and Fibre Optic Communication, S Chand & Co. Ltd.
6. Djafer K Mynbaev, Fibre Optic Communication technology, Pearson Education.

SIXTH SEMESTER				
Course code	**ELE6B16b**			
Name of the course	**INDUSTRIAL ELECTRONICS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
02	**Elective Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Identify power semiconductor devices	10	An	C	PSO 1	PO1
CO2	Understand different types of rectifiers	10	U	C	PSO 1	PO1
CO3	Distinguish various types of rectifiers, choppers and inverters	15	Ap	C	PSO 1	PO1
CO4	Illustrate the use of SMPS	5	R	C	PSO 1	PO 1, PO 4
CO5	Understand the working of UPS	5	R	C	PSO 1	PO 1, PO 4

Module I **(10 Hrs)**

Power semiconductor devices: Characteristics of SCR, gate trigger and communication circuits, series and parallel connection of SCRs, Diac, Triac, UJT, Power MOSFETS and IGBT.

Module II **(10 Hrs)**

Controlled Rectifier Half wave and full wave with resistive and inductive loads, Free– wheeling diode, three phase rectifier. Bridge rectifiers–half controlled and fully controlled.

Module III **(15 Hrs)**

DC choppers: Principle of chopper operation and control strategies, Step-up and step-down choppers, Types of chopper circuits, Voltage-commutated chopper, Current-commutated chopper, Load- commutated chopper. Inverters: single-phase voltage source inverters, Modified McMurray half- bridge and full-bridge inverter, Pulse-width modulated inverters, Series and Parallel inverter.

Module IV **(10 Hrs)**

Induction Heating, effect of frequencies and power requirements, Dielectric heating and applications. Applications of industrial electronics Switched mode power supply (SMPS), Uninterruptible power supplies, Solid state relays.

Text Books

1. Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, Pearson /PHI.
2. Dr. P. S. Bimbhra, Power Electronics, Khanna Publishers.

References

1. P. C. Sen, Power Electronics, Tata McGraw-Hill.
2. S.K. Dutta, Power Electronics and Control, PHI.
3. SN Biswas, Industrial Electronics, DhanpatRai& Sons, 2005.
4. C. W. Lander, Power Electronics, McGraw-Hill.

****Hands on Exercise**

Suggested Experiments:

1. Study of IV characteristics of SCR
2. SCR as half wave rectifier and full wave rectifier with R and RL loads
3. AC voltage controller using TRIAC with UJT triggering
4. Study of IV characteristics of DIAC
5. Study of IV characteristics of TRIAC

** The “hands on Exercise” may be considered for internal evaluation

SIXTH SEMESTER				
Course code	**ELE6B16c**			
Name of the course	**CONTROL SYSTEMS**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
03	**Elective Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES:

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	**Understand the classifications of control system .**	**4**	**U**	**C**	**PSO 3**	**PO 1**
CO2	**Understand the fundamentals of Laplace transform.**	**3**	**U**	**F**	**PSO 3**	**PO 7**
CO3	**Illlustrate overall gain using laplace transform, block diagram reduction and signal flow graph methods.**	**12**	**Ap**	**F**	**PSO 3**	**PO 1, PO 7**
CO4	**Understand the performance characteristics of control system**	**7**	**U**	**F**	**PSO 3**	**PO 7**
CO5	**Compute stability of the system using various methods.**	**13**	**Ap**	**F**	**PSO 3**	**PO 1**
CO6	**Illustrate various controllers and compensators**	**6**	**U**	**C**	**PSO 3**	**PO 1**

Module I **(7 Hrs)**

Basics of control system, classification of control system, open loop, closed loop, examples Servomechanism, feedback and feed forward system, Basics of Laplace Transform, Use of Laplace transform in control system.

Module II **(6 Hrs)**

Transfer function, Mathematical modeling of control system-electrical systems, servomotors, speed control system,Impulse response, poles, zeroes, pole-zero plot, order and type number

Module III **(13 Hrs)**

Block diagram representation; block diagram reduction, signal flow graph, Mason's gain formula,

Time response analysis, standard test signals, steady state error, Analysis of first and second order system. Time domain specifications.

Module IV **(19 Hrs)**

Frequency domain analysis, Frequency domain specifications, frequency response plots, Bode plot, polar plot, stability analysis, Routh Hurwitz criterion, Nyquist stability, concept of Root locus- Controllers –PI,PD,PID ,Compensators-Lag, lead, Lag-lead

Self Study topics:
Transfer function of Mechanical and rotational system.

Text Books
1. Control Systems – NagoorKani
2. Control System Engineering-U.A Bakshi , V.U Bakshi

SIXTH SEMESTER				
Course code	**ELE6B16d**			
Name of the course	**VERILOG & FPGA BASED SYSTEM DESIGN**			
Course No	**Course Category Core/Compli/ Elective**	**Number of Credits**	**Number of hours of Lectures/week**	**Total marks (Int+Ext)**
04	**Elective Course**	**3:0:0**	**3**	**75** (Internal 15+ External 60)

COURSE OUTCOMES :

CO	CO Statement	Hrs	Cognitive Level (CL)	Knowledge Category (KC)	PSO	PO
CO1	Understand combinational and sequential circuit elements.	10	U	C	PSO 2	PO1
CO2	Understand Finite state machines	5	U	C	PSO 2	PO1
CO3	Understand the principle of programmable logic device	5	U	C	PSO 2	PO7
CO4	Illustrate programmable logic devices architectures.	15	U	F	PSO 2	PO1
CO5	Practice Verilog HDL	10	Ap	F	PSO 2	PO 1, PO 7

Module I **(10 Hrs)**

Digital logic design flow. Review of combinational circuits. Combinational building blocks: multiplexers, demultiplexers, decoders, encoders and adder circuits. Review of sequential

circuit elements: flip-flop, latch and register.

