KANNUR UNIVERSITY

(Abstract)

B Sc Electronics Programme-Scheme, Syllabus and Pattern of Question Papers of Core, Complementary Elective and Generic Elective Course under Choice Based Credit and Semester System (Outcome Based Education System-OBE) in Affiliated colleges with effect from 2019 Admission-Implemented-Orders issued.

Academic Branch

No.Acad.C2/12833/2019 Civil Station P.O Dated 21/06/2019

Read:- 1. U.O.No.Acad.C2/429/2017 dated 10-10-2017
2. The Minutes of the Meeting of the Curriculum Restructuring Committee held on 28-12-2018.
3. U.O No. Acad.C2/429/2017 Vol.II dated 03-06-2019
4. The Minutes of the Meeting of the Board of Studies in Electronics (Cd) held on 07/06/2019
5. Syllabus of Electronics programme Submitted by the Chairperson, Board of Studies in Electronics (Cd) dated 18-06-2019

ORDER

1. A Curriculum Restructuring Committee was constituted in the University vide the paper read (1) above to co-ordinate the activities of the Syllabus Revision of UG programmes in Affiliated colleges of the University.

2. The meeting of the Members of the Curriculum Restructuring Committee and the Chairpersons of different Boards of Studies held, vide the paper read (2) above, proposed the different phases of Syllabus Revision processes such as conducting the meeting of various Boards of Studies ,Workshops, discussion etc.

3. The Revised Regulation for UG programmes in Affiliated colleges under Choice Based Credit and Semester System (in OBE-Outcome Based Education System) was implemented with effect from 2019 Admission as per paper read (3) above.

4. Susequently as per paper read (4) above, the Board of Studies in Electronics (Cd) finalized the Scheme, Syllabus & Pattern of Question Paper for Core, Complementary Elective & Generic Elective Course of B Sc Electronics Programme to be implemented with effect from 2019 Admission.

5. As per paper read (5) above, the Chairperson, Board of Studies in Electronics (Cd) has submitted the finalized copy of the Scheme, Syllabus & Pattern of Question Papers of B Sc Electronics Programme for implementation with effect from 2019 Admission.

6. The Vice Chancellor after considering the matter in detail and in exercise of the powers of the Academic Council conferred under Section 11(i) of Kannur University Act 1996 and all other enabling provisions read together with accorded sanction to implement the Scheme, Syllabus & Pattern of Question Paper(Core/Complementary Elective/Generic Elective Course) of B Sc Electronics programme under Choice Based Credit and Semester System(in OBE-Outcome Based Education System) in the Affiliated colleges under the University with effect from 2019 Admission, subject to reporting before the Academic Council.

7. The Scheme, Syllabus & Pattern of Question Paper of B Sc Electronics Programme are uploaded in the University website (www.kannuruniversity.ac.in)

Orders are issued accordingly.

Sd/-
DEPUTY REGISTRAR (ACADEMIC)
for REGISTRAR

To

The Principals of Colleges offering B Sc Electronics programme

Copy to: -

1. The Examination Branch (through PA to CE)
2. The Chairperson, Board of Studies in Electronics (Cd)
3. PS to VC/PA to PVC/PA to Registrar
4. DR/AR-I, Academic
5. The Computer Programmer (for uploading in the website)
6. SF/DF/FC

KANNUR UNIVERSITY * CIVIL STATION P.O. KANNUR Pin-670 002 * THAVAKKARA *

Forwarded/By Order

SECTION OFFICER

KANNUR UNIVERSITY

BOARD OF STUDIES, ELECTRONICS (Cd)

SYLLABUS FOR ELECTRONICS CORE, COMPLEMENTARY ELECTIVE COURSE* AND GENERAL AWARENESS COURSE *FOR B.ScELECTRONICS PROGRAMME AND GENERIC ELECTIVE COURSES

CHOICE BASED CREDIT AND SEMESTER SYSTEM

(2019 ADMISSION ONWARDS)

Kannur University

Vision and Mission Statement

KANNUR UNIVERSITY

VISION AND MISSION STATEMENTS

Vision: To establish a teaching, residential and affiliating University and to provide equitable and just access to quality higher education involving the generation, dissemination and a critical application of knowledge with special focus on the development of higher education in Kasargode and Kannur Revenue Districts and the ManandavadyTaluk of Wayanad Revenue District.

Mission:

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice and merit in all educational endeavors.
- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

KANNUR UNIVERSITY
PROGRAMME OUTCOMES (PO)

PO 1.Critical Thinking:

1.1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.
1.2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.
1.3 Develop self-critical abilities and also the ability to view positions, problems and social issues from plural perspectives.

PO 2.Effective Citizenship:

2.1. Learn to participate in nation building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.
2.2. Develop and practice gender sensitive attitudes, environmental awareness, empathetic social awareness about various kinds of marginalisation and the ability to understand and resist various kinds of discriminations.
2.3. Internalise certain highlights of the nation's and region's history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

PO 3.Effective Communication:

3.1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language
3.2. Learn to articulate, analyse, synthesise, and evaluate ideas and situations in a well-informed manner.
3.3. Generate hypotheses and articulate assent or dissent by employing both reason and creative thinking.

PO 4.Interdisciplinarity:

4.1. Perceive knowledge as an organic, comprehensive, interrelated and integrated faculty of the human mind.
4.2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.
4.3. Develop aesthetic, social, humanistic and artistic sensibilities for problem solving and evolving a comprehensive perspective.

PREFACE

The UG syllabus in Electronics is based on Outcome Based Education (OBE) concept adopted in Kannur University. The Programme Specific outcomes and course outcomes are stated clearly in the syllabus. Faculty members are requested to plan their courses to achieve these outcomes at the end of the semester. In the restructuring of UG syllabus, the board of studies has taken efforts to offer in depth knowledge of the subject starting from its basic concepts to the state of the art technologies in use today. Students are also provided extensive laboratory training on the course content.

The project in the 6th semester is a 5 credit activity and hence we expect that students will come up with better deliverables at the end of their project. The syllabus is designed with a view to cater the present day requirements in industries, R&D field, higher studies and self-employment. The Board of studies acknowledges the contributions of external resource person of the syllabus restructuring workshop and teaching members of all the affiliated colleges.

Dr. Rohith K. Raj
Chairman
Board of Studies Electronics (UG)
Kannur University

Kannur University

Programme Specific Outcome of B.Sc Electronics Programme

After the completion of this programme, the students should be able to:

PSO 1: Design Electronic Circuits

PSO 2: Analyze Electronic circuits

PSO3: Construct Assembly Language Programmes

PSO4: Develop High level language programmes

PSO5: Design Embedded systems

PSO6: Understand the basics of communication systems

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KANNUR UNIVERSITY

B.SC. ELECTRONICS PROGRAMME

WORK AND CREDIT DISTRIBUTION STATEMENT

Semester	Course Title*	Credits	Hours per week	Total Credits	Total Hours	MARKS		
						CE	ESE	Total
I	Common course (English) I	4	5	18	25	10	40	50
	Common course (English) II	3	4			10	40	50
	Additional Common course I	4	4			10	40	50
	Core course 1B01ELE	2	2			10	40	50
	Core course Practical 4B01ELE-P *	--	2			--	--	--
	First Complementary Elective Mathematics	3	4			10	40	50
	Second complementary Elective Physics/Computer Science	2	2			8	32	40
	Second complementary Elective Physics/Computer Science Practical *	--	2			--	--	--
II	Common course (English) III	4	5	18	25	10	40	50
	Common course (English) IV	3	4			10	40	50
	Additional Common course II	4	4			10	40	50
	Core course 2B02ELE	2	2			10	40	50
	Core course Practical 4B01ELE-P *	--	2			--	--	--
	First Complementary Elective Mathematics	3	4			10	40	50
	Second complementary Elective Physics/Computer	2	2			8	32	40

	Science							
	Second complementary Elective Physics/Computer Science Practical *	--	2			--	--	--
III	Common course (English) V	4	5	16	25	10	40	50
	Additional Common course III	4	5			10	40	50
	Core course 3B03ELE	3	3			10	40	50
	Core course Practical 4B01ELE-P *	--	2			--	--	--
	First Complementary Elective Mathematics	3	5			10	40	50
	Second complementary Elective Physics/Computer Science	2	3			8	32	40
	Second complementary Elective Physics/Computer Science Practical *	--	2			--	--	--
IV	Common course (English) VI	4	5	24	25	10	40	50
	Additional Common course IV	4	5			10	40	50
	Core course 4B04ELE	3	3			10	40	50
	Core course Practical 4B01ELE-P	4	2			10	40	50
	First Complementary Elective Mathematics	3	5			10	40	50
	Second complementary Elective Physics/Computer Science	2	3			8	32	40
	Second complementary Elective Physics/Computer Science Practical	4	2			8	32	40
V	Core course 5B05ELE	4	3			10	40	50
	Core course 5B06ELE	3	3			10	40	50

	Core course 5B07ELE	3	3	18	25	10	40	50
	Core course 5B08ELE	3	3			10	40	50
	Discipline specific Elective	3	3			10	40	50
	Generic Elective	2	2			5	20	25
	Core course Practical 6B02ELE-P **	--	4			--	--	--
	Core course Practical 6B03ELE-P **	--	4			--	--	--
VI	Core course 6B10ELE-Project	5	5	26	25	15	60	75
	Core course 6B11ELE	4	3			10	40	50
	Core course 6B12ELE	3	3			10	40	50
	Core course 6B13ELE	3	3			10	40	50
	Discipline specific Elective	3	3			10	40	50
	Core course Practical 6B02ELE-P	4	4			10	40	50
	Core course Practical 6B03ELE-P	4	4			10	40	50
Total				120	150	360	1440	1800

** External examination will be conducted at the end of 4th semester*
** *External examination will be conducted at the end of 6h semester*

First Complementary Elective: Mathematics

Second Complementary Elective: Physics/Computer Science

PART A:

ELECTRONICS CORE COURSES
WORK AND CREDIT DISTRIBUTION

(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HRS
1B01ELE	Basic Electronics	1	2	2	3
4B01ELE-P	Practical-1 Electronic circuits Lab	1	2	--	--
2B02ELE	Electronic Devices and circuits	2	2	2	3
4B01ELE-P	Practical-1 Electronic circuits Lab	2	2	--	--
3B03ELE	Analog circuits and systems	3	3	3	3
4B01ELE-P	Practical-1 Electronic circuits Lab	3	2	--	--
4B04ELE	Principles of digital Electronics	4	3	3	3
4B01ELE-P	Practical-1 Electronic circuits Lab	4	2	4	3
5B05ELE	Electromagnetics	5	3	4	3
5B06ELE	Electronic Communication	5	3	3	3
5B07ELE	Microprocessor and Microcontroller	5	3	3	3
5B08ELE	Applications of Linear ICs	5	3	3	3
6B02ELE-P	Practical-2 Microcontroller and Embedded system Lab	5	4	--	--
6B03ELE-P	Practical-3 LIC & communication lab	5	4	--	--
5B09ELE-E01	Problem solving using				

