THIRUVALLUVAR UNIVERSITY

SERKKADU, VELLORE–632115

B.Sc. ELECTRONICS SCIENCE

SYLLABUS

FROM THE ACADEMIC YEAR

2023 – 2024

THIRUVALLUVAR UNIVERSITY, VELLORE – 632 115
B.Sc. Electronics Science Curriculum
(For the students admitted during the academic year 2023 – 24 onwards)

FIRST SEMESTER

Credits	Title of the Paper	Credits	Hours	Maximum Marks		
				CIA	ESE	Total
Language-I	Tamil/Other Languages	3	6	25	75	100
English (CE)-I	Communicative English I	3	6	25	75	100
Core Theory-I	Basic Electronics	5	6	25	75	100
Core Practical-I	Basic Electronics Lab	5	5	25	75	100
Elective-I	Basic Mathematics-I	3	5	25	75	100
Skill Enhancement Course (SEC - I)	Electronic Communication Systems	2	2	25	75	100
Foundation Course	Fundamentals Of Electronics	2	2	25	75	100
	Total	**23**	**32**	**175**	**525**	**700**

SECOND SEMESTER

Credits	Title of the Paper	Credits	Hours	Maximum Marks		
				CIA	ESE	Total
Language-II	Tamil/Other Languages	3	6	25	75	100
English (CE)-II	Communicative English II	3	6	25	75	100
Core Theory-II	Analog Electronics	5	5	25	75	100
Core Practical-II	Analog Electronics Lab	5	5	25	75	100
Elective-II	Basic Mathematics-II	3	6	25	75	100
Skill Enhancement Course (SEC -II)	(NMSDC I : Language Proficiency for Employability) **Effective English**	2	2	25	75	100
Skill Enhancement Course (SEC - III)	Trouble shooting and Maintenance of Audio and video equipments	2	2	25	75	100
	Total	**23**	**32**	**175**	**525**	**700**

THIRD SEMESTER

Credits	Title of the Paper	Credits	Hours	Maximum Marks		
				CIA	ESE	Total
Language-III	Tamil/Other Languages	3	6	25	75	100
English (CE)-III	Communicative English III	3	6	25	75	100
Core Theory-III	Semiconductor Device and IC Fabrication Technology	5	5	25	75	100
Core Practical-III	Semiconductor Device Lab	5	5	25	75	100
Elective-III	(to choose any 1 out of 2) a) Programming in C b) Basic Physics - 1	3	5	25	75	100
Skill Enhancement Course (SEC - IV)	**NMSDC**	1	1	25	75	100
Skill Enhancement Course (SEC - V)	PCB Design and Fabrication	2	2	25	75	100
EVS	Environmental Studies	2	2	0	0	0
	Total	**22**	**32**	**175**	**525**	**700**

FOURTH SEMESTER

Credits	Title of the Paper	Credits	Hours	Maximum Marks		
				CIA	ESE	Total
Language-IV	Tamil/Other Languages	3	6	25	75	100
English (CE)-IV	Communicative English IV	3	6	25	75	100
Core Theory-IV	Digital Electronics	5	5	25	75	100
Core Practical-IV	Digital Electronics Lab	5	4	25	75	100
Elective-IV	(to choose any 1 out of 2) a) Python Programming b) Basic Physics – 2	3	6	25	75	100
Skill Enhancement Course (SEC - VI)	**NMSDC**	2	2	25	75	100
Skill Enhancement Course (SEC - VII)	Principles of Electronic Appliances	2	2	25	75	100
	Total	**23**	**32**	**175**	**525**	**700**

FIFTH SEMESTER

Credits	Title of the Paper	Credits	Hours	Maximum Marks		
				CIA	ESE	Total
Core Theory-V	Microprocessor and its Applications	4	5	25	75	100
Core Theory-VI	Electrical and Electronic Instrumentation	4	5	25	75	100
Core Theory-VII	Internet Of Things	4	5	25	75	100
Core Practical - V	Communication and Microprocessor Lab	4	5	25	75	100
Elective-V	(to choose any 1 out of 3) a) Cellular Mobile Communication b) VLSI Design c) Wireless Communication	3	4	25	75	100
Elective-VI	(to choose any 1 out of 3) a) Medical Electronics b) Power Electronics c) Industrial Electronics	3	4	25	75	100
Value Education	VALUE EDUCATION	2	2	25	75	100
	Summer Internship / Industrial Training	2	-	100	-	100
Total		**26**	**30**	**275**	**525**	**800**

SIXTH SEMESTER

Credits	Title of the Paper	Credits	Hours	Maximum Marks		
				CIA	ESE	Total
Core Theory-VIII	Microcontroller 8051 and its Applications	4	6	25	75	100
Core Practical - VI	Microcontroller 8051 Lab	4	6	25	75	100
Core Project - I	Individual / Group Project	4	6	25	75	100
Elective-VII	(to choose any 1 out of 3) a) Television and Video Engineering b) Digital System Design c) Robotics And Automation	3	5	25	75	100
Elective-VIII	(to choose any 1 out of 3) a) Computer Networks b) Automotive Electronics c) Arduino with Sensors	3	5	25	75	100
Extension Activity	Extension Activity	1	-	100	-	100
Professional Competency Skill	**NMSDC**	2	2	25	75	100
Total		**21**	**30**	**250**	**450**	**700**

First Semester

Paper Code		BASIC ELECTRONICS	L	T	P	C
			5	0	0	5
Paper type		Core Theory-I	Syllabus Version		2023-24	

Course Objectives:
The main objectives of this course are to design the amplifiers, feedback amplifiers and power amplifiers.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Understand the Concept of Network Theorems	K2
2	Study the basic concepts of AC fundamentals	K2
3	Understand the basics of P-N junction diode and Zener diode with its applications.	K2
4	Analyze the working of various configurations of Transistor	K6
5	Outline the concept of feedback amplifiers with parameters involved.	K5
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	NETWORK THEOREMS	12 hours
Ohm's law - Kirchhoff's law - node voltage analysis - mesh current method - super position theorem - Thevenin's theorem - Norton's theorem. Thevenin to Norton Conversion- Star and Delta Conversion.		

Unit:2	AC CIRCUITS	12 hours
Introduction To Sinusoidal Wave-RMS Value – Average Value-AC Circuits with Resistance- Circuits with XL Alone – Circuits with XC Alone - Series Reactance And Resistance – Parallel Reactance and Resistance - Series Parallel Reactance and Resistance – Real Power –Series Resonant Circuit – Parallel Resonant Circuit - Q Factor.		

Unit:3	DIODE CIRCUITS AND POWER SUPPLIES	12 hours
PN Junction diode - characteristics - Half and full wave rectifiers - Bridge rectifier - Efficiency - ripple factor - Filter circuits - Clipper and Clamper using diodes. Differentiator and integrator using resistor and capacitor - Zener Diode - Characteristics - Regulated power supply using Zener diode		

Unit:4	TRANSISTOR CIRCUITS & POWER AMPLIFIERS	12 hours
Characteristics of a transistor in CB, CE modes - Relatively merits - Graphical analysis in CE configuration - Transistor as a amplifier - RC coupled Single stage amplifier - Frequency response. Transformer coupled amplifiers - Multistage amplifiers - Emitter follower. Construction of basic logic gates using diodes and transistors. Class A and Class B power amplifiers - Single ended and push-pull configurations - Power dissipation and output power calculations.		

Unit:5	FEEDBACK AMPLIFIERS	12 hours
Basic concept of feedback amplifiers - Transfer gain with feedback - General characteristics of negative feedback amplifier - Effect of negative feedback on gain - Gain stability - Distortion and bandwidth - Input and output resistance in various types of feedback - Analysis of voltage and current in feedback amplifier circuits.		