Module II **(10 Hrs)**

Finite state machines: Mealy and Moore. Other sequential circuits: shift registers and counters. FSMD (Finite State Machine with Data path): design and analysis. Microprogrammed control. Memory basics and timing. Programmable Logic devices.

Module III **(15 Hrs)**

Evolution of Programmable logic devices.PAL, PLA and GAL.CPLD and FPGA architectures. Placement and routing. Logic cell structure, Programmable interconnects, Logic blocks and I/O Ports. Clock distribution in FPGA. Timing issues in FPGA design. Boundary scan.

Module IV **(10 Hrs)**

Verilog HDL: Introduction to HDL. Verilog primitive operators and structural Verilog, Behavioral Verilog. Design verification. Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design examples in Verilog.

References

1. LizyKurien and Charles Roth. Principles of Digital Systems Design and VHDL. Cengage Publishing. ISBN-13:978-8131505748
2. Palnitkar, Samir, Verilog HDL. Pearson Education; Second edition (2003).
3. Ming-Bo Lin. Digital System Designs and Practices: Using Verilog HDL and FPGAs. Wiley India Pvt Ltd. ISBN-13:978-8126536948
4. ZainalabedinNavabi. Verilog Digital System Design. TMH;2ndedition
5. Wayne Wolf. FPGA Based System Design. Pearson Education.
6. S. K. Mitra, Digital Signal processing, McGraw Hill,1998
7. VLSI design, Debaprasad Das, 2nd Edition, 2015, Oxford University Press.
8. D.J. Laja and S. Sapatnekar, Designing Digital Computer Systems with Verilog, Cambridge University Press,2015

****Hands on Exercise Suggested Experiments**

At least 08 experiments from following:

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full subtractor using basic and derived gates.
4. Design and simulation of a 4 bit Adder.
5. Multiplexer (4x1) and Demultiplexer using logic gates.
6. Decoder and Encoder using logic gates.
7. Clocked D, JK and T Flip flops (with Reset inputs)
8. 3-bit Ripple counter
9. To design and study switching circuits (LED blinkshift)

10. To design traffic light controller.
11. To interface a keyboard
12. To interface a LCD using FPGA
13. To interface multiplexed seven segment display.
14. To interface a stepper motor and DC motor.
15. To interface ADC0804.

** "Hands on Exercise" may be considered for Internal Evaluation

Reference Books:

1. W. Wolf, FPGA- based System Design, Pearson, 2004
2. U. Meyer Baese, Digital Signal Processing with FPGAs, Springer, 2004 • S. Palnitkar,
3. Verilog HDL– A Guide to Digital Design & Synthesis, Pearson,2003
4. Verilog HDL primer- J. Bhasker. BSP, 2003 II edition

MODEL QUESTION PAPERS

ST. THOMAS' COLLEGE (Autonomous), THRISSUR
FIRST SEMESTER BSc. ELECTRONICS MODEL QUESTION PAPER
ELE1B01: BASIC ELECTRONICS AND NETWORK THEOREMS

Time: 2 Hrs **MAX. MARKS: 60**

Section A

Answer the following Questions (1-12), each carries 2 marks **Ceiling: 20 Marks**

1. State Ohm's Law?
2. What is an UJT? Write any two applications.
3. Differentiate between ideal and real diode?
4. Draw the symbols of n channel Depletion MOSFET and NPN transistor?
5. Define charge and current?
6. Differentiate between open and short circuit?
7. What are passive components? Give egs.
8. State Thevenin's Theorem?
9. What is mass action law?
10. State KVL?
11. Determine the resistance and tolerance ratings for the following
    a. Brown , Black, Blue and Silver.
    b. Yellow, violet, Black and Gold.
12. State Superposition Theorem?

Section B

Answer the following Questions (13-19), each carries 5 marks **Ceiling: 30 Marks**

13. Differentiate between BJT and FET?
14. Explain Maximum Power Transfer Theorem with suitable applications?
15. What is the difference between direct current and alternating current?
16. What do you mean by a voltage division rule and a current division rule?
17. Discuss about diffusion and drift current in a semiconductor?
18. Explain the formation of depletion layer in a PN Junction?
19. Explain briefly the working of an Enhancement MOSFET?

Section C

Answer any onequestion (20-21), carries 10 marks **1x10=10 Marks**

20. Discuss briefly the construction and working of SCR?
21. Explain the VI characteristics of Zener diode with suitable diagrams and waveforms?

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PATTERN OF QUESTION PAPER (B.Sc. Core)

SEMESTER: First Semester

ELE1B01: Basic Electronics and Network Theorems

Contact Hours per Week : 1

Number of Credits : 2

Number of Contact Hours: 30 Hrs

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2 Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 60						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour: 6	Hour:6	Hour:9	Hour:9
			Marks:15	Marks:16	Marks:24	Marks:24
Expected Marks >>>>						
A	2	1.	2			
		2.				2
		3.			2	
		4.				2
		5.	2			
		6.	2			
		7.	2			
		8.		2		
		9.			2	
		10.		2		
		11.	2			
		12.		2		
B	5	13.				5
		14.		5		
		15.	5			
		16.		5		
		17.			5	
		18.			5	
		19.				5
C	10	20.				10
		21.			10	
Total Marks >>>>						79