	Programming Language	5	3	3	3
5B09ELE-E02	Electronic Instrumentation				
5B09ELE-E03	Advanced Digital system design				
5D01ELE	Biomedical Instruments in daily life	5	2	2	2
5D02ELE	Computer Hardware				
5D03ELE	Consumer Electronics				
5D04ELE	Basic Electronics				
5D05ELE	3D Printing				
6B10ELE	Project	6	5	5	Viva
6B11ELE	Mathematical Methods and Digital Signal Processing	6	3	4	3
6B12ELE	Fiber optics and optical communication	6	3	3	3
6B13ELE	Embedded system basics	6	3	3	3
6B14ELE-E01	Power Electronics	6	3	3	3
6B14ELE-E02	Principles of VLSI				
6B14ELE-E03	Microwaves and Radar				
6B02ELE-P	Practical-2 Microcontroller and Embedded system Lab	6	4	4	3
6B03ELE-P	Practical-3 LIC & communication lab	6	4	4	3

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

CONTINUOUS INTERNAL ASSESSMENT

COMPONENT	WEIGHTAGE	REMARKS
COMPONENT1 TEST	60%	Best of two
COMPONENT 2 OPEN BOOK PROBLEM SOLVING/VIVA/ASSIGNMENT	40%	One

CORE COURSE I : 1B01ELE Basic Electronics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
1	1B01ELE	2	2	3

COURSE OUTCOME

CO 1: Identify basic elements of electronic circuits

CO2: Analyze the resistive network

CO3: Apply Network Theorems to resistive networks

CO4:Design regulated diode rectifiers and RC filters

Unit I :

Resistor – different types, colour coding, power dissipation and rating, current through series resistance, KVL, parallel resistance, KCL, Balanced bridge
(Text 1- 2.1 to 2.5, 3.1 to 3.10, 4.1 to 4.9, 5.1 to 5.6, 6.1 to 6.6)
DC voltage and current , Ohms law, Alternating Current, sine wave, peak r.m.s and average value, frequency, phase and period
(Text 1 - 3.1 to 3.9, 15.1 to 15.9) (6 Hrs)

Unit II :

Voltage and Current dividers, Kirchhoff's Laws (KCL, KVL),- Mesh & Node (DC analysis), Source tranformation, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem
(Text 2 - 2.9, 2.10, 2.12, 2.13, 2.15, 3.2, 3.3, 3.4, 3.7) (8 Hrs)

Unit III:

Capacitor - Different types, capacitance, charging and discharging , capacitor coding, parallel and series C, energy stored, AC through C, X_C, Volatge lags current, X_C and R in series, X_C and R parallel, impedance
(Text 1 – 16.1 to 16.9, 17.1 to 17.6, 18.1 to 18.6)
Inductor – Self and mutual inductance, transformers, X_L, Voltage leads current, phase angle, X_L and R in series and parallel, impedance, Q of a coil
Concept of L/R and RC time constant, wave shapes, long and short time constants
(Text 1 – 19.1 to 19.7, 20.1 to 20.6, 21.1. to 21.5, 22.1 to 22.10)

Concept of filter- RC filters – low pass and high pass, decibel and frequency response curve (Text 1 – 26.1 to 26.10)(8 Hrs)

Unit IV:

Semiconductors – Intrinsic, extrinsic, N type, P type, Majority and minority charge carriers (Text 3 – 10.1 to 10.11)
PN junction, depletion layer, Barrier potential, biasing , reverse break down, depletion layer capacitance, PN junction diode, V-I characteristics, diode equation ,ideal and real diode (Text 3 – 11.1 to 11.12, 12.1 to 12.9)
Zener diode , breakdown, characteristics, applications, Varactor diode, light emitting diode, seven segment display, dot matrix display, photo diode, photo conductive cell, solar cell. (Text 3 - 13.1 to 13.6, 13.12 to 13.14, 13.21 to 13.26, 13.31 to 13. 36)
Rectifiers (half and full wave), ripple factor, Efficiency, rectifier with capacitor-filter, Voltage regulator, Zener regulator
(Text 3 - 19.1 to 19.24, 19.35, 20.1 to 20.7) (10 Hrs)

Books for Study:

1. Grob's Basic Electronics: Mitchel E Schultz, Tata McGraw Hill Education , 10th Edition
2. Circuits and Networks- Analysis and Synthesis: Sudhakar A and Shyammohan S Palli, McGraw Hill Education (India) Pvt Ltd , 5 th Edition
3. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd

Books for Reference:

1. Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition
2. A text book of Electrical Technology: B.L.Theraja, S.Chand and Co.
3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., TMH
3. Electronic Devices and Circuits: Bolyestad, TataMcGraw Hill.
4. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition.

Marks including choice:

Unit	Marks
1	4
2	16
3	16
4	24

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE II : 2B02ELE Electronic Devices and Circuits

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
2	2B02ELE	2	2	3

COURSE OUTCOME

CO 1: Understand working of BJT, FET and Thyristors

CO2: Analyze Bipolar Junction Transistor circuits

CO3: Design single stage BJT amplifier

Unit I :

Bipolar Junction Transistor (BJT) symbol, types (NPN and PNP), construction, working principle, parameters,BJTamplification,BJT switching, Transistor configurations- CB, CE and CC , characteristics , DC load line (CE), Q point, factors affecting the stability - biasing circuits-fixed bias, emitter feedback bias , voltage divider, thermal stability,
(Text 1 - 4.1 to 4.7, 5.1,5.2,5.4, 5.7, 5.8, 5.9) (8Hrs)

Unit II :

AC analysis, Coupling and byepass capacitors, AC load line and equivalent circuits,
Transistor models – RE model Hybrid equivalent circuits , CE circuit analysis, - Small signal amplifier, Design of single stage amplifier, RC coupled and direct coupled two stage CE amplifier, effect of coupling capacitor and bypass capacitor on frequency response. (8Hrs)

Unit III:

Construction, working principle,Symbol, types, V-I characteristics, Specifications and parameters of: Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET), comparison of JFET, MOSFET and BJT, Applications:
(Text 1 - 9.1 to 9.2,9.4, 9.5) (8Hrs)

Unit IV:

Construction, working principle,Symbol, types, V-I characteristics, Specifications and parameters of: SCR, DIAC , TRIAC, SUS, SBS, GTO, SIDAC, Uni-Junction Transistor (UJT), PUT,
(Text 1 - 20.1 , 20.4, 20.6, 20.7, 20.8) (8Hrs)

Books for Study:

1. Electronic devices and circuits : David A Bell, Oxford University Press, 5 th edition

Books for Reference:

1. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd
2. Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition
3. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
4. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., TMH
6. Electronic Devices and Circuits: Bolyestad, Tata McGraw Hill.

Marks including choice:

Unit	Marks
1	18
2	14
3	14
4	14

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE III : 3B03ELE Analog Circuits and Systems

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
III	3B03ELE	3	3	3

COURSE OUTCOME

CO1: Understand working of power amplifier

CO2: Design of oscillator circuit

CO3: Analyze small Operational Amplifier based circuits

Unit I :Power Amplifiers

Comparison of small signal and large signal amplifiers: with respect to gain, efficiency, and distortion. Classification of power amplifiers on the basis of conduction: class-A, class-B, class-AB, class-C. Class-A amplifier: resistive load/transformer coupled load, efficiency calculation of transformer coupled amplifier, comparison for efficiency, concept of harmonic distortion. Class B amplifier: Efficiency calculation, Push-pull amplifier concept, complimentary symmetry class-B push pull amplifier, crossover distortion, class AB push pull amplifier. Concept use and types of heat sinks.(12 Hrs)

Unit II :Feedback

Concept of negative and positive feedback. Types of feedbacks circuits: current shunt, current series, voltage shunt and voltage series, comparison and applications. Effect of negative feedback: on amplifier performance, stability of an amplifier. Positive feedback: oscillator circuits -Wien bridge , Phase Shift , Hartley , Colpitts and Crystal (12 Hrs)

Unit III: Differential Amplifier and Operational amplifiers

Concept and working of differential amplifier. Configurations of differential amplifier: Single ended, double ended. Differential and Common mode gain.CMRR.
Operational Amplifiers - block diagram of an operational amplifier (IC 741) , Op-amp characteristics, parameters - open loop and closed loop configurations. (12 Hrs)

Unit IV: Op-Amp Applications :

Inverting, Non-inverting, summing and difference amplifier, Integrator, Differentiator, voltage to current converter, current to voltage converter. Comparators, Schmitt Trigger. Phase shift oscillator, Wien bridge oscillator, Square wave generator. (12 Hrs)

Books for Study:

1. Malvino A. Electronic Principles TMH
2. Gaykawad R. Operational amplifiers and linear Integrated Circuits PHP
3. Boltkar - Integrated circuits,
4. Millman, Halkias Electronic devices and circuits McGrawHill
5. Boylestead Electronic devices and circuits PHP
6. Applied Electronics – R. S. Sedha - Khanna

Marks including choice:

Unit	Marks
I	16
II	16
III	12
IV	16

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE IV :4B04ELE: Principles of Digital Electronics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	4B04ELE	3	3	3

COURSE OUTCOME

CO 1: Understand different number systems

CO 2: Construct logic circuits using logic gates

CO 3: Simplify logical expressions

CO 4: Analyze various combinational and sequential circuits

Unit I

Number systems – Decimal, Binary, Octal & Hexadecimal – conversions, Digital codes – BCD, Excess 3, Gray code-conversions, ASCII codes, Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table. Boolean algebra & theorems, De Morgan's theorem, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).
(15 Hrs)

Unit II

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.
(13Hrs)

Unit III

Multiplexers: 2 input, 4 input & 8 input. Demultiplexers: 1 to 4 & 1 to 8. Realization of Boolean expression using multiplexers and demultiplexers. Sequential circuits: Flip Flops: RS latch, clocked RS, D, JK, T and Master slave. Applications. (10Hrs)

Unit IV

Counters: Ripple Binary counter, up counter, down counter, concept of modulus counters, Decade counter, Counters for high-speed applications (Synchronous counters) with timing diagrams- popular ICs. . Shift registers: SISO, SIPO, PISO, PIPO shift registers, ring counter, Johnsons counter. Design for random sequence generator. Familiarization of popular ICs: 7490, 4017 and 7446. (10Hrs)

Books for Study:

1. Anandkumar, Fundamentals of digital circuits, PHI, 2012.
2. Thomas L Floyd, Digital Fundamentals, Pearson, 2011.

Books for Reference:

1. John MYarbrough, 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. Thomas A.DeMessa, Zack Ciecone: Digital Integrated Ciruits, Wiley India,2007
5. Ghoshal, Digital Electronics, Cengage, 2012.
6. Malvino& Leach, Digital principles and applications, TMH.