	Total Lecture hours	60 hours

Text Book(s)	
1	Introduction to Integrated Electronics - V. Vijayendran, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2005.
2	Electronic Circuits and Systems - Y.N. Bapat, Tata McGraw Hill Publishing Co. Ltd.

Reference Books	
1	Electronic Devices and Circuits - G.K. Mithal, Khanna Publishers, Delhi.
2	Hand Book of Electronics - Gupta & Kumar, Pragati Prakashan, Meerut.
3	Electronic Devices and Circuit Theory - R. Boylestad & L. Nashelsky, Prentice Hall of India Private Limited, 6/e.
4	Electronic Devices and Circuits - J.P. Agarwal & Amit Agarwal, Prakasam Publishers.
5	Linear Integrated Circuits - D. Roy Choudhury & Shail Jain, New Age International (P) Limited.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=qqiZ2LPkFws
2	https://www.youtube.com/watch?v=Sr-Sm_d3oVE
3	https://www.youtube.com/watch?v=LYQ4J94EDdg
4	https://www.youtube.com/watch?v=8iPRR6iCD8A
5	https://www.youtube.com/watch?v=qrIOoAIWSaQ
6	https://nptel.ac.in/courses/108102112

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	S	L	M	S	S	S	M	L
CO2	M	S	M	L	L	S	S	M	M	S
CO3	S	L	M	S	M	L	L	S	S	M
CO4	M	S	S	M	L	S	M	S	L	S
CO5	S	L	M	S	M	L	L	**S**	S	M
*S-Strong; M-Medium; L-Low										

Paper code		**BASIC MATHEMATICS - I**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper type		**Elective - I**	**Syllabus Version**		**2023-24**	

Course Objectives:
The main objectives of this course are to develop logical and problem solving skills; becoming familiar with some of the basic techniques used to construct mathematical.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Understand the algebra concepts	K2
2	Analyze the Theory of Equations and its various operations.	K2
3	Evaluate the methodology of different matrices.	K5
4	Understand the different matrices concepts	K2
5	Understand the trigonometry concepts	K2
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create	

Unit:1	**ALGEBRA**	**10 hours**
Partial fractions, Binomial, Exponential, Logarithmic Series [No Proof] Summation Problem.		

Unit:2	**THEORY OF EQUATIONS**	**10 hours**
Transformation of equations by increasing, decreasing and multiplying the roots by a constant, Reciprocal Equations.		

Unit:3	**MATRICES**	**10 hours**
Square Matrix, Symmetric and Skew symmetric, Orthogonal, Hermitian, Skew Hermitian, Unitary Characteristic equations , eigen values, Cayley Hamilton's Theorem (Problem Only)		

Unit:4	**MATRICES (CONTD)**	**10 hours**
Operations on matrices, Adjoint and inverse of a matrix - Determinant of a matrix, Solving equations by Cramer's rule.		

Unit:5	**TRIGNOMETRY**	**10 hours**
Expansions of sin $n\theta$, cos $n\theta$, tan $n\theta$ - Expansions of $\sin^n \theta$, $\cos^n \theta$		

	Total Lecture hours	**50 hours**

Text Book(s)	
1	P.R.Vittal (2003) Allied Mathematics . Marghan Publications, Chennai
2	P.Balasubramanian and K.G.Subramanian, (1997) Ancillary Mathematics. Vol. I & II. Tata McGraw Hill, New Delhi.

Reference Books	
1	P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand & company Ltd., New Delhi-55.
2	S.P.Rajagopalan and R.Sattanathan,(2005) Allied Mathematics .Vol. I & II. Vikas Publications, New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=it9jv9F8jaA
2	https://www.youtube.com/watch?v=Cp7W8TDjXCQ
3	https://www.youtube.com/watch?v=16LX95gVT_M
4	https://www.youtube.com/watch?v=ZOHMCsdDti0
5	https://www.youtube.com/watch?v=7eHuQXMCOvA
6	https://www.digimat.in/nptel/courses/video/122107036/L01.html

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	M	S	L	M	M	S
CO2	L	M	S	L	M	S	S	S	M	L
CO3	M	S	M	L	L	S	S	M	M	S
CO4	S	L	M	S	M	L	L	S	S	M
CO5	M	M	L	S	M	S	L	L	S	L
*S-Strong; M-Medium; L-Low										

Course Code		ELECTRONIC COMMUNICATION SYSTEMS	L	T	P	C
			2	**0**	**0**	**2**
Paper type		**Skill Enhancement Course (SEC - I)**	**Syllabus Version**		2023-24	
Course Objectives:						
Fundamentals of antenna, their characteristics and types						
Amplitude modulation and demodulation and radio wave transmission and reception						
Frequency modulation and demodulation and FM radio wave transmission and reception						
Principle of analog and digital pulse modulation.						

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Illustrate the construction and working of different types of antennas	**K2**
2	Explain modulation and discuss the different types modulation	**K4**
3	Explain the concept and principles of amplitude modulation, frequency and pulse modulation.	**K3**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create		

Unit:1	**ANTENNA**	**6 hours**
Antenna –Efficiency –Directive gain - Bandwidth, Beam width and polarization - Dipole - Folded dipole - Yagi - Uda - Helical - Discone - Parabolic - Dish Antennas		

Unit:2	**WAVE PROPAGATION**	**6 hours**
Ground wave, sky wave and space wave propagation – skip distance – Maximum usable frequency.		

Unit:3	**AMPLITUDE MODULATION**	**6 hours**
Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Block diagram of AM Radio transmitter and super heterodyne Receiver		

Unit:4	**FREQUENCY MODULATION**	**6 hours**
Frequency Modulation - Definition - Derivation of Modulated wave - Block diagram of FM transmitter and receiver.		

Unit:5	**PULSE MODULATION**	**6 hours**
Pulse Modulation - Sampling theorem - PAM, PWM, PPM, PCM		

	Total Lecture hours	**30 hours**

	Text Book(s)
1	Electronic Communication Systems - George Kennedy, McGraw Hill Book Company, 4/e, 2005.
2	Communication Engineering - T.G. Palanivelu, Anuradha Publicatons, 1/e, 2002.

	Reference Books
1	Communication System - Roddy & Coolen, 4/e, Pearson Education, 2005.
2	Principles of Communication Engineering - Anok Singh, 4/e, Sathyaprakasam Publications, 2004.
3	Electronic Communication Systems Wayne Tomasi, 4/e, Pearson Education, 2004.
4	Antennas by J.D.Kraus

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.youtube.com/watch?v=mHvV_Tv8HDQ
2	https://www.youtube.com/watch?v=6Y9n8dMYL-o
3	https://www.youtube.com/watch?v=90dizh1Sl3E
4	https://www.youtube.com/watch?v=oYRMYSIVj1o
5	https://www.youtube.com/watch?v=fSoXIqBlg9M
6	https://nptel.ac.in/courses/117102059

Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	M	M	S
CO2	S	L	L	L	L	L	L	S	S	M
CO3	L	M	S	M	S	S	M	L	L	S
CO4	M	S	M	S	S	M	S	M	S	S
CO5	S	L	M	L	M	S	S	S	L	L
*S-Strong; M-Medium; L-Low									

Paper code		**FUNDAMENTALS OF ELECTRONICS**	**L**	**T**	**P**	**C**
Paper type		**Foundation Course**	**2**	**0**	**0**	**2**
			Syllabus Version		**2023-24**	

Course Objectives:

The main objectives of this course are to:
Provide an adequate knowledge in Basics of electrostatics, electrical measurements, electronics components

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the outline and basics of electrostatics.	K2
2	Understand the concept of a capacitor and its applications.	K2
3	Evaluate the electrical measurements and describe magnetic effect of current	K5
4	Apply the electronic components in network theorems.	K2
5	Understand the basic of Semiconductors	K3

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create

Unit:1	**ELECTROSTATICS**	**7 hours**

Electric charges - Coulomb's law - Electric field - Electric intensity and electric potential - Relation between electric potential and intensity - Electric intensity and potential due to a uniform charged conducting sphere at a point outside, on, and inside the conductor.