ST. THOMAS' COLLEGE (Autonomous), THRISSUR
SECOND SEMESTER BSc. ELECTRONICS MODEL QUESTION PAPER
ELE2B02: ELECTRONIC CIRCUITS

Time: 2 Hrs **MAX. MARKS: 60**

Section A

Answer the following Questions (1-12), each carries 2 marks **Ceiling: 20 Marks**

1. Define stability factor?
2. Define line regulation and load regulation?
3. Write down the conditions for proper biasing of a transistor?
4. Write any two difference between voltage amplifier and power amplifier?
5. Draw the circuit of RC phase shift oscillator ?
6. What are the factors which affect the frequency stability of an oscillator?
7. Differentiate between voltage series and voltage shunt feedback connection?
8. Why bias stabilization is not needed in common base circuit?
9. What is a clamping circuit?
10. Differentiate between positive feedback and negative feedback?
11. What are hybrid parameters?
12. Give the two Bark Hausen conditions required for sinusoidal oscillations to be sustained?

- Section B

Answer the following Questions (13-19), each carries 5 marks **Ceiling: 30Marks**

13. Explain self biascircuit ?
14. Compare the characteristics of three rectifier circuits?
15. What is a tuned voltage amplifier? Explain it briefly.
16. Explain zener diode Series regulator using necessary circuit?
17. Compare Class A, Class B and Class C amplifiers?
18. Explain briefly Hartelyoscillator circuit?
19. Derive the ripple factor of fullwave rectifier?

Section C

Answer any one question (20-21), carries 10 marks **1x10=10 Marks**

20. With the help of neat circuit diagram and waveform explain astablemultivibrator?
21. Explain any one type of fullwave rectifier with and without filter?

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PATTERN OF QUESTION PAPER (B.Sc. Core)

SEMESTER: Second Semester

ELE2B02: Electronic Circuits

Contact Hours per Week : 1

Number of Credits : 2

Number of Contact Hours: 30 Hrs

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2 Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 60						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour:12	Hour:6	Hour:6	Hour:6
			Marks:29	Marks:15	Marks:16	Marks:19
Expected Marks >>>>						
A	2	1		2		
		2	2			
		3		2		
		4			2	
		5				2
		6		2		
		7			2	
		8		2		
		9	2			
		10			2	
		11		2		
		12				2
B	5	13		5		
		14	5			
		15			5	
		16	5			
		17			5	
		18				5
		19	5			
		20				10
C	10	21	10			
Total Marks >>>>						79

ST. THOMAS' COLLEGE (Autonomous), THRISSUR
THIRD SEMESTER B.Sc. ELECTRONICS MODEL QUESTION PAPER

ELE3B05- Digital Electronics

Time: 2Hrs **MAX. MARKS: 60**

Section A

Answer the following Questions (1-12), each carries 2 marks **Ceiling: 20 Marks**

1. Add the binary Numbers i) 10111 + 11011 ii) 110011 + 100011
2. Explain the self-complementing property of Excess-3 code.
3. Write De Morgan's theorems.
4. Draw the full subtractor circuit.
5. Explain the basic difference between a multiplexer and a decoder.
6. Explain Priority Encoder.
7. Draw a 1 – line to 4 – line de-multiplexer.
8. What is the basic difference between a latch and a flip flop?
9. Explain Race-around condition in JK Flip.
10. Mention the applications of Counters.
11. Define resolution of an ADC.
12. Draw flash type ADC.

Section B

Answer the following Questions (13-19), each carries 5 marks **Ceiling: 30Marks**

13. Simplify the given expression using K- map.

$$\bar{A}\bar{B}\bar{C} + A\bar{B}D + \bar{A}CD + A\bar{B}\bar{D} + \bar{A}\bar{B}C\bar{D} + ABC\bar{D}$$

14. Write short note on Gray code and Excess-3 code.
15. Explain half adder and full adder circuit.
16. With the help of necessary diagram explain the operation of a 1 to 16 de-multiplexer.
17. Explain Parallel-in Serial-out Shift Register.
18. Explain the working of a Johnson counter.
19. Explain R-2R Ladder DAC.

Section C

Answer any one question (20-21), carries 10 marks **1x10=10 Marks**

20. Realize and explain the Universal property of NAND and NOR gates.
21. Explain the working of edge triggered J K flip flop with truth table.

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PATTERN OF QUESTION PAPER (B.Sc. Core)
SEMESTER: Third Semester

ELE3B05- Digital Electronics

Contact Hours per Week : 4

Number of Credits : 3

Number of Contact Hours: 60 Hrs

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 60						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour:18	Hour:12	Hour:16	Hour:14
			Marks:26	Marks:16	Marks:21	Marks:16
Expected Marks >>>>						
A	2	1.	2			
		2.	2			
		3.	2			
		4.		2		
		5.		2		
		6.		2		
		7.			2	
		8.			2	
		9.			2	
		10.				2
		11.				2
		12.				2
B	5	13.	5			
		14.	5			
		15.		5		
		16.		5		
		17.			5	
		18.				5
		19.				5
C	10	20.	10			
		21.			10	
Total Marks >>>>						79

ST. THOMAS' COLLEGE (Autonomous), THRISSUR
FOURTH SEMESTER B.Sc. ELECTRONICS MODEL QUESTION PAPER

ELE4B06- Analog Integrated Circuits

Time: 2 Hrs **MAX. MARKS: 60**

Section A
Answer the following Questions (1-12), each carries 2 marks Ceiling: 20 Marks

1. Mention the characteristics of an ideal Op-amp?
2. .Draw the voltage transfer curve of an Op-Amp?
3. What is meant by a practical differentiator circuit?
4. Draw and explain the internal diagram of IC 555.
5. Explain the working of Square wave generator using Op-amp.
6. Draw the non-inverting Op-Amp configuration.
7. What is meant by an 'All pass filter'?
8. Define a filter? How are filters classified?
9. Draw the circuit diagram of first order low pass filter.
10. Why we are using feedback in Op-amp circuits?
11. What is the difference between 78XX and 79XX IC'S?
12. What is sample and hold circuit?