Marks including choice:

Unit	Marks
I	15
II	15
III	10
IV	20

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE V : 4B01ELE-P Practical-1 (Electronic Circuits Lab)

Practice

- Familiarization of components/Tools

  Resistor, Capacitor, Inductor, Diode, Transistor, Cables, Connectors, Transformer, Switches, Fuses, Relays, Batteries) - Identification based on visual inspection/Datasheet/specification/Notation

- Familiarization of multimeters (Analog and Digital) –

  a. Measurement of AC/DC voltage, Current, Resistance – on different ranges

  b. Measurement of Variation of Resistance of LDR, Potentiometer
  c. Continuity checking
  d. Testing of Diodes & Transistors

- Familiarization of Signal Generator/CRO

  a. Measurement of amplitude and frequency of Sine/Square waveform
  b. Measurement of AC/DC Voltages

- Soldering practice - Simple circuits

- Verification of network theorems: KCL , KVL,
- RC Circuits: Time constant

Experiment list

1. V-I Characteristics of PN junction Diode
2. Half wave rectifier with and with out C filter - Evaluation of Ripple factor
3. Full wave centre tapped rectifier with and with out C filter - Evaluation of Ripple factor
4. Full wave bridge rectifier with and with out C filter - Evaluation of Ripple factor
5. Zener diode voltage regulator (Line regulation,Load regulation)

6. V-I Characteristics of the Common Emitter configuration of BJT
7. Design Transistor Biasing circuits (Fixed Bias and Voltage divider bias) for a given specification

8. Design a Single Stage CE amplifier for a specific gain

9. Design inverting and non inverting amplifier using an op-amp for a given gain

10. Design a non inverting amplifier of given gain using an op-amp.

11. Realize Adder and subtractor using Op Amp

12. Design Schmitt trigger using Opamp for a given specification

13. Design a RC Phase Shift Oscillator using op-amp for a given specification

14. Design an AstableMultivibrator using for a given specification

15. Realization of basic gates using NAND gate

16. Realization of basic gates using NOR gate

17. Realize Half adder and Full adder

18. Realize Halfsubtractor and Full Subtractor.

19. Realize 2 X 1 and 4 X 1 Multiplexers using logic gates

20. Realize SR, JK and D flipflop using NAND gate

Lab rules to be followed

1. There will be 20 experiments
2. Certified rough record is compulsory to attend external lab examination (total experiments done out of 20 experiments must be mentioned on the front page)
3. Internal mark distribution is as follows,

    (a) Test - 25%
    (b) Viva - 25%
    (c) Record (no. of experiments done and punctuality) and Lab skill- 50%

4. Teacher in charge of the lab will maintain a record, that contains lab details of each student such as attendance, date of lab experiment done and date of signature on the

record obtained from teacher). This data is the base for internal mark component 3c mentioned above.

5. There will be 20 questions for external evaluation
6. Mark distribution for External Evaluation is as follows
   Design - 20 Marks
   Implementation - 10
   Result - 5
   Viva - 5

CORE COURSE VI :5B05ELE: Electromagnetics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B05ELE	3	4	3

COURSE OUTCOME

CO 1 : Understand the theorems and laws in Electrostatics, Magnetostatics and Electrodynamics
CO 2: Analyze Electrostatic and Magnetostatic problems
CO 3: Understand Maxwell's equations
CO 4 : Interpret the characteristics of electromagnetic waves

Unit I: Concept of Circuit & Fields, Vector Analysis, Physical interpretation of gradient, Divergence & curl, integral theorems & comparison. (10Hrs)

Unit II: Electrostatics : Introduction, fundamental relations of electro static field – Gauss's law - special Gauss surfaces – the potential function, divergence theorem – Poisson's & Laplace's equation. Magnetostatics :Biot – Savart law, force between two current carrying coils – Magnetic flux density, Magnetic field intensity, Intensity of Magnetisation - Ampere's circuital theorem –Lorent's force- Magnetic vector potential –Boundary conditions for magnetic fields. (15Hrs)

Unit III: Electrodynamics: Faraday's law of induction – modified Amper's law – Maxwell's equation – wave equation – solutions of wave equation in free space –poynting vector-electromagnetic energy. (15Hrs)

Unit IV: Radiation of electromagnetic fields – Dipole and monopole antennas (concept only), polarization –isotropic radiator –plane waves – electromagnetic spectrum. (8Hrs)

Books for Study:

1. Electromagnetic waves & radiating systems – Jordan & Balmier -PH (New edition)

Books for Reference:

1. Fundamentals of Electrodynamics- Grifith (IV Edition)
2. Fundamental of electronic waves – Hugh H. S Ane books
3. Engineering electromagnetics- Haytt

Marks including choice:

Unit	Marks
1	10
2	20
3	20
4	10

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE VII : 5B06ELE: Electronic Communication

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B06ELE	3	3	3

COURSE OUTCOME

CO 1: Distinguish between Analog and Digital Communications

CO 2: Understand various noise sources in communication

CO 3: Analyze various Modulation and demodulation techniques

CO 4: Understand digital modulation techniques

Unit I Block diagram of an electronic communication system, electromagnetic spectrum- band designations and applications. Types of Electronic Communication systems: Simplex, Duplex. Noise in communication: External noise- Atmospheric, space noise, man-made noise, Internal noise- Thermal, Shot noise Definitions and relationship between Bit rate, Baud rate, Bandwidth and signal to noise ratio. (10 Hrs)

Unit II Modulation – Need for modulation- Amplitude modulation –Side band- AM signals & spectra, power relations, product modulator, single sideband AM – AM generation – High level & low level AM transmitters - AM receivers - Super heterodyne receivers –SSB generator balanced modulator -SSB transmitters –SSB receivers. (15 Hrs)

Unit III Frequency modulation -FM & PM signals – spectra – Band with – narrow band & wide band FM – generation – direct FM – VCO – phase modulator – indirect FM –demodulation of FM- balanced discriminator, de- emphasis & pre– emphasis – FM transmitter & receivers – FM stereo transmission & reception. (13 Hrs)

Unit IV Sampling – Aliasing - PAM, PWM, PPM – concept of FDM & TDM, pulse code modulation – quantization – generation & reconstruction – companding, concept of ASK, FSK,PSK, DPSK. (10Hrs)

Books for Study:

1 G. Kennedy, Electronic Communication, 2nd edition TMH

Books for Reference:

1 Frenzel, Communication Electronics, 3rd edition TMH

2 Dennis Roddy,JohnCoolen Electronic Communication System PHI

Marks including choice:

Unit	Marks
1	10
2	20
3	20
4	10

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE VIII : 5B07ELE: Microprocessor and Microcontroller

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B07ELE	3	3	3

COURSE OUTCOME

CO 1: Understand the architecture of 8085 microprocessor

CO 2: Understand the architecture of 8051 microcontroller

CO 3: Construct Assembly Language programmes for 8051 Microcontroller

CO 4: Design 8051 microcontroller based systems

Unit I: Introduction to Microprocessors – Evolution of Microprocessor - Introduction to 8085 - functional block –pin diagram - 8085 registers - bus organization Microprocessors initiated operations & internal data operations – externally initiated operation – memory organization –mapping & types- types of I/O addressing – instruction format - instructions & timing (Programming not required) – instruction classification. Concept of RISC & CISC – MMX – Pentium processors.(12Hrs)

Unit II : Microcontroller Architecture : Comparison between Microprocessor, Microcontroller - 8051 Microcontroller Hardware (Oscillator & Clock, Program Counter, Data Pointer, A and B Registers, Flags and PSW, Internal Memory, Internal RAM/ROM, Stack & Stack Pointer, SFRs). I/O ports, External Memory , Counters and Timers, Serial I/O Interrupts (10 Hrs)

Unit III : Instruction Set : Addressing Modes, Different Groups of Instructions-Data Transfer Instructions, Logical Operation, Arithmetic Operations, Jump and Call Instructions Simple Program : Arithmetic, Logical, Code Conversion, Block Data Transfer & Timer Programming. (14Hrs)

Unit IV: Peripherals Timer / counter interrupt – counting – serial data-i/p & serial data output – serial data interrupt –Data transmission & reception – serial data transmission mode. Timer flag interrupt - serial port interrupt – external interrupt – reset – interrupt priority – software generated interrupt.– keyboard interfacing - display interfacing – Seven segment & LCD display - D/ A and A/D interface. (12Hrs)

Books for Study:

1. 8085 – Architecture programming & technique – Ramesh Goanker

2. Kenneth J. Ayala The 8051 Microcontroller, Architecture, Programming and Application [Second Edition] Penram International, (1999).

Books for Reference:

1. M.A. Mazidi, J. G. Mazidi, R.D. MckinlayThe 8051 Microcontroller And Embedded

Systems, Using Assembly and C - Pearson Education , Second Edition (2009)

2. Kenneth J. Ayala, Dhanjay V. GadreThe 8051 Microcontroller And Embedded Systems, Using Assembly and C

3. Deshmukh Ajay V. Microcontrollers Theory and Applications TMH

Marks including choice:

Unit	Marks
1	20
2	14
3	14
4	12

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1each = 6)

- **Answer all questions** (*6 questions x Mark 1each = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - **Essay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE IX : 5B08ELE: Applications of Linear ICs

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B08ELE	3	3	3

COURSE OUTCOME

CO 1: Understand the functions and characteristics of various Analog ICs and their applications.

CO2: Design of op amp based circuits

CO3: Design various multivibrators

CO4: Understand operation of voltage regulators, ADC and DAC

Unit 1

Operational Amplifier - selection criterion for Op Amp ICs, Design of inverting and non – inverting amplifier circuits for a given gain, input and output impedance and bandwidth.Practical integrator and differentiator circuit and their design.Design of peak detector circuit. Design of Practical S/H circuits using two Op – Amps. Design of precision rectifier circuits and application. Active filters using Op amp - Design of LP, HP and BP filters for 2nd order, Switched capacitor filters : Concept and applications. (14Hrs)

Unit 2

555 Timer - Block diagram, Design of astable and monostablemultivibrator circuit, Voltage controlled Oscillator (IC566) Block Diagram – Circuits – applications. Phase locked loops (IC565) – Block diagram, lock range and capture range, typical circuits, applications. (10Hrs)

Unit 3

Voltage regulators –Linear Regulator ICs LM723, LM317 and three terminal regulators ICs-78XX, 79XX, LM723 (Low and high voltage regulators). Switching regulators & SMPS, typical circuits, applications (12Hrs)

Unit 4

ADC & DAC, Basic DAC Techniques – Weighted Resistor DAC, R-2R Ladder DAC, Multiplying DAC. A-D Converters – The Parallel Comparator (Flash) ADC, The Counter type ADC, Servo Tracking ADC, Successive Approximation type, Integrating type ADC – popular ICs (12Hrs)

Books for Study:

1. K.R. Botkar, Integrated Circuits (Tenth Edition), Khanna Publishers
2. Ramakant A. Gayakwad Op-Amps and Linear Integrated Circuits, 4th Edition Prentice- Hall India Pvt. Ltd.