Unit:2	**RESISTORS**	**7 hours**

Types of Resistors: Fixed, Variable - Brief mention of their Construction and Characteristics - Color Coding of Resistors - Connecting Resistors in Series and Parallel. Testing of Resistance using Multimeter.

Unit:3	**INDUCTORS**	**7 hours**

Types of Inductors: Fixed, Variable- Self and Mutual Inductance-Faraday's Law and Lenz's Law Of Electromagnetic Induction-Energy Stored In An Inductor-Inductance In Series And Parallel- Testing of Inductance using Multimeter.

Unit:4	**CAPACITORS**	**7 hours**

Principles of Capacitance-Parallel Plate Capacitor-Permittivity-Definition of Dielectric Constant - Dielectric Strength-Energy Stored in a charged Capacitor-Types of Capacitors: Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic: Construction and Application- Capacitors in Series and Parallel. Testing of Capacitor using Multimeter.

Unit:5	**INTRODUCTION TO SEMICONDUCTORS**	**7 hours**

Classification of solids - conductors, insulators and semiconductors – energy band diagram - Intrinsic semiconductors - extrinsic semiconductors - doping of impurities- P type - N type - electron and hole current – Basic Concepts of Diode and Transistor.

	Total Lecture hours	**35 hours**

Text Book(s)	
1	Electricity and Magnetism - M. Narayanamoorthi and Others, National Publishing Co.,chennai
2	Electricity and Magnetism - R. Murugeshan, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.
3	Principles of Electronics - V.K. Mehta, S. Chand & Co., 4/e, 2001.
4	Basic Electronics - B.L. Theraja, S. Chand & Co., 4/e, 2001.
5	Applied Electronics – R.S.Sedha S. Chand & Co., 1/e 1990,Reprint 2018.

Reference Books	
1	Electricity and Magnetism - Brijlal & Subrahmanyam, Ratan Prakashan Mandir, Agra.
2	Fundamentals of Electricity and Magnetism - B.D. Duggal & C.L. Chhabra, Shoban Lal Nagin Chand & Co., Jallundur.
3	Physics, Vol. II - Resnick, Halliday & Krane, 5/e, John Wiley & Sons, Inc.,.
4	Basic Electronics - B. Grob, McGraw - hill, 6/e, NY, 1989.
5	Elements of Electronics - Bagde & Singh, S. Chand & Co.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=OXyR2VaxgYo
2	https://www.youtube.com/watch?v=_c9I2-OwKCc
3	https://www.youtube.com/watch?v=211aWRuv7XI
4	https://youtu.be/UGGaGUPF2fg
5	https://www.youtube.com/watch?v=5MLVr9r6Vzk
6	https://www.digimat.in/nptel/courses/video/108105112/L01.html

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	S	L	L	S	M	L	M	M
CO2	L	S	M	S	S	M	M	L	L	S
CO3	S	M	L	L	M	S	L	M	M	S
CO4	L	M	S	L	M	S	S	S	M	L
CO5	M	M	S	S	S	L	L	M	M	S
*S-Strong; M-Medium; L-Low										

Paper Code		Basic Electronics Lab	L	T	P	C
			0	0	5	5
Paper type		Core Practical-I	Syllabus Version		2023-24	

Course Objectives:

The main objectives of this course are to understand the concepts and working of various instruments like Multimeter, CRO, AFO, PN Junction Diode, Zener diode, transistor, construction of power supply, logic gates, wave shaping circuits.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember the value of resistance by color coding and multimeter.	K1
2	Understand the characteristics of diode and Transistor with its applications.	K2
3	Analyze the working CRO.	K3
4	Analyze the function of Wave shaping circuits	K5

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

	Minimum of Eight Experiments from the list
1	Study of Multimeter – Checking of Components.
2	Study of Colour Coding of Resistors & Connecting Resistance in Series and Parallel.
3	Verification of Ohm's Law.
4	Verification of Kirchhoff's Law
5	Verification of Thevenin's Theorem
6	Verification of Norton's Theorem
7	Uses of CRO - Measurement of voltage, current, frequency and phase - Displaying waveforms and Lissajou's figures - Study Experiment.
8	Half wave rectifier using PN junction Diode.
9	Full wave rectifier using PN junction Diode.
10	Characteristics of PN junction diode.
11	Characteristics of Zener diode.
12	Regulated power supply using Zener diode.
13	Transistor characteristics in CE mode.
14	Clipping and clamping circuits.
15	Differentiating and integrating circuits using R and C.
16	Basic logic gates (AND, OR, NOT) using diode & transistor.

	Total Lecture hours	**60 hours**

Text Book(s)

1	K. Craigs and L. Fuentes, Introduction to Electric Circuits: Lab Manual, 10th Ed. (OBU Publishers, 2019).

Reference Books

1	**B.E.S. Practicals -** *R. Sugaraj Samuel & Horsley Solomon -* Department of Electronic Science, C.T.M. College of Arts and Science, Chennai.
2	**Basic Electronics - A Text Lab Manual -** *Zbar, Malvino & Miller -* Tata McGraw Hill.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.youtube.com/watch?v=3h2edx6O6Vc
2	https://www.youtube.com/watch?v=i6n2yHIBjQw
3	https://www.youtube.com/watch?v=zjrSAuhTFPE
4	https://www.youtube.com/watch?v=wvHcm84RsFw
5	https://www.youtube.com/watch?v=SwI_3BPTr0I
6	https://nptel.ac.in/courses/122106025

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	S	M	M	L	S	M	L
CO2	M	S	M	L	L	S	S	M	M	S
CO3	S	L	M	S	M	L	L	S	S	M
CO4	L	S	M	S	S	M	M	L	L	S
CO5	S	M	M	L	S	M	S	S	M	M
*S-Strong; M-Medium; L-Low										

Second Semester

Paper Code		**ANALOG ELECTRONICS**	L	T	P	C
Paper Code	Core Theory - 2		**5**	**0**	**0**	**5**
			Syllabus Version		**2023-24**	

Course Objectives:
To enhance the knowledge of the students in advanced circuits
To gain ability to design and develop own electronic applications

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Describe the working principle of Transistor and its variants.	**K1**
2	Explain the operation of FET and MOSFET with its application.	**K3**
3	Describe the working of Oscillators and its types	**K6**
4	Acquire knowledge in multivibrators	**K4**
5	Gain the knowledge of regulated power supplies	**K2**

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

Unit:1	**TRANSISTOR BIASING**	**12 hours**
Transistor biasing methods - Fixed bias - collector to base bias - potential divider bias - stability analysis - thermal runaway - Q point - load line analysis.		

Unit:2	**FIELD EFFECT TRANSISTORS**	**12 hours**
Construction, working characteristics of FET and MOSFET (D and E type) - Parameters of FET - Difference between FET and BJT - Difference between FET and MOSFET - Applications of FET and MOSFET - Advantages of MOSFET.		

Unit:3	**OSCILLATORS**	**12 hours**
Positive feedback - Stability issues - Feedback requirement of oscillations - Barkhausen criterion for oscillation - Hartley, Colpitts, Phase shift and Wien bridge oscillators - Condition for oscillation and frequency derivation - Crystal oscillator.		

Unit:4	**MULTIVIBRATORS**	**12 hours**
Monostable, bistable and astable multivibrators - Schmitt trigger.		

Unit:5	**REGULATED POWER SUPPLY**	**12 hours**
Zener diode as a voltage regulator - fixed voltage regulator ICs - Variable voltage regulator ICs.		