Section B
Answer the following Questions (13-19), each carries 5 marks Ceiling: 30 Marks

13. For an Op-Amp CMRR=10^5 and differential gain= 10^5 determine the common mode gain?
14. Explain about Wien bridge Oscillator.
15. Explain Op-Amp as a differentiator.
16. Draw and explain the 555 timer IC.
17. Explain BP filters using op-Amp.
18. Explain inverting and non-inverting configurations of summing amplifier.
19. With the help of diagram discuss the working of SMPS?

Section C
Answer any one question (20-21), carries 10 marks 1x10=10 Marks

20. Explain the working of Schmitt trigger with Hysteresis characteristics.
21. Explain the block diagram of PLL in detail?

****

PATTERN OF QUESTION PAPER (BSc CORE)
SEMESTER: fourth Semester

ELE4B06- Analog Integrated Circuits

Contact Hours per Week : 4

Number of Credits : 3

Number of Contact Hours: 60 Hrs

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2 Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 60						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour: 20	Hour:14	Hour:14	Hour:12
			Marks:25	Marks:18	Marks:19	Marks:17
Expected Marks >>>>						
A	2	1.	2			
		2..	2			
		3.	2			
		4.			2	
		5.		2		
		6.	2			
		7.		2		
		8.		2		
		9.		2		
		11.	2			
		13.				2
		14.			2	
B	5	16.	5			
		17.		5		
		18.	5			
		19.			5	
		20.		5		
		21.	5			
		22.				5
		23.			10	
		24.				10
Total Marks >>>>						79

ST. THOMAS' COLLEGE (Autonomous) ,THRISSUR
FIFTH SEMESTER BSc. ELECTRONICS MODEL QUESTION PAPER
ELE5B10: ELECTROMAGNETIC THEORY

Time: 2.5 Hrs **MAX MARKS: 80**

Section A

Answer the following Questions (1-15), each carries 2 marks Ceiling: 25 Marks

1. Define magnetic flux density?
2. Determine the capacitance of parallel plate capacitor?
3. Differentiate between electrostatic field and magnetic field?
4. State Faraday's induction law?
5. State Coulomb's law?
6. Define Field ?eg.
7. What do you meant by TEM waves?
8. What is meant by equipotential surface?
9. State Ampere's work law?
10. Define electric field strength?
11. What is meant by direction cosine of a vector?
12. What is the equation of continuity for a time varying field?
13. Define Dot Product? eg.
14. Give mathematical representation of two vector integral theorems?
15. State Poynting Theorem?

Section B

Answer the following Questions (16-23), each carries 5 marks Ceiling: 35 Marks

16. Derive Poisson's and Laplace's Equation?
17. Explain physical interpretation of Gradient?
18. Find the potential V at the point P of field of an infinitesimal Electric Dipole?
19. Obtain the solution of wave equations in a conducting medium?
20. Give the expression for energy stored in electric and magnetic field?
21. Explain Ampere's Circuit Theorem?
22. Explain boundary conditions for magnetostatic fields?
23. Explain briefly various antenna parameters ?

Section C

Answer any two Questions (24-27), each carries 10 marks 2x10=20 Marks

24. Explain the physical interpretation of divergence and curl in rectangular coordinate systems?
25. State Gauss's law and explain it?
26. Explain Ampere's law for a current law and Ampere's force law ?
27. Obtain Maxwell's electromagnetic field equations from fundamental concepts of electrostatics and magnetostatics. Explain the significance of each equations?

****

PATTERN OF QUESTION PAPER (B.Sc. Core)

SEMESTER: Fifth Semester

ELE5B10: Electromagnetic Theory

Contact Hours per Week : 4

Number of Credits : 4

Number of Contact Hours: 60 Hrs

Course Evaluation : External 80 Marks + Internal 20 Marks

Duration of Exam : 2.5 Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 80						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour:14	Hour:16	Hour:15	Hour:15
			Marks:23	Marks:30	Marks:29	Marks:28
Expected Marks >>>>						
A	2	1.			2	
		2.		2		
		3.		2		
		4.				2
		5.		2		
		6.	2			
		7.				2
		8.		2		
		9.			2	
		10.		2		
		11.	2			
		12.				2
		13.	2			
		14.	2			
		15.				2
B	5	16.		5		
		17.	5			
		18.		5		
		19.				5
		20.			5	
		21.			5	
		22.			5	
		23.				5
C	10	24.	10			
		25.		10		
		26.			10	
		27.				10
Total Marks >>>>						110

ST. THOMAS' COLLEGE (AUTONOMOUS), THRISSUR
FOURTH SEMESTER B.SC ELECTRONICS MODEL QUESTION PAPER

ELE5B11 - Microcontroller & Interfacing

Hours: 2 Hrs **TOTAL MARKS: 60**

SECTION A

Answer the following questions (1-12) each carries 2 marks (ceiling 20 marks)

1. Distinguish between microprocessor and microcontroller.
2. What is a program counter?
3. Draw PSW register bits.
4. Distinguish between JUMP and CALL instruction.
5. Explain PUSH and POP instructions.
6. What is SWAP instruction? Explain using an example.
7. What is stack and stack pointer.
8. List out the various timer modes
9. Explain about subroutine.
10. Explain about bit addressable memory in RAM.
11. What is a PIR sensor?
12. Mention the features of Arduino.