Books for Reference:

1. U A Bakshi – Linear IC applications - Technical Publications Pune
2. George Clayton Operational Amplifiers, 5th Edition Newnes Imprint of Elsevier
3. Sergi Franco Design With operational Amplifiers and analog integrated circuits Tata McGraw Hill
4. Thoman L Floyd Electronic Devices McGraw Hill Companies

Marks including choice:

Unit	Marks
I	18
II	15
III	12
IV	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - **Essay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE X : 5B09ELE-E01 Problem solving using Programming Language

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B09ELE -E01	3	3	3

COURSE OUTCOME

CO 1:Understand the fundamentals of C programming.

CO2: Choose the loops and decision making statements to solve the problem.

CO3: Implement different Operations on arrays

CO4:Use functions to solve the given problem

CO5: Understand pointers, structures and unions

Unit I :C- Fundamentals
Introduction, character set, constants and variables, Key words, storage class, Symbolic constant, operators and expressions, statements, operator precedence, entering and executing C program, Managing input and output operations, simple and formatted input/output, Decision making, Branching and Looping. (18 Hrs)

Unit II: Arrays and Strings
Defining and processing of an array,Two dimensional arrays, character arrays and strings, Reading strings from terminal, writing strings to screen, string handling functions (8 Hrs)

Unit III : User defined Functions and pointers
Need for functions, Elements of function, Defining a function, Accessing a function, function prototype, passing argument, recursion, passing arrays to function,structure, Union, Pointers declarations, passing pointers to a function, operations of Pointers, pointers and arrays, pointers and character strings,pointers as function parameters (16Hrs)

Unit IV: Introduction to embedded C
Introduction, register variables, real time methods using interrupts, state machines (6 Hrs)

Books for Study:

1. E Balaguruswamy, Programming in ANSI C, 4 th edition, Tata McGraw Hill
2. Richard Barnett, Larry O'Cull and Sarah Cox , Embedded C Programming and the Atmel AVR, Cengage India edition

Books for Reference:

1 Byron. S. Gottfried Schaum's Outline of Programming with C TMH

2 J. JayasriThe 'C Language Trainer with C Graphics and C++ WILEY

3 Stephens Cochan Programming in C Prentice hall of India Ltd

4 V. Rajaraman Computer Programming in C Prentice hall of India Ltd.

Marks including choice:

Unit	Marks
1	24
2	16
3	16
4	4

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - **Essay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE XI : 5B09ELE-E02 Electronic Instrumentation

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B09ELE -E02	3	3	3

COURSE OUTCOME

CO 1: Understand the operation of basic measurement instruments

CO2: Understand the operation of signal generators

CO3: Understand various electronic displays

CO4: Understand various transducers

Unit I : Qualities of Measurement:
S. I. system of units, dimensions and standards; errors in measurement, types of static error, sources of error, dynamic characteristics and statistical analysis. **Basic Measurement Instruments**: DC measurement: dc voltmeter, ohmmeter and ammeter. Digital type voltmeter, ammeter and ohmmeter ,digitalmultimeter, AC measurement , voltmeter, ammeter. (8Hrs)

Unit II : Signal Generators:
Types of generators and their operation: Audio oscillator, Function generators, Pulse generators, RF generators, Random noise generators. Probes and Connectors: Test leads, shielded cables, connectors, low capacitance probes, high voltage probes, RF demodulator probes, special probes for IC's, current probes. (15Hrs)

Unit III: Electronic Displays:
The Cathode Ray Oscilloscope (CRO): Block diagram of a General Purpose Oscilloscope and its basic operation, electrostatic focusing and deflection, screen for CRT and graticules, CRT connections, CRO probes. Types of CRO's: dual trace oscilloscope, digital storage oscilloscope. (10Hrs)

Unit IV: Transducers:
Various types of transducers for measurement of displacement, speed, stress and strain Classification and selection of transducers. Strain Gages: bonded and un-bonded strain gages, strain gage transducer sensitivity. Position Transducer: capacitive, inductive, linear variable differential transformer (LVDT), Piezoelectric, potentiometric. Temperature transducers: Resistance thermometers, thermocouples, thermistor and semiconductor p-n junction transducer. Light Transducers: photo resistors, photovoltaic cells, photodiodes. (15 Hrs)

Books for Study:

1.H. S. Kalsi, Electronic Instrumentation, Tata McGraw Hill (2006)

2.Joseph J Carr, Elements of electronic instrumentatioand measurement, Pearson Education (2005)

3.C. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata McGraw Hill (1998)

4.H. Cooper, Modern electronic instrumentation and measurement techniques, Pearson Education (2005)

5.R. A. Witte, Electronic test instruments: analog and digital measurements, Tata McGraw Hill (2004)

6.S. Wolf and R. F. M. Smith, Student Reference Manual for Electronic Instrumentation Laboratories, Pearson Education (2004)

Marks including choice:

Unit	Marks
1	15
2	15
3	12
4	18

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE XII : 5B09ELE-E03 Advanced Digital System Design

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B09ELE -E03	3	3	3

COURSE OUTCOME

CO 1: Understand the concepts of digital system design

CO2: Design sequential circuit

CO3: Understand programmable logic design

Unit I : Concepts of digital system design:
Digital system, digital systems design process, Methodology, Types of logic circuits. (5 Hrs)

Unit II : Sequential circuit design:
Introduction, State equivalence, state reduction, state assignment techniques, along with state machines, sequential machine.**Asynchronous Sequential Circuits:** Introduction to asynchronous sequential machine, Fundamental and pulse mode asynchronous machine, analyzing asynchronous machine, deriving flow tables, state assignment, asynchronous design problems, data synchronizers, mixed operating mode asynchronous circuits. (15Hrs)

Unit III: Programmable logic design:
Introduction to reconfigurable logic ,PLD, SPLD, PAL, CPLD's, FPGA. (15 Hrs)

Unit IV: Introduction to VHDL :
Design entity synthesis, verification and implementation using E-cad tools **Case study:** Traffic light controller, Stepper motor sequence generator, Rolling display, Tablet filling system. (13 Hrs)

Books for Study:

1. Fundamental of digital logic with VHDL - Stephen Brown , ZvonkoVranesic Tata McGraw hill
2. Digital logic: Applications and design - John M. Yarbrough - Cengage Learning India (Thompson)

3. Digital fundamentals - Floyd , Thoms L., Jain R.P. - Pearson Education
4. VHDL Design - Bhaskar

Marks including choice:

Unit	Marks
1	5
2	20
3	20
4	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE XIII : 6B10ELE Project

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B10ELE	5	5	3

Guidelines to conduct Project work

Total Mark : 75
Internal Evaluation : 15 Marks

The project should not be a mere reproduction of existing product or designs available in online resources and books. The project should have clear relevance in Electronics. Aim of this course is to expose students to the various phases of product development in industry. Hence internal guides must lead them systematically through various phases of a product development such as proposing a new project after rigorous discussions with industry and society, block level design phase, circuit and program level implementations, debugging, fabrication and prototyping and finally recording the methodology and findings. At the end of this project each student must be able to individually explain all technical details involved in the project such as design of circuits, programmes if any etc.

In house projects under faculty members and projects done at a company with registration is only accepted. If the students are doing projects in any registered company, a certificate on company letterhead must be included in the project report. The certificate should include the title of the project, Name of students, signature and designation of the external guide and company registration details. The project should not be carried out in pseudo companies.

Internal Evaluation

1. The department will constitute a Project review panel, comprising of faculty members and internal guide
2. There must be an internal guide assigned for each group
3. Maximum members in each group is 4

4. Tentative dates of project reviews must be published in the beginning of the semester
5. There will be 4 phases of internal evaluation for each student
6. Internal guide must keep a log book to record the marks of each student during each phase of evaluation
7. If the project is conducted in company, the Internal guide will maintain a certified monthly attendance statement of the student obtained from the company, duly signed by the external guide

The expected deliverables of each Phase is as follows,

Phase 1: Project title & abstract
Phase 2: Block level design of the project
Phase 3: Mid term evaluation (circuit and program development)
Phase 4: Final deliverables (Working model, Project report & ICT based presentation)

Internal Mark distribution:
Phase 1 : 1 Mark
Phase 2 : 2 Mark
Phase 3 : 3 Mark
Phase 4 : Presentation: 3Mark, Report: 3 Mark & Working model: 3 Mark

External Evaluation
1. Individual ICT based presentation is a must for external evaluation
2. Mark must be deducted if presentation is not done
3. Individual viva is compulsory

Mark distribution is as follows,

Relevance and technical content - 10
Working model - 10
Presentation-10
Viva-30

CORE COURSE XIV : 6B11ELE Mathematical methods and Digital Signal Processing

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B11ELE	3	4	3

COURSE OUTCOME

After the completion of this course, students should be able to:

1. Understand the frequency domain analysis of discrete time signals
2. Calculate Z-transforms for discrete time signals
3. Calculate frequency domain of signals using Discrete Fourier Transform.
4. Develop Fast Fourier Transform (FFT) algorithms for faster realization of signals and systems

Unit I : Signals & systems -Continuous time, discrete & digital signals, elementary Continuous time and discrete time signals, representation of discrete time signals, basic operations on signals, classification of signals, systems, classification of systems , time domain analysis of Discrete Time Systems, Solution of difference equations, Natural and forced response, Impulse response,Transfer function, representation in terms of impulses, impulse response and convolution sum, convolution of two discrete sequences , Matrix method, FIR and IIR systems, BIBO stability. (10 Hrs)

Unit II :Analysis of signals and systems

Introduction to Fourier series analysis of continuous time periodic signals and Fourier coefficients (Theory only)

Introduction to Continuous time fourier Transform, Fourier transform of some standard signals (Theory only)

Laplace Transform - definition, Laplace transform of simple functions, properties, Inverse LT, partial fraction technique, solution of differential equation

Introduction to Discrete Fourier series, Discrete Time Fourier Transform (Theory only) Z transform - Definition, properties, ROC and Inverse Z Transform, solution of difference equation (16 Hrs)

Unit III: Discrete Fourier transform & Fast Fourier transform: Introduction – discrete Fourier transform of finite duration sequences – properties of DFT – circular convolution - computation of DFT. Fast Fourier transform : FFT Algorithms - general computational considerations – decimation in time & decimation in frequency algorithms – Radix 2 – FFT algorithms. (14 Hrs)

Unit IV: Realization of digital systems : Recursive & non recursive systems – block diagrams & signal flow graphs – realization of IIR filters - direct form realization – cascade & parallel form realization – realization of FIR filters. (8 Hrs)

Books for Study:

1. P Ramesh Babu, R Anandanatarajan, Signals and Systems, Scitech Publications (India) Fourth edition
2. A NagoorKani, Digital Signal Processing, Second edition, MacGraw Hill Education

Books for Reference:

1. Digital Signal Processing, Principles, Algorithms and applications 3rd Edition– Proakis&Manolakis -PHI

2. Digital Signal Processing S K Mithra

3. Digital signal processing - Rameshbabu 4. Network theory – Van Valkenbug

5. Network system – Roy Chowdhary

6. Digital signal processing - SalaiVahanan

Marks including choice:

Unit	Marks
1	10
2	18
3	18
4	14

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE XV: 6B12ELE Fiber Optics and Optical Communication

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B12ELE	3	3	3

COURSE OUTCOME

After the completion of this course, students should be able to:

CO 1: Familiarize with the fundamentals of light transmission through fiber

CO 2:Understand how signal degrades inside the fiber due to physical effects

CO 3:Understand the operation of optical sources and detectors

CO 4:Understand a basic optical communication system

Unit I : Introduction: Historical development, general system, advantages disadvantages and applications of optical fiber communication, Basic structure of optical fiber, ray transmission theory, propagation of light in optical fiber, acceptance angle, numerical aperture, Derivation for numerical aperture, skew rays, Ivanacent waves,single mode, multimode, step index and graded index fibers, V number and modes supported by step index and graded index fiber, fiber materials (12 Hrs)

Unit II :Transmission characteristics of Optical Fibers
Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion. (8 Hrs)

Unit III: Optical sources and detectors :
Radiation sources- Light emitting diodes, operating principle, different types, construction, spectral response-LED sources in optical communication. Lasers: Principle of laser, spontaneous and stimulated emission, Einstein equations, different types, ruby lasers, He- Ne lasers. Semiconductor lasers, hetrojunction lasers - operation - comparison with LED's Optical detectors- Physical principles of PN, PIN and APD, Detector response time, concepts of responsivity, sensitivity and quantum efficiency (16 Hrs)

Unit IV: Optical communication
Block diagram of fiber optic communication system, Optical transmitter circuit, Optical receiver circuit, Analog and digital systems, Multiplexing strategies. (12Hrs)

Books for Study

1. John M. Senior Optical fiber communications Principles and Practice , (2_{nd} edition) PHI

Books for Reference:

1 G. Kaiser Optical fiber communication McGraw Hill

2 SubirkumarSarkar Optical fibers and fiber optic communication systems S.Chand and company

3 R. P. Khare Fiber optics and optoelectronics Oxford University Press

5 AjoyGhatak and K. Thyagarajan Introduction to fiber optics Cambridge University Press 6 D. C. Agarwal Fiber optic communication Wheeler publications

Marks including choice:

Unit	Marks
1	16
2	14
3	16
4	14

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***

CORE COURSE XVI : 6B13ELE Embedded System Basics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
6	6B13ELE	3	3	3

COURSE OUTCOME

After the completion of this course, students should be able to:

1. Understand architecture of PIC16F877 Processor
2. Design small embedded systems using PIC16F877 Microcontroller
3. Develop embedded programme using embedded C
4. Understand architecture of ARM Processor

Unit I : Introduction to Embedded Systems, Stand-alone and real-time embedded systems, Requirements of embedded systems, Components of embedded system. Embedded processors (ARM, PIC32 etc) Programming languages and tools. Embedded operating system, Embedded system Application examples. (10 Hrs)

Unit II : PIC16F877 Microcontroller: Architecture – memory organization – addressing modes – instruction set – I/O port, RAM & ROM Allocation, Timer - Interrupts, I2C bus-A/D converter-UART. (15 Hrs)

Unit III: Embedded system software. Assembly languages, high level languages. Embedded C programming (Kiel C, Microchip C, SDCC Compiler). Simple programs – LED blinking, LCD, Serial port. Embedded communication standards, RS232, I2C, SPI, USB (Over view). Case study, Traffic Light controller, Water level controller, DC Motor speed control. (15 Hrs)

Unit IV: Advanced embedded systems, ARM processors general architecture, Overview of Embedded OS, Android OS. Real Time OS , Embedded Linux (Examples). (8 Hrs)

Books for Study

1. Introduction to embedded systems - Shibu .K.V - Tata McGraw Hill Publications
2. Embedded Systems, B. KantaRao, PHI Learning Pvt. Ltd.

Books for Reference:

1. Embedded system architecture, programming and designing.-Rajkamal Tata McGraw Hill Publications.

2. Introduction to Embedded Systems, Raj Kamal, TMS, Tata McGraw Hill Publications, 2002.

3. Embedded Real time systems: Concepts, Design and Programming, Dr.K V K K Prasad, Dream Tech press, New Delhi, 2003

Marks including choice:

Unit	Marks
I	15
II	20
III	15
IV	10

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE XVII : 6B14ELE-E01 Power Electronics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B14ELE –E01	3	3	3

COURSE OUTCOME

CO 1: Understand electronic components in Power electronics

CO2: Understand common circuits used in power electronics

CO3: Understand safety measures to be implemented in power electronics systems

Unit I : Introduction to Power Electronics
Concept of single phase and three phase using phasors, Single phase , 3 phase transformers , power transformer ,Power diodes, Power transistors and Thyristors (SCRs): Symbols and Characteristics, Concept of Power circuits using block diagram.
Diodes and Rectifiers : Shockley equation of Diode, Reverse recovery characteristics Single phase rectifiers: Performance parameters, Half wave, Full wave centre tapped and bridge rectifier with resistive and inductive loads DC Filters: concept of C, L and LC filters (10 Hrs)

Unit II :
Power transistors, DC Choppers and transistorized PWM inverter Switching Characteristics: Power BJT, power MOSFET,IGBT Choppers: Step-up, Step-down, Class A, B, C, D,E choppers (No Circuit details) Regulators: Buck, Boost and Buck-boost Inverters: Performance parameters, principle, Half Bridge and full Bridge inverter, Voltage control methods, Inverter filters. (15 Hrs)

Unit III:
Thyristors, AC to DC and DC to AC Converters Static Switches SCR characteristics, Two transistor static and transient model, turn-on, turn-off characteristics, dv/dt and di/dt protection Single phase Controlled rectifiers: Principle, Semi, Full and Dual Converters AC voltage controllers: on-off control, Phase angle control, Bi-directional control with Resistive and Inductive load, Cyclo converter DC Switches, Solid state relays, AC Switches and Microelectronic relays.(15 Hrs)

Unit IV:
Safety Measures, Protection Devices and Measurement instruments : Electric Shock, safety in home and outdoors, Grounding systems, Undesirable circuit conditions, Fuses, Circuit breakers, thermal overload protections, lightening rods and arresters, High voltage probe,

Differential probe, Clamp-on meter, Hall-sensor current meter, Power meters and energy meter, power factor measurement.(8 Hrs)

Books for Study:

1 M.H. Rashid Power electronics: Circuits, Devices and Applications , third Edition (2004) Pearson Education
2 Frank D Petruzella, MacMillan Essentials of Electronics A survey McGraw Hill (1993)
3 O.P. Arora Power electronics Laboratory : theory , Practice & Organization Narosa Publishing house (2007)
4 Mohan, undeland, Robbins Power Electronics , Third Edition (2006) John Wiley& Sons
5 P.C. Sen Power Electronics Tata McGraw Hill, (1998)

Marks including choice:

Unit	Marks
I	15
II	20
III	15
IV	10

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE XVIII : 6B14ELE-E02 Principles of VLSI

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B14ELE-E02	3	3	3

COURSE OUTCOME

CO 1: Understand thick film technology and design ideas

CO2: Understand thin film technology and monolithic IC process

CO3: Understand modern VLSI devices

Unit I : Introduction

General classification of integrated circuits – Scale of integration – Advantages over discrete components. (8 Hrs)

Unit II : Thick film technology

Features of hybrid IC technology – Thick film conductors– Dielectric – Resistors – Thick film processing – Thick film substrate – Design ideas – Advantages and applications. (10 Hrs)

Unit III: Thin film technology

Thin film conductors – resistors – dielectric – substrates – thin film processing – Advantages and applications – Monolithic IC process : Growth and refining of Si crystals – Substrate slicing and polishing – Wafer preparation – Diffusion – Ion implantation – Oxidation – Photo-lithography – CVD – Epitaxial grown – Metallization – Monolithic resistors and capacitors.(15 Hrs)

Unit IV:

Introduction – Modern VLSI devices – High field effect – MOSFET devices – long channel & short channel MOSFET. Bipolar devices –n.p.n. transistor – characteristics of typical n.p.n. transistor – Bipolar device design – Design of emitter, base and collector region – concept of HDL. (15 Hrs)

Books for Study:

1.Unit(I, II, III) : Integrated Circuits (K.R. Botkar).

2.Unit (IV) : Fundamentals of Modern VLSI Devices by Yuan Taur and Tak H. NING Cambridge Publishers.

Books for Reference:

1. Basic VLSI Design Systems and Circuits by Dougles A. Pucknell and Kamran Eshragian, PHI.

2. Fundamentals of Digital Design", Charles H.Roth,Jr., PWS Pub.Co.,1998.

Marks including choice:

Unit	Marks
I	5
II	15
III	20
IV	20

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice - 60**
- ***Maximum marks of the course- 40***

CORE COURSE XIX : 6B14ELE-E03 Microwaves and Radar

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B14ELE-E03	3	3	3

COURSE OUTCOME

CO 1: Understand transmission lines used in communication

CO2: Apply wave guide theory

CO3: Understand operation of microwave amplifiers and oscillators

CO4: Understand operations of microwave solid state components

CO5: Understand operation of various microwave radars

Unit I : Frequency spectrum ,Microwave bands, Applications of microwaves in different fields, wave guides – different types, transmission lines, types- parallel, co- axial, strip, optical & microwave guides, TE, TM &TEM waves, cut off frequency, phase & group velocities, Characteristics impedance, H- plane, E –plane & Magic Tees. (15Hrs)

Unit II : Directional couplers, Isolators, circulators, Multicavity Klystron, reflex Klystron, Magnetrons, TWT – working principle & applications. (10Hrs)

Unit III: Schottky diodes, point contact diodes, Varactor diodes, concept of parametric amplifier, IMPATT, TRAPATT & GUNN devices –Applications(8Hrs)

Unit IV: Basic principle, fundamentals, performance factors,pulsed radar, Antennas & scanning, display methods, pulsed radar systems, MTI recons, CW Doppler radar. (15 Hrs)

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Books for Study:

1. Electronic communication system – Kennedy.

2. Fundamental of Microwave engineering – Collins

Books for Reference:

1. Electronic communication, Roddy&Coolen
2. Electronic & radio engineering, Terman
3. Principles of communication systems, Taub& Schilling

Marks including choice:

Unit	Marks
I	15
II	15
III	15
IV	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course-40***

CORE COURSE XX : 6B02ELE-P Practical 2 (Microcontroller and Embedded System Lab)

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B02ELE-P	4	4	3

Experiments

1. Addition, Subtraction, Multiplication and division (8 bit numbers)
2. Addition and Subtraction (16 bit numbers)
3. Logical Operations – AND, OR and NOT
4. Program to transfer a block of data
5. Array addition (8 bit number array)
6. Decimal to ASCII and ASCII to Decimal.
7. Decimal to Hex and Hex to Decimal.
8. Sort numbers in Ascending order / Descending order
9. Up/down Counter
10. Dancing LED
11. Square wave generator
12. Serial Communication
13. Seven segment LED interface
14. LCD interface
15. Interfacing of matrix Keypad
16. Interfacing SSD / Stepper Motor/ LED Bank
17. Interfacing DAC
18. Interfacing RTC with 8051
19. Traffic Light Controller
20. DC Motor speed control