		Total Lecture hours	**60 hours**

Text Book(s)	
1	Electronic Devices and Circuits (Applied Electronics Vol. I) - G.K. Mithal, Khanna Publishers.
2	Principles of Electronics - V.K. Metha, S. Chand & Co., 1991.

Reference Books	
1	Electronic Devices and Circuits - Jacob Millman and C.C. Halkias, Tata McGraw Hill Publishing Co. Ltd.
2	Physics of Semiconductor Devices - S.M. Sze, Wiley Eastern Limited.
3	Electronic Principles - A.P. Malvino, Tata McGraw Hill Publishing Co. Ltd.
4	A Text Book of Applied Electronics - R.S. Sedha, S. Chand & Co., 2005

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=J4oO7PT_nzQ
2	https://www.youtube.com/watch?v=3Ny3wzw0ke0
3	https://www.youtube.com/watch?v=rIMexAWE6Cc
4	https://www.youtube.com/watch?v=9IGAEKzdJ_k
5	https://www.youtube.com/watch?v=drwkJ0ez9iY
6	https://nptel.ac.in/courses/113106062

Mapping with Programme Outcomes									
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	M	M	M	S	L	L	L
CO2	S	M	M	M	M	M	M	S	M	M
CO3	M	L	S	L	S	L	M	S	S	M
CO4	L	M	M	M	M	S	S	M	S	S
CO5	M	S	S	S	S	M	L	M	M	M
*S-Strong; M-Medium; L-Low										

Paper Code		**BASIC MATHEMATICS II**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper Type	Elective-II		**Syllabus Version**		**2023-24**	

Course Objectives:
The main objectives of this course are to develop logical and problem solving skills; becoming familiar with some of the basic techniques used to construct mathematical.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Use Differential Calculus for solving problems.	K3
2	Solve basic application problems described by second order linear differential equations with constant coefficients.	K5
3	Obtain an approximate set of solution function values to a second order boundary value problem using a finite difference equation.	K6
4	Perform Vector analysis to find solutions.	K1
5	Solve problems using Integral Calculus	K4
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create	

Unit:1		**DIFFERENTIAL CALCULUS**	**10 hours**
Successive differentiation, nth derivative, Leibnitz Theorem (with out proof), Jocobians.			

Unit:2		**ORDINARY DIFFERENTIAL EQUATION**	**10 hours**
Second order linear differential equation with constant coefficient			

Unit:3		**PARTIAL DIFFERENTIAL EQUAITON**	**10 hours**
Formation of equation by elimination of constants and arbitrary functions.			

Unit:4		**VECTOR ANALYSIS**	**10 hours**
Scalar point function, vector point function, gradient, divergence, curl, irrotational, solenoidal, Line and surface integrals.			

Unit:5		**INTEGRAL CALCULUS**	**10 hours**
Integration by part's, Bernoulli's formula, Fourier series for a function in $(-\pi, \pi)$, Even and odd function.			

		Total Lecture hours	**50 hours**

Text Book(s)
1	P.R.Vittal (2003) Allied Mathematics . Marghan Publications, Chennai
2	P.Balasubramanian and K.G.Subramanian, (1997) Ancillary Mathematics. Vol. I & II. Tata McGraw Hill, New Delhi.

Reference Books	
1	P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand & company Ltd., New Delhi-55.
2	S.P.Rajagopalan and R.Sattanathan,(2005) Allied Mathematics .Vol. I & II. Vikas Publications, New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=PL7F4ui3Q3o
2	https://www.youtube.com/watch?v=NlCU-9kudkQ
3	https://www.youtube.com/watch?v=Hf8492A5vZ4
4	https://www.youtube.com/watch?v=1qLb0B40YnA
5	https://www.youtube.com/watch?v=NcD9JNPMfUs
6	https://www.digimat.in/nptel/courses/video/111105122/L01.html

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	S	M	M	L	S	M	L
CO2	M	S	M	L	L	S	S	M	M	S
CO3	L	S	M	S	S	M	M	L	L	S
CO4	S	M	L	L	M	S	L	M	M	S
CO5	S	M	M	L	S	M	S	S	L	L
*S-Strong; M-Medium; L-Low										

Paper Code		TROUBLE SHOOTING AND MAINTENANCE OF AUDIO AND VIDEO EQUIPMENTS	L	T	P	C
			2	0	0	2
Paper Type		Skill Enhancement Course (SEC - III)	Syllabus Version		2022-23	
Course Objectives:						
To learn about Home appliances. Trouble shoot the faults in the electronic appliance						

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Explain the working of recording and reproduction.	K2
2	Gain the knowledge of PA system	K6
3	Integrate trouble shooting skills in television	K4
4	Acquire knowledge on maintenance and safety measures of video disc	K2
5	Illustrate the operation of digital access devices used in regular activity.	K1
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	RECORDING AND REPRODUCTION	6 hours
Recording and reproduction principles - Optical recording - Different types - Methods of recording and reproduction - Optical recording on compact disc - play back process - Advantage of compact disc - Trouble shooting in compact disc.		

Unit:2	PA SYSTEMS	6 hours
Stereophony - Stereophonic recording on disc and reproduction - Hi-Fi Stereo reproducing system - Block diagram of Public Addressing system - Requirement of Public Addressing system - Typical PA installation planning for a public meeting.		

Unit:3	TELEVISION	6 hours
PAL colour TV transmitters Faults in TV transmitter - PAL colour TV receiver - Faults in colour TV receiver - Testing of TV receiver.		

Unit:4	VIDEO DISC	6 hours
Video disc format - Video recording on disk - Very High density disk - High definition TV system - Block diagram of MAC encoder - MAC receiver - Advantages.		

Unit:5	DIGITAL TV	6 hours
Digital TV system - Cable TV concepts set top box - Dish TV and connections - Closed circuit television - Introduction to FLAT LCD and Plasma television systems.		

	Total Lecture hours	30 hours

Text Book(s)	
1	Electronic Instruments and systems, Principles, Maintenance and Troubleshooting - R.G. Gupta Tata Mc Graw Hill Publishing Co.Ltd.
2	Colour Television Theory and Practice - S.P. Bali, Tata Mc Graw Hill Publishing Co.Ltd.

Reference Books	
1	Audio and Video systems - R.G. Gupta Tata Mc Graw Hill Publishing Co.Ltd.
2	Monochrome and Colour Television – R.R. Gulati. New Age Interbational (P) Ltd. New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=D9_2qtD8flo
2	https://www.youtube.com/watch?v=HksMSVZqB4Y
3	https://www.youtube.com/watch?v=9uCeFhO8H40
4	https://www.youtube.com/watch?v=s4zi1wdKE5k
5	https://www.youtube.com/watch?v=CkR9YyWaAkU

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	L	M
CO2	M	L	M	M	M	S	S	M	S	M
CO3	L	S	L	M	L	L	M	S	S	S
CO4	M	M	S	S	S	M	S	M	L	M
CO5	S	M	M	L	S	S	L	L	M	L
*S-Strong; M-Medium; L-Low										

Paper Code		**ANALOG ELECTRONICS LAB**	**L**	**T**	**P**	**C**
			0	**0**	**5**	**5**
Paper type		**Core Practical-II**	**Syllabus Version**		**2023-24**	

Course Objectives:
The main objectives of this course are to understand the concepts and working of various instruments like CRO, AFO, transistors based elementary amplifier and oscillator circuits

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Design and construct electronic circuits using BJT.	K1
2	Understand the characteristics and operations of FET.	K2
3	Learn all waveform generation technique.	K3
4	Design and construct regulated power supplies.	K5

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

	Minimum of Eight Experiments from the list	
1	Transistor as an amplifier	
2	Transistor – Emitter follower	
3	FET – Characteristics	
4	FET as an amplifier	
5	FET – Source follower	
6	Transistor Hartley oscillator.	
7	Transistor Colpitts oscillator.	
8	Transistor phase shift oscillator.	
9	Astable multivibrator using BJT.	
10	Mono stable multivibrator using BJT.	
11	Bistable multivibrator using BJT.	
12	IC regulated power supply using IC 78XX.	
13	Dual regulated power supply using IC 78XX and 79XX.	
	Total Lecture hours	**60 hours**

Text Book(s)	
1	K. Craigs and L. Fuentes, Introduction to Electric Circuits: Lab Manual, 10th Ed. (OBU Publishers, 2019).