SECTION B

Answer the following questions (13-19); each carries 5 marks (ceiling 30 marks)

13. Explain the byte and bit addressable area of 8051.
14. Explain the internal RAM organization of 8051 microcontroller.
15. Write a program to find a square of a number.
16. Explain about IE register.
17. Explain different serial modes of operation.
18. Briefly explain about different types of sensors used to interface with Arduino.
19. Explain the interfacing of an 8 bit LCD to Arduino.

SECTION C

Answer any two questions (20-21), each carries 10 marks (1x10=10marks)

20. Explain the architecture of 8051 with its diagram.
21. Writ an ALP to find multiplication of two 8- bit data

****

PATTERN OF QUESTION PAPER (B.Sc. CORE)
SEMESTER: Fifth Semester
ELE5B11: MICROCONTROLLER & INTERFACING

Contact Hours per Week : 4

Number of Credits : 3

Number of Contact Hours: 60

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 60						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour:17	Hour:17	Hour:13	Hour:13
			Marks:26	Marks:23	Marks:16	Marks:14
Expected Marks >>>>						
A	2	1.	2			
		2.	2			
		3.	2			
		4.		2		
		5.		2		
		6.		2		
		7.		2		
		8.			2	
		9.			2	
		10.			2	
		11.				2
		12.				2
B	5	13.	5			
		14.	5			
		15.		5		
		16.			5	
		17.			5	
		18.				5
		19.				5
C	10	20.	10			
		21.		10		
Total Marks >>>>						79

ST. THOMAS' COLLEGE (Autonomous) THRISSUR
FIFTH SEMESTER B.Sc. ELECTRONICS MODEL QUESTION PAPER

ELE5B12 - Network Theory

Time: 2.5 Hrs **MAX MARKS: 80**

Section A

Answer the following Questions (1-15), each carries 2 marks **Ceiling: 25 Marks**

1. Write current division and voltage division rules?
2. What is average power and apparent power?
3. Distinguish between mesh and node.
4. Explain source transformation.
5. Explain standard input signals.
6. What are the applications of tuned circuits?
7. Distinguish between circuit and network?
8. Write Kirchhoff's voltage law?
9. Distinguish between linear and non-linear networks?
10. Define power factor?
11. Classify dependent sources?
12. What is super node?
13. Explain about star-delta transformation.
14. What is magnetic coupling? List any one application.
15. Define time constant of a parallel RC circuit.

Section B

Answer the following Questions (16-23), each carries 5 marks **Ceiling: 35Marks**

16. Explain the concept of duality of a network.
17. Explain node analysis with example.
18. Explain the D.C. transient response of a series R-C circuit.
19. Explain the sinusoidal response of a series R-L circuit.
20. Write Voltage –Current relationships in passive circuit elements?
21. Derive the expression for resonance frequency of series RLC circuit.
22. Define the terms Phasor and Complex impedance.
23. Explain different passive filter characteristics.

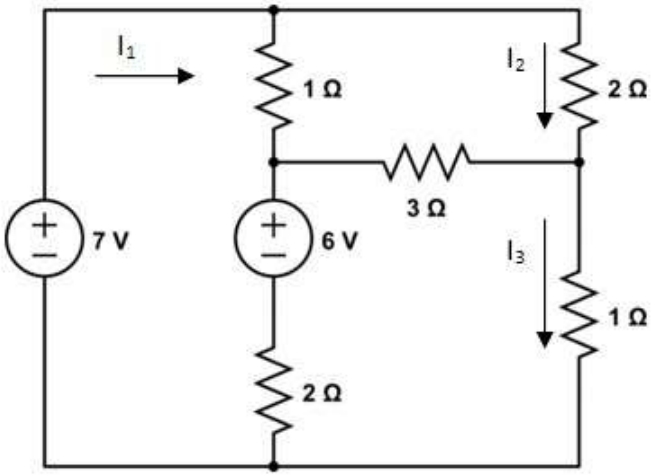
Section C

Answer any two Questions (24-27), each carries 10 marks **2x10=20 Marks**

24. Classify passive filters. Design a constant k- high pass filter (T and π-section), having f_c = 2 kHz and a load resistance of 500 Ω.

25. Explain the D.C. transient response of a series R-L-C circuit.

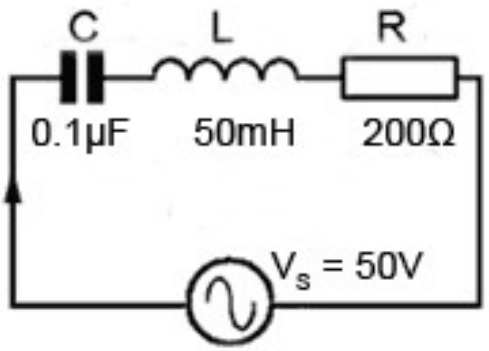
26. Find loop currents I_1, I_2, I_3 using mesh analysis.



27.

a) Explain about the variation of current and impedance with frequency in the case of a series resonant circuit.

b) Determine the value of resonant frequency, Q and bandwidth of the series RLC circuit given below.