Lab rules to be followed

1. There will be 20 experiments
2. Certified rough record is compulsory to attend external lab examination (total experiments done out of 20 experiments must be mentioned)
3. Internal mark distribution is as follows,

(a) Test - 25%
(b) Viva - 25%
(c) Record (no. of experiments done and punctuality) and Lab skill- 50%

4. Teacher in charge of the lab will maintain a record, that contains lab details of each student such as attendance, date of lab experiment done and date of signature on the record obtained from the teacher). This data is the base for internal mark component 3c mentioned above.
5. There will be 20 questions for external evaluation
6. Mark distribution for External Evaluation is as follows
   Design - 20 Marks
   Implementation - 10
   Result - 5
   Viva - 5

CORE COURSE XXI : 6B03ELE-P Practical 3 (LIC and Communication Lab)

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B03ELE-P	4	4	3

Experiments

1. Design an integrator using IC741 for a given specification
2. Design a differentiator using IC741 for a given specification a
3. Design a precision rectifier using Op amp.
4. Design an inverting amplifier for given input impedance and bandwidth
5. Design active first order low pass filter for a given specification
6. Design active first order high pass filter for a given specification
7. Design active first order band pass filter for a given specification
8. Design AstableMultivibrator using IC 555 for a given specification
9. Design monostableMultivibrator using IC 555 for a given specification
10. Design fixed Voltage Regulators using IC 78xx and 79xx
11. Design variable Voltage Regulators using IC 723
12. Study of AM generation
13. Study of Frequency response of IF amplifier
14. Study of Mixer
15. Study of Frequency modulation and Demodulation
16. Study of Balanced modulator
17. Study of Pulse Amplitude Modulation and Demodulation
18. Study of Pulse Width Modulation and Demodulation
19. Study of Pulse Position Modulation Demodulation
20. Study of Time Division Multiplexing.

Lab rules to be followed

1. There will be 20 experiments
2. Certified rough record is compulsory to attend external lab examination (total experiments done out of 20 experiments must be mentioned)
3. Internal mark distribution is as follows,

(a) Test - 25%
(b) Viva - 25%
(c) Record (no. of experiments done and punctuality) and Lab skill- 50%

4. Teacher in charge of the lab will maintain a record, that contains lab details of each student such as attendance, date of lab experiment done and date of signature on the record obtained from the teacher). This data is the base for internal mark component 3c mentioned above.
5. There will be 20 questions for external evaluation
6. Mark distribution for External Evaluation is as follows
   Design - 20 Marks
   Implementation - 10
   Result - 5
   Viva - 5

PART B:

ELECTRONICS COMPLEMENTARY ELECTIVE COURSES

[FOR COMPUTER SCIENCE/PHYSICS PROGRAMMES]

WORK AND CREDIT DISTRIBUTION

(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS	MARKS		
						CE	ESE	Total
1C01ELE	Basic Electronics	I	2	2	3	8	32	40
4C04ELE-P *	Electronics Lab	I	2	--	--	--	--	--
2C02ELE	Digital Electronics	II	2	2	3	8	32	40
4C04ELE-P*	Electronics Lab	II	2	--	--	--	--	--
3C03ELE	Communication Systems	III	3	2	3	8	32	40
4C04ELE-P*	Electronics Lab	III	2	--	--	--	--	--
4C04ELE	Microprocessor & Microcontroller	IV	3	2	3	8	32	40
4C04ELE-P	Electronics Lab	IV	2	4	3	8	32	40

**External examination will be conducted at the end of 4th semester*

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

INTERNAL ASSESSMENT

COMPONENT	WEIGHTAGE	REMARKS
COMPONENT1 TEST	60%	Best of two
COMPONENT 2 OPEN BOOK PROBLEM SOLVING/VIVA/ASSIGNMENT	40%	One

COMPLEMENTARY ELECTIVE COURSE I: BASIC ELECTRONICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
I	1C01ELE	2	2	3

COURSE OUTCOME

CO 1:Understand basic components in Electronics

CO2: Understand the operation of PN Junction diodes and rectifiers

CO3: Understand active components BJT, FET AND MOSFET

CO4: Understand operation of RC Coupled Amplifiers and Operational amplifier

Unit I : Introduction to electronics, applications ohm's law - Definitions – potential difference, current, voltage & its units, concept of voltage source & current source, Passive components, identification, colour coding. Introduction to semiconductor materials, metals, insulator, semiconductors doping, PN junction, majority &minority carriers, VI characteristics, reverse break down, Zener diode, LED, Rectifiers - half wave, full wave. Ripple factor, efficiency, RC filter. (12 Hrs)

Unit II : Bipolar Junction Transistor – operation, configuration, input – output characteristic, parameters, JFET, Comparison between BJT & FET. MOSFET (8 Hrs)

Unit III: Need for biasing, voltage divider biasing. RC coupled amplifier – working, frequency response. (6Hrs)

Unit IV: Operational amplifier- concept of 741 block diagram. Inverting & non inverting amplifier, applications.(6 Hrs)

Books for Study:

1)Principles of electronics - V.K. Mehta

2)Operational – Amplifier & Linear integrated circuits – Gaykwad .

Books for Reference:

1) Basic electronics & linear circuits – N.N .Bhargava

2) Electronic device & circuit theory - Boylested&Neshelsky

3) Electronic devices and circuits : David A Bell, Oxford University Press, 5 th edition

Marks including choice:

Unit	Marks
1	13
2	13
3	13
4	13

About the Pattern of Questions:

Part A - **Short answer** (5questions x Mark 1 = 5)

- **Answer all questions** (5*questions x Mark 1 = 5*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 6questions*** *(4questions x Marks 2 each=8)*

Part C - E**ssay/Problem** (5 questions x Marks 3 each =15)

- ***Answer any 4 questions****(3 questions x Marks 3 each=9)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -52**
- ***Maximum marks of the course*-32**

COMPLEMENTARY ELECTIVE COURSE II: DIGITAL ELECTRONICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
II	2C02ELE	2	2	3

COURSE OUTCOME

CO 1: Understand number systems, logic gates, flip flops etc

CO2: Understand Combinational circuits and sequential circuits

CO3: Understand the operation of Analog to digital and Digital to analog converters

Unit I : Number systems – Decimal , Binary, octal &hexa decimal conversions, digital codes –BCD, excess – 3, gray code , ASCII code , Error detection codes conversions, Boolean Algebra & theorems, SOP & POS , De- Morgan's theorems, simplification of Boolean Algebra&K-map,Logicgates. (10Hrs)

Unit II : Combinational circuits – Adders, Subtractors , Comparators, Decoders, Encoders, Mux & De – mux , parity generators. (8 Hrs)

Unit III: Sequential circuits – Flip- flops (RS latch , Clocked RS ,D, J-K , T, Master slave), shift registers & applications , Asynchronous counter , Synchronous counter, Ring counter, counter design & sequence generator. (8 Hrs)

Unit IV: ADC & DAC, Basic DAC Techniques – Weighted Resistor DAC, R-2R Ladder DAC. A-D Converters – The Parallel Comparator (Flash) ADC, Successive Approximation type. (6Hrs)

Books for Study:

1. Thomas Floyd – Digital fundamentals.

Books for Reference:

1. Digital principles & applications by Malvino& Leach
2. Digital electronics circuits & systems , V.K. Puri (TMH)
3. Taub& Schilling , Digital Integrated electronics
4. Millman – Digital Integrated circuits.
5. Linear Integrated Circuits, D. Roy Choudhury.

Marks including choice:

Unit	Marks
I	16
II	13
III	15
IV	8

About the Pattern of Questions:

Part A - **Short answer** (5questions x Mark 1 = 5)

- **Answer all questions** (5*questions x Mark 1 = 5*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 6questions*** *(4questions x Marks 2 each=8)*

Part C - E**ssay/Problem** (5 questions x Marks 3 each =15)

- ***Answer any 4 questions****(3 questions x Marks 3 each=9)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -52**
- ***Maximum marks of the course*-32**

COMPLEMENTARY ELECTIVE COURSE III: COMMUNICATION SYSTEMS

SEMESTER	COURSE CODE	HOURS	CREDIT	EXAM

		PER WEEK		HRS
III	**3C03ELE**	**3**	**2**	**3**

COURSE OUTCOME

CO 1: To understand the concept of modulation in communication

CO2: Understand and apply AM & FM modulation

CO3: Understand AM transmitter and receiver

CO4: Understand Pulse communication and digital modulation schemes

Unit I : Noise in communication: External noise- Atmospheric, space noise, man-made noise, Internal noise- Thermal, Shot noise Definitions and relationship between Bit rate, Baud rate, Bandwidth and signal to noise ratio (8 Hrs)

Unit II: Basic block diagram of a communication system, transmission media, Electromagnetic spectrum, uses of various frequency bands, modulation, demodulation, Need for modulation, Amplitude modulation – definition, modulation index,power relation, AM equation. Frequency modulation , FM equation, comparison of FM & AM, wide band and narrow band FM (16 Hrs)

Unit III: Basic block diagram of AM transmitter, function of each block, AM receiver – block diagram, principle of super heterodyne receiver, sensitivity and selectivity- Generation of FM – direct FM- Basic reactance modulator – indirect FM using Armstrong method (14Hrs)

Unit IV: Pulse communication – basis of PAM, PWM, PPM - Digital communication - PCM, block diagram, bit rate, baud rate. Digital modulation schemes – ASK, FSK andPSK (10 Hrs)

Books for Study:

1.Electronic communication – G. Kennedy

Books for reference:

1. Radio engineering - G.K.Mittel
2. Communication system – Kumar
3. Communication system – Roddy&Coolen

4. Data & computer communication – William Stallings
5. Data communications – William L Schweber.

Marks including choice:

Unit	Marks
1	6
2	16
3	16
4	14

About the Pattern of Questions:

Part A - **Short answer** (5questions x Mark 1 = 5)

- **Answer all questions** (5*questions x Mark 1 = 5*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 6questions*** *(4questions x Marks 2 each=8)*

Part C - E**ssay/Problem** (5 questions x Marks 3 each =15)

- ***Answer any 4 questions****(3 questions x Marks 3 each=9)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -52**
- ***Maximum marks of the course-*32**

COMPLEMENTARY ELECTIVE COURSE IV: MICROPROCESSOR & MICROCONTROLLER

SEMESTER	COURSE CODE	HOURS	CREDIT	EXAM

		PER WEEK		HRS
IV	4C04ELE	3	2	3

COURSE OUTCOME

CO 1: To understand the architecture of 8085 microprocessor
CO2: Develop assembly language programmes
CO3: Understand operation of Programmable peripheral chips
CO4: Understand 8051 architecture

Unit I : Microprocessor – Introduction to 8085, 8085 Architecture - functional blocks, Bus organisation – Registers , Interrupts, Memory Organisation – I/O addressing. (12 Hrs)

Unit II : Instruction & timing, instruction classifications – word length – simple programs , instruction set of 8085 – Addressing modes, Looping – counting – indexing – simple illustrative programs – logical instruction –Branching instruction. (12Hrs)

Unit III:

Introduction to programmable peripheral devices (8255A, 8254A, 8279 A) – Function of each chip – bus standards (serial & parallel) – RS 232 & USB – other processors–Features of Intel Pentium processors. (12 Hrs)

Unit IV:

Comparison between Microprocessor, Microcontroller - 8051 Microcontroller Hardware Oscillator & Clock, Program Counter, Data Pointer, A and B Registers, Flags and PSW, Internal Memory, Internal RAM/ROM, Stack & Stack Pointer, SFRs,I/O ports. (12 Hrs)

Books for Study:

1.Microprocessor Architecture, programming & application with 8085/8089, A Ramesh .G. Gaonkar
2.Introduction to Microprocessor – Adithya. P. Mathew

3 Kenneth J. Ayala The 8051 Microcontroller, Architecture, Programming and Application [Second Edition] Penram International, (1999).