Reference Books	
1	**B.E.S. Practicals -** *R. Sugaraj Samuel & Horsley Solomon* - Department of Electronic Science, C.T.M. College of Arts and Science, Chennai.
2	**Basic Electronics - A Text Lab Manual -** *Zbar, Malvino & Miller* - Tata McGraw Hill.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=3h2edx6O6Vc
2	https://www.youtube.com/watch?v=i6n2yHIBjQw
3	https://www.youtube.com/watch?v=zjrSAuhTFPE
4	https://www.youtube.com/watch?v=wvHcm84RsFw
5	https://www.youtube.com/watch?v=SwI_3BPTr0I
6	https://nptel.ac.in/courses/122106025

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	L	S	M	M	L	S	M	L
CO2	M	S	M	L	L	S	S	M	M	S
CO3	S	L	M	S	M	L	L	S	S	M
CO4	L	S	M	S	S	M	M	L	L	S
CO5	S	M	M	L	S	M	S	S	M	M
*S-Strong; M-Medium; L-Low										

Third Semester

Paper Code		SEMICONDUCTOR DEVICE AND IC FABRICATION TECHNOLOGY	L	T	P	C
			5	0	0	5
Paper type		Core Theory-III	Syllabus Version		2023-24	

Course Objectives:
The main objectives of this course are to design the amplifiers, feedback amplifiers and power amplifiers, op-amp characteristics

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Explain the working of amplifier with its types.	K1
2	Outline the concept of feedback amplifiers with parameters involved.	K2
3	Discuss the DC and AC characteristics of Operational amplifier	K4
4	Develop electronic circuits using Op-amp.	K6
5	Describe the working of Oscillators and its types.	K5
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create	

Unit:1	POWER ELECTRONICS	12 hours
Construction, working characteristics of UJT and SCR - Equivalent circuit of UJT - SCR as a switch and rectifier - Applications of UJT and SCR - Characteristics of TRIAC.		

Unit:2	SPECIAL DIODES	12 hours
Schottky effect - Working characteristics of MIS, MIM diodes - Working and merits of CCD, LED and LCD - LDR - Photodiode - Solar cell - Semiconductor LASER diode and its application.		

Unit:3	INTEGRATED CIRCUITS	12 hours
Integrated circuit - Monolithic Integrated Circuit technology - Fabrication of IC components - Resistors, Capacitors, Diodes, Transistors, FET and MOSFET - Thin and thick film technology - LSI - MSI - VLSI - IC package and symbols - Merits and demerits of ICs.		

Unit:4	OPERATIONAL AMPLIFIERS	12 hours
BJT Differential amplifier – ideal operational amplifier - Transfer characteristics - Various offset parameters - Differential gain - CMRR - Slew rate – Bandwidth – Internal circuit diagram of IC 741.		

Unit:5	OP-AMP CIRCUITS	12 hours
Basic operational amplifier circuits under inverting and non-inverting modes - Adder - Subtractor - Integrator - Differentiator - Comparator - Sine, square and triangular waveform generators - Active filters - Sample and Hold circuits.		

		Total Lecture hours	**60 hours**

Text Book(s)	
1	Electronic Devices and Circuits (Applied Electronics Vol. I) - G.K. Mithal, Khanna Publishers.
2	Principles of Electronics - V.K. Metha, S. Chand & Co., 1991.

Reference Books	
1	Electronic Devices and Circuits - Jacob Millman and C.C. Halkias, Tata McGraw Hill Publishing Co. Ltd.
2	Physics of Semiconductor Devices - S.M. Sze, Wiley Eastern Limited.
3	Electronic Principles - A.P. Malvino, Tata McGraw Hill Publishing Co. Ltd.
4	A Text Book of Applied Electronics - R.S. Sedha, S. Chand & Co., 2005

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=J4oO7PT_nzQ
2	https://www.youtube.com/watch?v=3Ny3wzw0ke0
3	https://www.youtube.com/watch?v=rIMexAWE6Cc
4	https://www.youtube.com/watch?v=9IGAEKzdJ_k
5	https://www.youtube.com/watch?v=drwkJ0ez9iY

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	S	L	M	S	S	S	M	L
CO2	M	S	M	L	L	S	S	M	M	S
CO3	S	L	M	S	M	L	L	S	S	M
CO4	M	S	S	M	L	S	M	S	L	S
CO5	S	L	M	S	M	L	L	**S**	S	M
*S-Strong; M-Medium; L-Low										

Paper Code		**A. PROGRAMMING IN C**	L	T	P	C
			4	0	0	3
Paper Type	**ELECTIVE – III**		**Syllabus Version**		**2023-24**	

Course Objectives:

The main objectives of this course are to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Explain the fundamentals of C Programming.	K2
2	Develop programs using Decision making statements and functions.	K6
3	Write C programs using Arrays and pointers.	K3
4	Interpret the concept of Structures and Unions in C language	K5
5	Use Data file concepts in C language.	K1
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**FUNDAMENTALS**	12 hours
Character set - Keywords - Identifiers - Data types - Constants - Variables - Operators and their hierarchy - Expression - Statements - Input/Output functions.		

Unit:2	**DECISION MAKING STATEMENTS**	12 hours
if-else, while, do-while, for, switch I break, continue, goto statements. Functions: Definitions - Arguments - Function prototype - Recursion - Library functions.		

Unit:3	**ARRAYS**	12 hours
Array definition - Processing arrays - Passing array to a function - Multidimensional arrays - Strings - Storage classes.		

Unit:4	**POINTERS**	12 hours
Pointer declaration - Pointer arithmetic - Pointers and arrays - Pointer operation - Passing pointers to a function - Passing function to a function.		

Unit:5	**STRUCTURES AND UNIONS**	12 hours
Structure definition - Processing a structure - Structures and pointers - Passing structure to a function - Self-referential structures - Unions. Data files: Opening, Closing, Creating, Processing data files		

	Total Lecture hours	**60 hours**

Text Book(s)
1	Theory and Problems of Programming with 'C' (Schaum's Series) - B.S. Gottfried, McGraw Hill International Book Company.
2	Programming in ANSI C - E. Balagurusamy, Tata McGraw Hill Publishing Co. Ltd., 2/e.