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PATTERN OF QUESTION PAPER (BSc CORE)

SEMESTER: Fifth Semester

ELE5B12 - Network Theory

Contact Hours per Week : 4
Number of Credits : 4
Number of Contact Hours: 60Hrs
Course Evaluation : External 80 Marks + Internal 20 Marks
Duration of Exam : 2.5 hr

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 80						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour: 20	Hour: 13	Hour: 12	Hour:15
			Marks:42	Marks:17	Marks:19	Marks:32
Expected Marks >>>>						
A	2	1.	2			
		2.			2	
		3.	2			
		4.	2			
		5.	2			
		6.				2
		7.	2			
		8.	2			
		9.	2		2	
		10.				
		11.	2			
		12.	2			
		13.	2			
		14.	2			
		15.		2		
B	5	16.	5			
		17.	5			
		18.		5		
		19.			5	
		20.			5	
		21.				5
		22.			5	
		23.				5
C	10	24.				10
		25.		10		
		26.	10			
		27.				10
Total Marks >>>>						110

ST THOMAS COLLEGE (AUTONOMOUS), THRISSUR
FIFTH SEMESTER B.Sc ELECTRONICS DEGREE EXAMINATION MODEL QUESTION PAPER

OPEN COURSE-ELECTRONICS

ELE5D02 Digital Fundamentals

TIME: - 2 hrs **TOTAL- 60 MARKS**

Answer all the questions-(2 marks each) Ceiling 20- marks

1. Convert $(25)_{16}$ to Binary
2. Draw the truth table and symbol for AND gate.
3. Explain De Morgan's law.
4. Write a short note on BCD?
5. Draw the diagram of S-R flip flop.
6. Using Boolean techniques simplify the expression AB+A (B+C) +B (B+C)
7. Write the 2's complement of $(25)_{10?}$
8. Write the 2's complement of $(10)_{10?}$
9. Draw the truth table and symbol for XOR gate.
10. Explain De Morgan's law.
11. Write a short note on Hexadecimal number system?
12. Draw the diagram of D flips flop

Answer all the questions - (5 markseach) Ceiling 30- marks

13. Explain about Half adder and Full adder.
14. Write a short note T and D flip flops?
15. Write a short note on basic shift registers?
16. Write a short note S-R flip flop?
17. Write a short note on AND gates?
18. Design an OR gate using NAND gates?
19. Convert the given SOP to standard form and write its corresponding truth table
    AB+ C'D'+ ABC'+ DB'

Answer any one - (10 marks)(1x10=10 Marks)

20. Explain in detail the concepts of logic gates with truth table and necessary diagram.
21. Discuss in detail about different counters in digital electronics.

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PATTERN OF QUESTION PAPER (BSc ELECTRONICS OPEN COURSE)
SEMESTER: FIFTH SEMESTER
ELE5D02: Digital Fundamentals

Contact Hours per Week : 3

Number of Credits : 3

Number of Contact Hours: 45 Hrs

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2 Hrs

Module Blue Print For Question Paper Setting / Scrutiny					
Maximum Mark: 60					
Question Paper			Syllabus		
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE: 3
			Hour:20	Hour:10	Hour:15
			Marks:38	Marks:12	Marks:29
Expected Marks >>>>					
A	2	1.	2		
		2.	2		
		3.	2		
		4.	2		
		5.			2
		6.		2	
		7.	2		
		8.	2		
		9.	2		
		10.	2		
		11.	2		
		12.			2
B	5	13.		5	
		14.			5
		15.			5
		16.			5
		17.	5		
		18.	5		
		19.		5	
C	10	20.	10		
		21.			10
Total Marks >>>>					79

ST. THOMAS' COLLEGE (Autonomous) THRISSUR
SIXTH SEMESTER BSc. ELECTRONICS MODEL QUESTION PAPER

ELE6B13: COMMUNICATION SYSTEM

Time: 2.5 Hrs **MAX. MARKS: 80**

Section A
Answer the following Questions (1-15), each carries 2 marks Ceiling: 25 Marks

1. Distinguish between FDMA and TDMA
2. Derive the expression for total modulation index in case of modulation by sine waves
3. List out the various layers in ionosphere
4. Distinguish between narrow band and wide band FM
5. Explain companding law
6. What is modulation and its need?
7. What is an AGC?
8. Mention the mathematical representation of FM
9. What is amplitude modulation?
10. Explain amplitude limiting
11. What is amplitude shift keying?
12. Write a note on discriminator circuit
13. What is skip distance?
14. Why modulation is important in communication?
15. What is noise triangle?

- Section B
Answer the following Questions (16-23), each carries 5 marks Ceiling: 35Marks

16. With a neat diagram explain balanced modulator circuit for generation of DSBSC AM
17. Explain propogation of waves in free space
18. Compare wide band and narrow band FM
19. Explain pre-emphasis and de-emphasis in FM with neat diagram
20. What is PCM?
21. Explain TDMA and CDMA
22. What is image frequency? Define image frequency rejection ratio
23. Write a note on SSB techniques

Section C
Answer any two Questions (24-27), each carries 10 marks 2x10=20 Marks

24. Describe in detail about different digital modulation techniques
25. Explain discriminator circuits for FM demodulation using neat diagram
26. Illustrate superheterodyne receiver with a neat diagram
27. What are the methods for generation of SSB SC wave?Explain with necessary diagrams

****

PATTERN OF QUESTION PAPER (B.Sc. Core)