Marks including choice:

Unit	Marks
1	13

2	13
3	13
4	13

About the Pattern of Questions:

Part A - **Short answer** (5questions x Mark 1 = 5)

- **Answer all questions** (5*questions x Mark 1 = 5*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 6questions*** *(4questions x Marks 2 each=8)*

Part C - E**ssay/Problem** (5 questions x Marks 3 each =15)

- ***Answer any 4 questions****(3 questions x Marks 3 each=9)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -52**
- ***Maximum marks of the course-*32**

COMPLEMENTARY ELECTIVE COURSE V: 4C04ELE-P ELECTRONICS LAB

PRACTICE

- FAMILIARIZATION OF COMPONENTS/TOOLS
  (RESISTOR, CAPACITOR, INDUCTOR, DIODE, TRANSISTOR, CABLES, CONNECTORS, TRANSFORMER, SWITCHES, FUSES, RELAYS, BATTERIES) - IDENTIFICATION BASED ON VISUAL INSPECTION/DATASHEET/SPECIFICATION/NOTATION

- STUDY OF MULTIMETERS (ANALOG AND DIGITAL) –
  A. MEASUREMENT OF AC/DC VOLTAGE, CURRENT, RESISTANCE – ON DIFFERENT RANGES
  B. MEASUREMENT OF VARIATION OF RESISTANCE OF LDR, POTENTIOMETER
  C. CONTINUITY CHECKING
  D. TESTING OF DIODES & TRANSISTORS
- STUDY OF SIGNAL GENERATOR/CRO
  A. MEASUREMENT OF AMPLITUDE AND FREQUENCY OF SINE/SQUARE WAVEFORM
  B. MEASUREMENT OF AC/DC VOLTAGES
- SOLDERING PRACTICE - SIMPLE CIRCUITS

1. V-I Characteristics of PN junction Diode
2. Half wave rectifier with and with out C filter - Evaluation of Ripple factor
3. Full wave centre tapped rectifier with and with out C filter - Evaluation of Ripple factor
4. Full wave bridge rectifier with and with out C filter - Evaluation of Ripple factor
5. Zener diode voltage regulator (Line regulation, Load regulation)
6. V-I Characteristics of the Common Emitter configuration of BJT
7. Design RC coupled BJT Amplifier
8. Design a non inverting amplifier of given gain using an op-amp.
9. Realize Adder and subtractor using Op Amp
10. Realization of basic gates using NAND gate
11. Realization of basic gates using NOR gate
12. Realize Half adder and Full adder
13. Realize Halfsubtractor and Full Subtractor.
14. Realize 2 X 1 and 4 X 1 Multiplexers using logic gates
15. Realize SR, JK and D flipflop using NAND gate
16. AM generation and Demodulation
17. 8085 ALP for Block data transfer
18. 8085 ALP for Multiplication and Division
19. 8085 ALP for Binary to decimal & decimal to binary conversion
20. 8085 ALP for finding Largest & smallest from a set of numbers

Lab rules to be followed

1. There will be 20 experiments
2. Certified rough record is compulsory to attend external lab examination (total experiments done out of 20 experiments must be mentioned)
3. Internal mark distribution is as follows,

(a) Test - 25%
(b) Viva - 25%
(c) Record (no. of experiments done and punctuality) and Lab skill- 50%

4. Teacher in charge of the lab will maintain a record, that contains lab details of each student such as attendance, date of lab experiment done and date of signature on the record obtained from the teacher). This data is the base for internal mark component 3c mentioned above.
5. There will be 20 questions for external evaluation
6. Mark distribution for External Evaluation is as follows

Design - 16 Marks
Implementation - 8
Result - 4
Viva - 4

PART C:

ELECTRONICS GENERIC ELECTIVE COURSES
WORK AND CREDIT DISTRIBUTION
(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS
5D01ELE	Biomedical Instruments in Daily life	V	2	2	2
5D02ELE	Computer Hardware	V	2	2	2
5D03ELE	Consumer Electronics	V	2	2	2
5D04ELE	Basic Electronics	V	2	2	2
5D05ELE	3D Printing	V	2	2	2

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

INTERNAL ASSESSMENT

COMPONENT	WEIGHTAGE	REMARKS
COMPONENT1 TEST	60%	One
COMPONENT 2 OPEN BOOK PROBLEM SOLVING/VIVA/ASSIGNMENT	40%	One

GENERIC ELECTIVE COURSE I: 5D01ELE Biomedical Instruments in Daily life

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5D01ELE	2	2	2

COURSE OUTCOME

CO 1: Understand the cell structure and bio electric signals

CO2: Understand the operation of ECG Machine, Pacemaker and Defibrillator

CO3: Understand the operation of imaging equipments, EEG, ventilator, Blood PH and blood sugar measuring equipments

CO4: Understand the patient safety in biomedical instrumentation

Unit I :
Cells and their structure, Cell as a bio-electric generator, resting and action potential, propagation of action potential (8 Hrs)

Unit II :
ECG machine, Cardiac Pacemaker, Need for pacemaker, Internal and external pacemaker, Cardiac defribillators, Need for defibrillator (block diagram only) (8Hrs)

Unit III:
X-Ray machine, Principles of generation, CT Scan, Physics of ultra sound wave, Ultra sound scan (block diagram only) (8Hr)

Unit IV:
Blood PH measurement (concept only), Blood sugar measurement, EEG machine, Ventillator (block diagram only), Patient safety: Electric shock hazards, leakage currents, Safety codes for electromedicalequipments (8 Hrs)

Books for Study:

1. Khandpur, R.S., Handbook of Biomedical Instrumentation, McGraw Hill (2003) 2nded.

Books for Reference:

1. Cromwell, L. and Weibell, F.J. and Pfeiffer, E.A., Biomedical Instrumentation andMeasurement, Dorling Kingsley (2006) 2nded.
2. 2.Carr, J.J. and Brown, J.M., Introduction to Biomedical Equipment Technology, Prentice Hall (2000) 4thed.
3. Geddes, L.A., and Baker, L.E., Principles of Applied Biomedical Instrumentation,

WileyInterScience (1989) 3rded.
4. Webster, J.G., Medical Instrumentation Application and Design, John Wiley (2007) 3rded

Marks including choice:

Unit	Marks
1	6
2	8
3	8
4	8

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 each= 6)

- **Answer all questions** (*6 questions x Mark 1 each = 6*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 4 questions****(4questions x Marks 2 each=8)*

Part C - E**ssay** (2 questions x Marks 6 each =12)

- ***Answer any 1 question*** *(1 question x Marks 6 each=6)*

- **Total marks including choice -30**
- ***Maximum marks of the course- 20***

GENERIC ELECTIVE COURSE II : 5D02ELE: Computer Hardware

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5D02ELE	2	2	2

COURSE OUTCOME

CO 1: Understand the functions of various parts of a Computer

CO 2: Understand various memory types

CO 3: Understand different types of Printers and Storage Units

Unit I PC overview – block diagram – functional elements, CPU- General specifications of microprocessors- internal cache – external cache – clock doubling, pipelining, form factors – ATX – NLX – BTX (8Hrs)

UnitIIMemory modules, DRAM, DDR, SDRAM, RDRAM, SIMM, DIMM, RIMM Banking, BIOS & CMOS setup, flash ROM, POST, COM, & LPT Ports, USB ports (8 Hrs)

Unit III Hard Disc Drives, CD-ROMS,DVD,THUMP DRIVES- WORKING & SPECIFICATIONS, HARD DISC interface like IDE, SCSI, SATA, LED monitor – working. (8Hrs)

Module IV Printers – dot matrix – Laser – inkjet, bluetooth technology, WiFi, Power supply, SMPS types, UPS (8Hrs)

Text books

1. Structural organization, Andrew &Tanenbaum
2. Computer organization by John P. Hayes
3. PC Hard ware Computers : Craizezaker , & John Rourke
4. Computer organization – Hamacher&Zaky
5. Trouble shooting maintain & repairing & Stephen J Bigelaw
6. IBM clones -B GovindaRajalu

Marks including choice:

Unit	Marks
1	8
2	8
3	8
4	6

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 each= 6)

- **Answer all questions** (*6 questions x Mark 1 each = 6*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 4 questions****(4questions x Marks 2 each=8)*

Part C - E**ssay** (2 questions x Marks 6 each =12)

- ***Answer any 1 question*** *(1 question x Marks 6 each=6)*

- **Total marks including choice -30**
- ***Maximum marks of the course- 20***

GENERIC ELECTIVE COURSE III: 5D03ELE: Consumer Electronics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5D03ELE	2	2	2

COURSE OUTCOME

CO 1: Understand the operations of Audio systems

CO2:Understand the operations of TV and Projector

CO3: Understand mobile telephony

CO4: Understand the operation of office equipments and domestic appliances

Unit I : Audio systems : PA system – Microphone, Amplifier, Loudspeakers, Radio receivers – AM/FM (8Hrs)

Unit II : TV and Video systems
Television – standards, BW/Colour, LCD, Plasma & LED TV ,DTH and Cable TV, Projectors – LCD and DLP (8 Hrs)

Unit III: Mobile phones – Cells, 2G, 3G, 4G standards and comparison,SIM, IMEI number, Bluetooth, GPS Navigation system (8Hrs)

Unit IV: Office Equipments& Domestic Appliances, Printers: dot matrix, Inkjet and Laser, Domestic Appliance- CCTV, Microwave oven (8 Hrs)

Books for Study:

1. R. P. Bali Consumer Electronics Pearson Education (2008)
2. R. G. Gupta Audio and Video systems Tata McGraw Hill (2004)

Marks including choice:

Unit	Marks
1	6
2	8
3	8
4	8

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 each= 6)

- **Answer all questions** (*6 questions x Mark 1 each = 6*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 4 questions****(4questions x Marks 2 each=8)*

Part C - **Essay** (2 questions x Marks 6 each =12)