Reference Books
1	Programming with 'C' - K.R. Venugopal & R.P. Sudep, Tata McGraw Hill Publishing Co. Ltd.
2	The C Programming Language - B.W. Kernighan & D.M. Ritchie, Prentice Hall of India Private Ltd., New Delhi, 2/e.
3	Mastering Turbo C - Stan Kelly & Bootle, BPB Publications, New Delhi.
4	Let Us C - Yashawant Kanetkar, BPB Publications, New Delhi, 3/e.
5	The Spirit of 'C' - H. Mullish & H.L. Cooper, Jaico Publishing House.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.youtube.com/watch?v=N8RADjBmIws
2	https://www.youtube.com/watch?v=EbNJ05EVXs0
3	https://www.youtube.com/watch?v=il1LWpCUZ_M
4	https://www.youtube.com/watchv=oa5ojjGEUSw&list=PLUogGZJOiMtNOus85Tq1zNvg9EU3aJ8VO
5	https://www.youtube.com/watch?v=cCnYT5TSHSA

Mapping with Programme Outcomes									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	S	M	L	L	S	S	M	M	S
CO2	S	L	M	S	M	L	L	S	S	M
CO3	L	M	S	L	M	S	S	S	M	L
CO4	M	L	M	S	L	S	S	L	M	S
CO5	S	L	M	S	M	L	L	S	S	M
*S-Strong; M-Medium; L-Low										

Paper Code		**B. BASIC PHYSICS I**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper Type		**ELECTIVE III**	**Syllabus Version**		**2023-24**	

Course Objectives:
The main objectives of this course are to understand the basic concept of physics.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Explain the concepts of Moment of Inertia and gravitation.	K2
2	Discuss the idea of elasticity in physics.	K3
3	Interpret the importance of viscosity in liquids.	K4
4	Outline the concept of Thermal Conductivity and thermodynamics.	K1
5	Describe the parameters sound energy and acoustics.	K6

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

Unit:1		**12 hours**

Moment of Inertia - Radius of gyration - Moment of inertia of a circular ring, circular disc, solid sphere - Kinetic energy of a rolling object - Acceleration of a body rolling down an inclined plane - Uniform circular motion - Centripetal force - Banking of curves. Gravitation: Newton's law - Determination of G by Boys method - Mass and mean density of earth - Variation of g with altitude, depth and latitude - Escape velocity - Weightlessness.

Unit:2	**ELASTICITY**	**12 hours**

Elastic constants - Young's modulus - Bending moment - Bending of beams - Young's modulus by non-uniform bending - Energy stored in a wire - Torsion in a wire - Torsional oscillations - Determination of rigidity modulus by static torsion.

Unit:3	**VISCOSITY**	**12 hours**

Streamlined and turbulent flow - Comparison of viscosities - Oswald's viscometer - Stoke's law - Terminal velocity - Viscosity of highly viscous liquid - Lubrication. Surface Tension: Molecular theory of surface tension - Formation of drops and bubbles - Excess of pressure inside a soap bubble - Surface tension of liquid by Jaegar's method - Variation of surface tension with temperature.

Unit:4	**THERMAL CONDUCTIVITY**	**12 hours**

Coefficient of thermal conductivity - Thermal conductivity of a bad conductor by Lee's disc method, Good conductor. Thermodynamics: Statement of first law of thermodynamics - Statement of second law of thermodynamics – Reversible and irreversible processes.

Unit:5		**12 hours**

Intensity and Loudness - Decibel - Intensity levels - Measurement of AC frequency – Melde string - Frequency of vibrator. Acoustics of Buildings and Ultrasonic: Reverberation - Time of reverberation - Sabine's formula - Absorption coefficient - Production and uses of ultrasonic waves.

		Total Lecture hours	**60 hours**

	Text Book(s)
1	Allied Physics Paper I & II - R. Murugeshan, S.Chand & Co. Ltd., New Delhi, 2005.
2	A Text Book of Allied Physics - Dr. R. Sabesan, Dr. A. Dhanalakshmi & Others, Popular Book Depot.

	Reference Books
1	College Physics - Weber, Manning & White.
2	Advanced Level Physics - Nelkon & Parker.
3	University Physics - Sears, et al, 6/e, Narosa Publishing House
4	Physics, Vol. I - Resnick, Halliday & Krane, 5/e, John Wiley & Sons, Inc.

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.youtube.com/watch?v=5xC6glA1NAA
2	https://www.youtube.com/watch?v=M8qLbujkxSw
3	https://www.youtube.com/watch?v=1qLb0B40YnA
4	https://www.youtube.com/watch?v=sOpxP4DI-80
5	https://www.youtube.com/watch?v=dgIOpxg0Tfs

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	M	S	L	M	S	S	S	M	L
CO2	S	L	M	S	M	L	L	M	L	L
CO3	M	M	L	S	M	S	L	M	S	L
CO4	M	S	M	L	L	S	S	M	M	S
CO5	S	L	M	S	M	L	L	S	S	M
*S-Strong; M-Medium; L-Low										

Paper Code		**PCB DESIGN AND FABRICATION**	L	T	P	C
Paper Type		**Skill Enhancement Course (SEC - V)**	2	0	0	2
			Syllabus Version		**2023-24**	

Course Objectives:
To Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Categorize different types of PCB	K2
2	Design a PCB schematic layout and artwork process.	K5
3	Discuss the process of Laminates and Photo Printing	K1
4	Explain the concept of Etching And Soldering	K3
5	Formulate Design Rules and Automation procedure for PCB design	K4
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**TYPES OF PCB**	12 hours
Single sided board – double sided – Multilayer boards – Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.		

Unit:2	**LAYOUT AND ARTWORK**	12 hours
Layout Planning – General rules of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and mounting – Layout check. Basic artwork approaches –General artwork rules.		

Unit:3	**LAMINATES AND PHOTO PRINTING**	12 hours
Manufacture of copper clad laminates – Properties of laminates – Types of Laminates – Manual cleaning process – Basic printing process for double sided PCB's – Photo resists – wet film resists – Dry film resists.		

Unit:4	**ETCHING AND SOLDERING**	12 hours
Introduction – Etching machine – Etchant system. Soldering: Principles of Solder connection – Solder joints – Solder alloys – Soldering fluxes. Soldering Tools: Soldering, Desoldering tools and Techniques.		

Unit:5	**DESIGN RULES AND AUTOMATION**	12 hours
Reflection – Crosstalk – Ground and Supply line noise –Automated artwork drafting – CAD.		

	Total Lecture hours	**60 hours**

	Text Book(s)
1	Walter C.Bosshart "PCB DESIGN AND TECHNOLOGY" Tata McGraw Hill Publications, Delhi. 1983.
2	Clyde F.Coombs "Printed circuits Handbook" IIIEdition McGrawhill.
3	R.G. Gupta "Electronic instruments and system" Tata McGraw Hill Publication, New Delhi.

	Reference Books
1	Printed Circuit Board Design by Christopher T. Robertson, - New Delhi, 2003)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=iC0LzSI2MIg
2	https://www.youtube.com/watch?v=EFf9jBs2yfU
3	https://www.youtube.com/watch?v=N4jeTjk3hM4
4	https://www.circuitrework.com/guides/7-1-1.html
5	https://www.youtube.com/watch?v=LIgBWgR-z7w
Course Designed By:	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	S	S	M	M	S
CO2	M	M	L	S	M	M	L	L	S	M
CO3	L	S	S	L	L	M	S	S	M	L
CO4	S	L	M	L	L	S	L	L	S	S
CO5	M	M	S	S	M	L	S	S	L	L
*S-Strong; M-Medium; L-Low										

Paper Code		**SEMICONDUCTOR DEVICE LAB**	L	T	P	C
			0	0	5	5
Paper type		**Core Practical - III**	Syllabus Version		2023-24	

Course Objectives:

To write simple programs in C language.

The generation of electric pulses, their width and duration,

Characteristics of semiconductor devices such as UJT, JFET and SCR.

Power control by SCR, audio wave generation and pulse shaping using Schmitt triggers.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Construct and verify Regulated power supply	**K3**
2	Demonstrate the characteristics of UJT, SCR, JFET and FET devices	**K1**
3	Design and implement amplifier, Source follower, JFET multivibrator and Emitter follower circuits	**K6**
4	Examine the characteristics of amplifier, oscillator and multivibrator circuits developed using transistor.	**K2**
5	Illustrate the concept Resistivity, Hall coefficient and Energy band determination	**K4**

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

	Minimum of Eight Experiments from the list
1	Characteristics of UJT.
2	Characteristics of SCR.
3	SCR power control.
4	Characteristics of TRIAC.
5	Op-amp - Inverting and Non-inverting modes, unity follower.
6	Op-amp - Summing amplifier - Inverting and Non-inverting modes.
7	Op-amp – Integrator.
8	Op-amp - Differentiator.
9	Op-amp - Square wave generator.
10	Op-amp - Sine wave generator.
11	Op-amp – Comparator
12	Op-amp – Active Filters

Total Lecture hours	**60 hours**

Text Book(s)	
1	Theory and Problems of Programming with 'C' (Schaum's Series) - B.S. Gottfried, McGraw Hill International Book Company.
2	Basic Electronics - A Text Lab Manual – Zbar, Malvino & Miller, Tata McGraw Hill Publishing Company Limited.