SEMESTER: Sixth Semester

ELE6B13:COMMUNICATION SYSTEM

Contact Hours per Week : 4

Number of Credits : 4

Number of Contact Hours: 60Hrs

Course Evaluation : External 80 Marks + Internal 20 Marks

Duration of Exam : 2.5 hr

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 80						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour:15	Hour:15	Hour:15	Hour:15
			Marks:28	Marks:28	Marks:28	Marks:26
Expected Marks >>>>						
A	2	1.				2
		2.	2			
		3.			2	
		4.		2		
		5.				2
		6.	2			
		7.			2	
		8.		2		
		9.	2			
		10.			2	
		11.				2
		12.		2		
		13.			2	
		14.	2			
		15.		2		
B	5	16.	5			
		17.			5	
		18.		5		
		19.		5		
		20.				5
		21.				5
		22.			5	
		23.	5			
C	10	24.				10
		25.		10		
		26.			10	
		27.	10			
Total Marks >>>>						110

ST.THOMAS' COLLEGE (AUTONOMOUS), THRISSUR.
SIXTH SEMESTER B.Sc. ELECTRONICS EXAMINATION-2019

ELE6B14-PRINCIPLES OF DSP

Time: 2.5 Hours MAX. MARKS:80

SECTION A

Answer the following questions (1-15), each carries 2 marks ceiling: 25 Marks

1. Explain about Direct form I and Direct form II of IIR systems.
2. Differentiate energy and power signal
3. What do you meant by the term causal and non-causal
4. Explain about even and odd signal.
5. Explain the relation between z transform and DFT.
6. Explain about butterfly diagram
7. Differentiate FIR and IIR filter
8. Compare analog and digital filters
9. Mention different representation methods of signals.
10. Describe different test signals.
11. What do you meant by the term cascade and parallel representation
12. Explain Laplace transform
13. What do you meant by the term DTFT
14. Define Z-Transform and it's properties
15. Explain any two properties of Laplace transform

SECTION B

Answer the following questions (16-23),each carries 5 marks**ceiling:35 Marks**

16. Explain about DFT and its properties.
17. Brief description about DFT computation techniques.
18. Compute 4 point DFT of sequence x(n)= { 0,1,2,3} using matrix multiplication method
19. Find the circular convolution of x1(n)= { 1,-1,-2,3,-1}, x2(n)= {1,2,3} using matrix multiplication method
20. Explain Parseval's theorem
21. Explainlinear and circular convolution.
22. Explain overlap add method
23. Brief description about FFT

SECTION C

Answer any ***two*** questions. (24-27),each carries 10 marks 2*10=20 Marks

24. Perform linear convolution of system which has h(n)={1,1,1,2}, and x(n)= {3,-1,0,1,3,2,0,1,2,1} using overlap add method
25. Find 8 point DFT of the sequence x(n)= {2,2,2,2,1,1,1,1} by radix 2 DIT FFT

26. Obtain direct form I and direct form II realization for the system

$$y(n) = x(n)+.5x(n-1)+.4x(n-2)-.6y(n-1)-.7y(n-2)$$

27. Explain overlap save method with suitable example

****

PATTERN OF QUESTION PAPER (B.Sc. Core)

SEMESTER: First Semester

ELE6B14-PRINCIPLES OF DSP

Contact Hours per Week : 4

Number of Credits :4

Number of Contact Hours:60Hrs

Course Evaluation : External 80 Marks + Internal 20 Marks

Duration of Exam : 2.5 hr

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 80						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour:10	Hour:20	Hour:20	Hour:10
			Marks: 18	Marks: 40	Marks: 34	Marks: 18
Expected Marks >>>>						
A	2	1.				2
		2.	2			
		3.	2			
		4.	2			
		5.			2	
		6.			2	
		7.				2
		8.				2
		9.	2			
		10.	2			
		11.				2
		12.	2			
		13.	2			
		14.	2			
		15.	2			
B	5	16.			5	
		17.			5	
		18.			5	
		19.		5		
		20.		5		
		21.		5		
		22.		5		
		23.			5	
C	10	24.		10		
		25.			10	
		26.				10
		27.		10		
Total Marks >>>>						110

ST.THOMAS' COLLEGE (AUTONOMOUS), THRISSUR.
SIXTH SEMESTER B.Sc. ELECTRONICS EXAMINATION-2019

ELE6B15-MICROWAVE THEORY AND TECHNIQUE

Time: 2.5 Hours MAX. MARKS:80

SECTION A

Answer the following questions (1-15), each carries 2 marks ceiling: 25 Marks

1. Explain electromagnetic frequency spectrum
2. Describe microwave bands
3. What do you meant by slow waves and fast waves
4. Write any two applications of microwaves
5. Explain point contact diodes
6. Explain the oscillation modes
7. Differentiate forward and backward wave cross field amplifiers
8. Explain the limitations of conventional tubes
9. Explain Multi cavity klystron
10. Explain tunnel diode
11. Define velocity modulation and beam bunching
12. Explain reentrant cavities
13. Explain about band theory for forward and reverse biasing
14. Define Microwave tubes
15. Explain Varactor diode

SECTION B

Answer the following questions (16-23),each carries 5 marks**ceiling:35 Marks**

16. Explain about the transverse electromagnetic waves
17. Explain phase and group velocities
18. Explain Telegraph equations
19. Brief description about magic Tees
20. Explain VSWR
21. Brief description about reflex klystron
22. Explain the characteristics of microwave
23. Explain slow wave structures amplification mechanism.