- ***Answer any 1 question*** *(1 question x Marks 6 each=6)*

- **Total marks including choice -30**
- ***Maximum marks of the course- 20***

GENERIC ELECTIVE COURSE IV: 5D04ELE Basic Electronics

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5D04ELE	2	2	2

COURSE OUTCOME

CO 1: Understand the basic concepts in electricity

CO2: Understand various battery types

CO3: Understand concepts in DC and AC circuits

Unit I : 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 (8 Hrs)

Unit II : 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. (8 Hrs)

Unit III: 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. (8Hrs)

Unit IV: 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. (8Hrs)

Books for Study:

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

Marks including choice:

Unit	Marks
1	4
2	9
3	9
4	8

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 each= 6)

- **Answer all questions** (*6 questions x Mark 1 each = 6*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 4 questions****(4questions x Marks 2 each=8)*

Part C - **Essay** (2 questions x Marks 6 each =12)

- ***Answer any 1 question*** *(1 question x Marks 6 each=6)*

- **Total marks including choice -30**
- ***Maximum marks of the course- 20***

GENERIC ELECTIVE COURSE V: 5D05ELE 3D Printing

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5D05ELE	2	2	2

COURSE OUTCOME

CO 1: Understand the basics of 3D printing

CO2: Understand different forms of 3D printing

CO3: Understand Applications of 3D printing

CO4: Familiarize 3D printing resources

Unit 1: Introduction.
Basics of 3D printing, Additive manufacturing, history of 3D printing, comparison of conventional manufacturing and additive manufacturing, advantages of 3D printing and 3rd generation industrial revolution.
(Text book 1, chapter 1, pages 6-18) (6 Hrs)

Unit 2: Types of 3D printing.
Different basic forms of 3D printing, desktop 3D printing and industrial 3D printing, materials used and the method of printing, fused deposition modelling, selective laser melting, laser metal deposition, limitations of current 3D printing technologies.
(Text book 1, chapter 2, pages 18-31) (8Hrs)

Unit 3: Applications of 3D printing
Current uses of 3D printing, designing for the future with 3D printing, Examining molding and casting through 3D printing, Applying artistic touches and personalization, customising designs on fly or at space, smart structures using 3D printing.
(Text book 1, pages 31-49, 356-371) (10Hrs)

Unit 4: 3D printing resources
Identifying available materials for 3D printing, identifying sources for 3D-printable objects, free 3D design softwares and designing objects in the computer, manufacturers of desktop and industrial 3D printers, 3D printing services.
(Text book 1, pages 52-85, 295-303) (8Hrs)

Recommended Books:

1. 1. Richard Horne and K. K. Hausman, 3D Printing For Dummies, 2nd Edition Published by: John Wiley & Sons, Inc. (2017)
2. 2. Refer online resources for a few portions in the syllabus that are not available in the text book.

Marks including choice:

Unit	Marks
1	5
2	10
3	10
4	5

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 each= 6)

- **Answer all questions** (*6 questions x Mark 1 each = 6*)

Part B - **Short Essay** (6 questions x Marks 2 each =12)

- ***Answer any 4 questions****(4questions x Marks 2 each=8)*

Part C - E**ssay** (2 questions x Marks 6 each =12)

- ***Answer any 1 question*** *(1 question x Marks 6 each=6)*

- **Total marks including choice -30**
- ***Maximum marks of the course- 20***

PART D:

GENERAL AWARENESS COURSES (LRP)

WORK AND CREDIT DISTRIBUTION

(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS
3A11ELE	Numerical Techniques	3	4	4	3
3A12ELE	Applied Electricity	3	4	4	3
4A13ELE	Control systems	4	4	4	3
4A14ELE	Computer Organization and Architecture	4	4	4	3

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

INTERNAL ASSESSMENT

COMPONENT	WEIGHTAGE	REMARKS
COMPONENT1 TEST	60%	Best of two
COMPONENT 2 OPEN BOOK PROBLEM SOLVING/VIVA/ASSIGNMENT	40%	One

GENERAL AWARENESS COURSE I: Numerical Techniques

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
3	3A11ELE	4	4	3

COURSE OUTCOME

CO 1: Apply iteration methods
CO2: Apply interpolation and curve fitting
CO3: Apply Numerical integrtion
CO4: Solve differential equations using initial value theorems

Unit I: Roots of Transcendental Equation Solution by iteration – convergence criterion –order of convergence – Newton Raphson method – Bisection method – False method.(17Hr)

Unit II: Interpolation and curve fitting Linear Interpolation –interpolating Lagrange interpolating polynomial – difference calculus – Newton forward and backward difference formula – least square curve fitting (linear and nonlinear) (17Hr)

Unit III: Numerical Integration Trapezoidal and Simpson's methods – Newton Cotes methods – Gauss Quadrature. (15Hr)

Unit IV: Ordinary differential equations Initial value problems – Euler's methods – Milne's method – RungeKutta method. (15Hr)

Text Books

1. Shasry S S, Introductory methods of Numerical Analysis, Prentice Hall

2. Jean Paul Tremblay & Richard B Blunt, An Introduction to Computer Science An algorithmic approach

References

1. E Balaguruswamy, Numerical Methods, TMH

2. Scarborough, Numerical Mathematical Analysis, Oxford and IBH Publishing

3. William H Press, Saul A Treukolsky

Marks including choice:

Unit	Marks
1	15
2	15
3	15
4	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B- **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**

Maximum marks of the course- 40

GENERAL AWARENESS COURSE II: Applied Electricity

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
3	3A12ELE	4	4	3

COURSE OUTCOME

CO1: Understand basics of Electrical circuit
CO2: Solve AC circuits
CO3: Understand the working principle of DC machine
CO4: Understand the working of transformer

Unit-1: Quantities- charge, current, voltage, power and energy Ideal voltage and current sources , dependant and independent sources Electrical circuit symbols-battery,ground,resistor,capacitor,inductor,voltage source and current source Ohm's law,KVL,KCL,voltage divider and current divider circuits,star-delta transformation Capacitor and inductor- voltage and current relationship,energy stored and impedance (16Hr)

Unit-2: AC fundamentals-Periodic and aperiodic wave forms – types of signals- sinusoidal signal- parameters-cycle, time period, frequency, amplitude and phase. Peak value, rms value, average value, form factor and peak factor of a sinusoidally varying voltage/current Phasor representation of alternating quantities- analysis with phasor diagrams of R,L,C,R-L,R-C and RLC circuits, Real power, reactive power, apparent power and power facor. Electromagnetism: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced emf's. Concept of self inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. (16Hr)

Unit-3: DC Machines: Working principle of DC machine as a generator and a motor. Types and constructional features.emf equation of generator, relation between emf induced and terminal voltage enumerating the brush drop and drop due to armature reaction. DC motor working principle, Back emf and its significance, torque equation.Types of D.C. motors, characteristics and applications.Necessity of a starter for DC motor. (14Hr)

Unit-4: Electromagnetism: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced emf's. Concept of self inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. Transformers: Principle of operation and construction of single-phase transformers (core and shell types), emf equation, losses, efficiency and voltage regulation (18Hr)

Books for study:

1. E hughes- Electrical technology

2. B.L. Theraja, S.G. Tarnekar, A.K. Teraja -A Text Book of Electrical Technology

3. Basic Electrical Engineering", D C Kulshreshtha, ,TMH,2009 Edition.

4. "Fundamentals of Electrical Engineering", Rajendra Prasad, PHI

Marks including choice:

Unit	Marks
1	15
2	15
3	15
4	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B- **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

Answer any 4 questions*(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*
- **Total marks including choice -60**

Maximum marks of the course- 40

GENERAL AWARENESS COURSE III: Control Systems

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
4	4A13ELE	4	4	3

COURSE OUTCOME

CO 1: Understand the modeling of systems
CO2: Analyze time response of feed back systems
CO3: Understand stability analysis and frequency domain analysis

Unit- 1: Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of PhysicalSystems -Mechanical systems, Friction, Translational systems , Rotational systems, Electrical systems, Analogous systems. Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs, Mason's gain formula. (15Hr)

Unit-2: Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. (15Hr)

Unit- 3: Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh-stability criterion, Relative stability analysis; More on the Routh stability criterion. Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci. (15Hr)

Unit-4 Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks ,Introduction to Polar Plots. (19Hr)

Books for study:

1. J. Nagarath and M.Gopal, “Control Systems Engineering”, New Age International (P) Limited, Publishers, Fourth edition – 2005.

2. “Modern Control Engineering “, K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.

3. “Automatic Control Systems”, Benjamin C. Kuo, John Wiley India Pvt. Ltd., 8th Edition, 2008.

4. “Feedback and Control System”, Joseph J Distefano III et al., Schaum’s Outlines, TMH, 2nd Edition 2007

Marks including choice:

Unit	Marks
1	15
2	15
3	15
4	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B- **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**

Maximum marks of the course- 40

GENERAL AWARENESS COURSE IV: Computer Organization and Architecture

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
4	4A14ELE	4	4	3

COURSE OUTCOME

CO 1: Understand functional components of a computer
CO2: Understand representation of instructions
CO3: Understand processing unit, memory and parallel processing
CO4: Understand input output subsystem

Unit-1 : Introduction- Function and structure of a computer ,Functional components of a computer, Interconnection of components, Performance of a computer. Representation of Instructions - Machine instructions, Operands, Addressing : Machine instructions, Operands, Addressing modes, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures. (15Hr)

Unit-2: Processing Unit-Organization of a processor - Registers, ALU and Control unit, Data path in a CPU, Instruction cycle, Organization of a control unit - Operations of a control unit, Hardwired control unit, Microprogrammed control unit. (15Hr)

Unit-3: Memory Organization and Parallel Processing - Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory. Address Space and Memory Space, Associative Memory, Page Table, Page Replacement Pipelining, Parallel Processing, Pipelining General Consideration, Arithmetic Pipeline, Instruction Pipeline. (15Hr)

Unit-4: Input/Output Subsystem - Access of I/O devices, I/O ports, I/O control mechanisms Program controlled I/O Interrupt controlled I/O and DMA controlled I/O I/O interfaces Program controlled I/O, Interrupt controlled I/O, and DMA controlled I/O, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI bus, USB bus, Firewall and Infiniband, I/O peripherals - Input devices, Output devices, Secondary storage devices. (19Hr)

Books for study:

1. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization",McGrawHill,2002

2. .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

3. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002

Marks including choice:

Unit	Marks
1	15
2	10
3	20
4	15

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B- **Short Essay** (8 questions x Marks 2 each =16)

- ***Answer any 6questions*** *(6questions x Marks 2 each=12)*

Part C - E**ssay** (6 questions x Marks 3 each =18)

- ***Answer any 4 questions****(4 questions x Marks 3 each=12)*

Part D - **Long Essay** (4 questions x Marks 5 each =20)

- ***Answer any 2 questions****(2 questions x Marks 5 each=10)*

- **Total marks including choice -60**
- ***Maximum marks of the course- 40***