Reference Books	
1	B.E.S. Practicals – R. Sugaraj Samuel & Horsley Solomon – Department of Electronic Science, C.T.M. College of Arts and Science, Chennai

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
2	
3	
4	
5	

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	M	S	M	S
CO2	S	L	M	M	S	M	L	M	M	M
CO3	S	M	L	S	L	S	M	S	S	L
CO4	M	S	M	S	S	S	S	M	S	S
CO5	M	M	M	M	S	L	S	S	L	M

*S-Strong; M-Medium; L-Low

Fourth Semester

Paper Code		DIGITAL ELECTRONICS	L	T	P	C
			5	0	0	5
Paper Type		Core Theory -4	Syllabus Version		2023-24	

Course Objectives:
Number systems and the interconversion between them, Boolean algebra and the simplification of logic circuits using Karnaugh map
Arithmetic circuits, multiplexing and demultiplexing operations and a few logic families
Various flip-flops, design of registers and counters, and the architecture and applications of Timer IC555
A/D and D/A converters and their accuracy and resolution.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Recall various number systems and its application in digital circuits.	K1
2	Apply Boolean laws and Karnaugh map to simplify the switching functions	K2
3	Design various combinational circuits using logic gates	K3
4	Design and analyze the various sequential digital circuits using flip-flops	K6
5	Perform analog to digital conversion and digital to analog conversion for given inputs	K5
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	NUMBER SYSTEM AND CODES	12 hours
Decimal, binary, octal, hex numbers, conversion from one to another - codes, BCD, excess 3, gray codes conversion from one to another - Error correction / detection codes.		

Unit:2	BOOLEAN ALGEBRA AND THEOREMS	12 hours
Basic, Universal logic gates - Boolean Theorems - sum of products, products of sums expression, simplification by Karnaugh Map method, simplification based on basic Boolean theorems - don't care conditions.		

Unit:3	COMBINATIONAL DIGITAL CIRCUITS	12 hours
Arithmetic building blocks, Basic Adders and Subtractors, BCD adders - Data processing circuits, multiplexers, demultiplexers, encoders, decoders - TTL, CMOS digital logic families.		

Unit:4	SEQUENTIAL DIGITAL CIRCUITS	12 hours
Flip - Flops, RS, clocked SR, JK, D, T, master-slave types - shift registers, ring counters-ripple counters - Design of counters - modulus of counters - timer IC 555, applications.		

Unit:5	DAC AND ADC	12 hours
Parameters, Accuracy, Resolution - DAC, variable resistor network, R-2R ladder network types - ADC, counting, continuous, successive approximation, dual-slope types.		

	Total Lecture hours	60 hours

Text Book(s)	
1	Digital Fundamentals - V. Vijayendran, S.Viswanathan Publishers, Chennai.
2	Modern Digital Electronics - R.P. Jain, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Reference Books	
1	Micro Electronics - J. Millman, McGraw Hill International Book Company, New Delhi, 1990.
2	Digital Principles and Applications - A.P.Malvino & D.P.Leach, 4/e, Tata McGraw Hill Publishing Co. Ltd.
3	Digital Integrated Electronics - H. Taub & D. Schilling, McGraw-Hill Book Company.
4	Digital Fundamentals - T.L. Floyd, Pearson Education, 8/e.
5	Digital Electronics - W.H. Gothmann, Prentice Hall of India Private Limited, 2/e.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=QhYBnViB1io
2	https://www.youtube.com/watch?v=TIYTI8rhaN8
3	https://www.youtube.com/watch?v=4luaoQGaEZQ
4	https://www.youtube.com/watch?v=AaN72s5WfOM
5	https://www.youtube.com/watch?v=HicZcgdGxZY

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	S	M	M	S	L	S	M
CO2	L	S	S	M	M	M	L	S	M	M
CO3	S	L	L	M	L	S	L	M	M	S
CO4	M	S	M	L	S	L	S	S	L	L
CO5	L	M	S	M	S	M	M	S	L	S
*S-Strong; M-Medium; L-Low										

Paper Code		A. PYTHON PROGRAMMING	L	T	P	C
Paper Type		**ELECTIVE -IV**	4	0	0	3
			Syllabus Version		2023-24	

Course Objectives:
The main objectives of this course are to:
1. To introduce the fundamentals of Python Programming.
2. To teach about the concept of Functions in Python.
3. To impart the knowledge of Lists, Tuples, Files and Directories.
4. To learn about dictionaries in python.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Remembering the concept of operators, data types, looping statements in Python programming.	K1
2	Understanding the concepts of Input / Output operations in file.	K2
3	Applying the concept of functions and exception handling	K3
4	Analyzing the structures of list, tuples and maintaining dictionaries	K6
5	Demonstrate significant experience with python program development environment	K5
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1		12 hours
Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables-Identifiers–Keywords-Built-in Data Type – Output Statements –Input Statements-Comments –Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.		

Unit:2		12 hours
Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elseif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**		

Unit:3		12 hours
Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **Python Strings:** String operations - Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace–Defining our own modules.		

Unit:4	LIST, TUPLES & DICTIONARIES	12 hours
Lists: Creating a list-Access values in List - Updating values in Lists- Basic list operations-List Methods. **Tuples**: Creating, Accessing, Updating and Deleting Elements in a tuple–Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions And Methods – Difference between Lists and Dictionaries.		

Unit:5	**FILE HANDLING**	12 hours
Python File Handling: Types of files in Python -Opening and Closing files-Reading and Writing files: write() and write lines() methods- append()method–read()andreadlines()methods–withkeyword–Splittingwords –File methods-File Positions-Renaming and deleting files.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Mark Summer field, Programming in Python3:AComplete introduction to the Python Language, Addison-Wesley Professional, 2009.
2	Mark Summer field, Programming in Python3:AComplete introduction to the Python Language, Addison-Wesley Professional, 2009.
3	E. Balagurusamy (2017), "Problem Solving and Python Programming", McGraw-Hill, First Edition.

Reference Books	
1	Allen B.Downey,"Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff /O' Reilly Publishers, 2016
2	Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated forPython3.2, NetworkTheory Ltd., 2011
3	Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated forPython3.2, NetworkTheory Ltd., 2011
4	Digital Fundamentals - T.L. Floyd, Pearson Education, 8/e.
5	Digital Electronics - W.H. Gothmann, Prentice Hall of India Private Limited, 2/e.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Python for Everybody-Specialisation - Coursera
2	Learn Python: The Complete Python Programming Course - Udemy
3	Python for Data Science – NPTEL / Swayam

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	S	M	M	S	L	S	M
CO2	L	S	S	M	M	M	L	S	M	M
CO3	S	L	L	M	L	S	L	M	M	S
CO4	M	S	M	L	S	L	S	S	L	L
CO5	L	M	S	M	S	M	M	S	L	S
*S-Strong; M-Medium; L-Low										

Paper Code		**B. BASIC PHYSICS II**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper Type		**ELECTIVE -IV**	**Syllabus Version**		**2023-24**	

Course Objectives:
Students will learn fundamentals of Optics, Spectroscopy, Relativity and Particle Physics

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Describe the impact of Optics in the constructional and designing environment	**K4**
2	Comprehend the fundamental ideas of Spectroscopy and lasers	**K1**
3	Enumerate the preambles of positive rays, Atom Model and Radioactivity	**K5**
4	Discuss the concepts of Nuclear and Particle Physics	**K3**
5	Explain the principle of Relativity and its associated concepts	**K6**

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

Unit:1	**OPTICS**	**12 hours**

Interference - Interference in wedge shaped films - Newton's rings - Measurement of wavelength and radius of curvature by Newton's rings - Diffraction - Fresnel and Fraunhofer diffraction - Elementary theory of formation of spectra by transmission grating (normal incidence) - Determination of wavelength - Polarization - Optical activity - Biot law - Determination of specific rotatory power - Half shade polarimeter - Uses of polarized light.