SECTION C

Answer any ***two*** questions. (24-27),each carries 10 marks 2*10=20 Marks

24. Explain plane wave and free space propagation
25. Explain about TE and TM waves
26. Explain about Gunn effect and Gunn diode
27. Brief description about Schottky diodes

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PATTERN OF QUESTION PAPER (B.Sc. Core)

SEMESTER: First Semester

ELE6B15- MICROWAVE THEORY AND TECHNIQUES

Contact Hours per Week : 4

Number of Credits :4

Number of Contact Hours: 60Hrs

Course Evaluation : External 80 Marks + Internal 20 Marks

Duration of Exam : 2.5 hr

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 80						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1 Hour:20 Marks: 38	MODULE:2 Hour:10 Marks: 15	MODULE:3 Hour:15 Marks: 27	MODULE:4 Hour:15 Marks: 30
Expected Marks >>>>						
A	2	1.	2			
		2.	2			
		3.	2			
		4.	2			
		5.				2
		6.				2
		7.			2	
		8.			2	
		9.			2	
		10.				2
		11.			2	
		12.			2	
		13.				2
		14.			2	
		15.				2
B	5	16.	5			
		17.	5			
		18.		5		
		19.		5		
		20.		5		
		21.			5	
		22.			5	
		23.			5	
C	10	24.	10			
		25.	10			
		26.				10
		27.				10
Total Marks >>>>						110

ST. THOMAS' COLLEGE (Autonomous), THRISSUR
SIXTH SEMESTER BSc. ELECTRONICS MODEL QUESTION PAPER
ELE6B16c: CONTROL SYSTEMS

Time: 2 Hrs **MAX MARKS: 60**

Section A

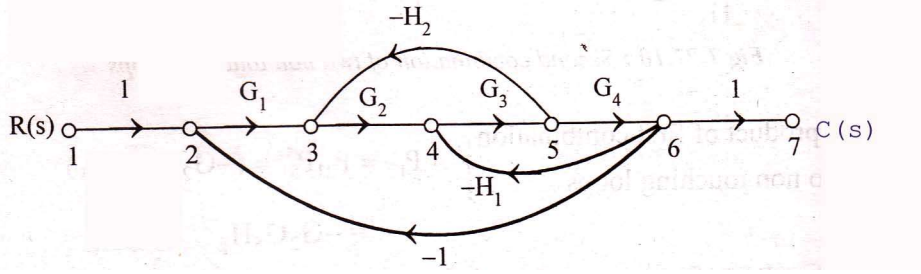
Answer the following Questions (1-12), each carries 2 marks **Ceiling: 20 Marks**

1. State Routh stability criterion?
2. Define damping ratio?
3. What is final value theorem?
4. Write some uses of Laplace Transform in control system?
5. Define Poles and Zeros?
6. What is BIBO stability?
7. Define Gain Margin?
8. Define Transfer function?
9. What are Compensators?
10. Define Resonant Peak?
11. What is a Servomechanism?
12. State Mason's gain formula?

Section B

Answer the following Questions (13-19), each carries 5 marks **Ceiling: 30Marks**

13. Determine the range of K for the stability of unity feedback system whose open loop transfer function is **G(s) =K / s (s+1) (s+2)**
14. What is Bode plot? Draw the bode plot of **K/s**.?
15. Define pole zero plot? Locate poles and zeros on pole zero plot for the equation given below. **G(s) = (s ^{2} + 6s + 25) /s (s+1) (s+2).**
16. Differentiate between feedback and feed forward system?
17. Show that type 0 system will have a constant steady state error when the input is unit step signal?
18. Find the overall gain **C(s)/R(s)** for the signal flow graph shown in figure given below.



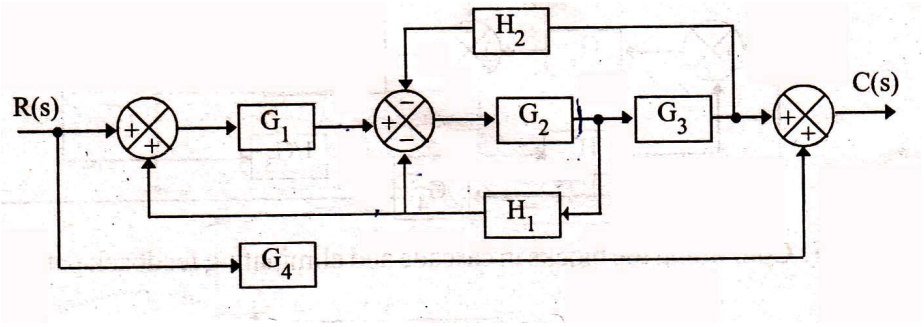
19. Explain closed loop system? List its advantages and disadvantages.

Section C

Answer any one question (20-21), each carries 10 marks **1x10=10 Marks**

20. Explain PI, PD and PID controllers?

21. Reduce the block diagram and find **C(s) / R(s).**



PATTERN OF QUESTION PAPER (BSc CORE)

SEMESTER: Sixth Semester

ELE6B16c: Control Systems

Contact Hours per Week : 3

Number of Credits : 3

Number of Contact Hours: 45 Hrs

Course Evaluation : External 60 Marks + Internal 15 Marks

Duration of Exam : 2 Hrs

Module Blue Print For Question Paper Setting / Scrutiny						
Maximum Mark: 60						
Question Paper			Syllabus			
Sections or Parts	Mark	Question Numbers	MODULE:1	MODULE:2	MODULE:3	MODULE:4
			Hour: 7	Hour:6	Hour:13	Hour:19
			Marks:16	Marks:14	Marks:19	Marks:30
Expected Marks >>>>						
A	2	1.				2
		2.			2	
		3.	2			
		4.	2			
		5.		2		
		6.				2
		7.				2
		8.		2		
		9.				2
		10.				2
		11.	2			
		12.			2	
B	5	13.				5
		14.				5
		15.		5		
		16.	5			
		17.		5		
		18.			5	
		19.	5			
C	10	20.				10
		21.			10	
Total Marks >>>>						79

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