Unit:2	**SPECTROSCOPY**	**12 hours**

Types of spectra - Scattering of light - Tyndall and Rayleigh scattering - Raman Effect - Experimental study of Raman Effect - Theory and applications. Laser: Principle, action and Characteristics of laser - Ruby laser - He-Ne laser - Applications of laser.

Unit:3	**POSITIVE RAYS**	**12 hours**

Properties - Bainbridge mass spectrometer - Isotopes. Photo electricity: Photoelectric emission - Einstein's equation - Millikan's experiment. Atom Model: Vector atom model - Postulates - Quantum numbers - Pauli's principle. Radioactivity: Natural radioactivity - Artificial radioactivity - Radio isotopes - Uses of radio isotopes.

Unit:4	**NUCLEAR AND PARTICLE PHYSICS**	**12 hours**

General properties of nuclei - Liquid drop model - Shell model - Magic numbers - Elementary particles - Classification - Anti-particles and anti-matter - Strangeness - Isospin - Basic ideas of quarks.

Unit:5	**RELATIVITY**	**12 hours**

Frame of reference - Galilean transformation - Postulates of special theory of relativity - Lorentz transformation - Length contraction - Time dilation - Relativity of simultaneity - Variation of mass with velocity - mass energy equation.

	Total Lecture hours	**60 hours**

Text Book(s)	
1	Allied Physics Paper I & II - R. Murugeshan, S.Chand & Co. Ltd., New Delhi, 2005.
2	A Text Book of Allied Physics - Dr. R. Sabesan, Dr. A. Dhanalakshmi & Others, Popular Book Depot.

Reference Books	
1	Modern Physics - R. Murugeshan, S.Chand & Co. Ltd., New Delhi.
2	College Physics - Weber, Manning & White.
3	Advanced Level Physics - Nelkon & Parker.
4	University Physics - Young, Zemansky & Sears, 6/e, Narosa Publishing House.
5	Physics, Vol. II - Resnick, Halliday & Krane, 5/e, John Wiley & Sons, Inc.,.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=Oh4m8Ees-3Q
2	https://www.youtube.com/watch?v=AwKqO4Lg8_U
3	https://www.youtube.com/watch?v=u9F1YzukJ88
4	https://www.youtube.com/watch?v=quSdhgX3NB8
5	https://www.youtube.com/watch?v=ev9zrt__lec

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	M	S	M	M	S	L	S	S
CO2	L	L	S	S	L	S	M	S	L	L
CO3	S	L	M	M	M	M	S	M	M	S
CO4	S	S	L	M	S	M	L	L	S	M
CO5	M	S	M	S	M	M	M	S	M	S
*S-Strong; M-Medium; L-Low										

Paper Code		PRINCIPLES OF ELECTRONIC APPLIANCES	L	T	P	C
Paper Type		**Skill Enhancement Course (SEC - VII)**	2	0	0	2
			Syllabus Version		**2023-24**	

Course Objectives:
To learn about Home appliances. Trouble shoot the faults in the electronic appliance

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Explain the working of Microwave Ovens and its safety procedures.	**K2**
2	Demonstrate the working of washing machines with different features.	**K6**
3	Describe the operation of Air Conditioners and Refrigerators.	**K4**
4	Discuss the importance and functionality of digital devices used in home and Office.	**K2**
5	Illustrate the operation of digital access devices used in regular activity.	**K1**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create	

Unit:1	**MICROWAVE OVENS**	12 hours
Microwaves - Properties and generation - Microwave oven block diagram - LCD timer with alarm - Controllers - Wiring and Safety instructions - Care and Cleaning.		

Unit:2	**WASHING MACHINES**	12 hours
Electronic controller for washing machines - Washing machine hardware and software - Types of washing machines - Fuzzy logic washing machines - Features of washing machines.		

Unit:3	**AIR CONDITIONERS AND REFRIGERATORS**	12 hours
Air Conditioning - Components of air conditioning systems - All water air conditioning systems - All air conditioning systems - Unitary and central air conditioning systems - Split air conditioners.		

Unit:4	**HOME / OFFICE DIGITAL DEVICES**	12 hours
Facsimile machine - Xerographic copier - Calculators - Structure of a calculator - Internal Organization of a calculators - Servicing electronic calculators - Digital clocks - Block diagram of a digital clock.		

Unit:5	**DIGITAL ACCESS DEVICES**	12 hours
Digital computer - Internet access - Online ticket reservation - Functions and networks - Barcode Scanner and decoder - Electronic Fund Transfer - Automated Teller Machines (ATMs).		

	Total Lecture hours	**60 hours**

Text Book(s)	
1	Consumer Electronic - S.P. Bali, Pearson Education, New Delhi, 2005.
2	Handbook of Repair and Maintenance Of Domestic Electronics Appliances handbook By Shashi Bhushan Sinha-india-2017

Reference Books	
1	Principles of Electronic- Metha V.K
2	principles of Analog Eletronics - Giovanni Saggio

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=D9_2qtD8flo
2	https://www.youtube.com/watch?v=HksMSVZqB4Y
3	https://www.youtube.com/watch?v=9uCeFhO8H40
4	https://www.youtube.com/watch?v=s4zi1wdKE5k
5	https://www.youtube.com/watch?v=CkR9YyWaAkU

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	M	M	S	L	M
CO2	M	L	M	M	M	S	S	M	S	M
CO3	L	S	L	M	L	L	M	S	S	S
CO4	M	M	S	S	S	M	S	M	L	M
CO5	S	M	M	L	S	S	L	L	M	L
*S-Strong; M-Medium; L-Low										

Paper Code		**DIGITAL ELECTRONICS LAB**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**5**
Paper Type		**Core Practical – 4**	**Syllabus Version**		**2023-24**	

Course Objectives:
To understand the logical operations of various gates and theorems.
To develop various digital circuits.
To acquire the knowledge about sequential circuits
To understand the applications of IC 555

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Analyze the circuit using Boolean laws	**K1**
2	Verify the truth table, Boolean identities and Combinational logic using Universal gate and Flip-flop	**K5**
3	Design the binary,ring and modulus counters	**K6**
4	Develop Astable, Monostable multivibrators and Schmitt trigger using IC 555 timer	**K3**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create	

Minimum of Eight Experiments from the list	
1	Verification of Universal gate – NAND.
2	Verification of Universal gate – NOR.
3	Verification of basic Boolean identities using NAND gates.
4	Verification of basic Boolean identities using NOR gates.
5	Sum of Products and Product of Sums - NAND gates.
6	Sum of Products and Product of Sums - NOR gates.
7	Study of RS, D and JK flip flops.
8	Half, Full and adders using simple logic gates.
9	Half and Full subtractors using simple logic gates.
10	Binary Counter
11	Ring Counter
12	Modulus Counters using IC 7490.
13	BCD to seven-segment decoder using 7447/7448.
14	Astable, multivibrators using 555 timer.
15	Monostable multivibrator using 555 timer.
Total Lecture hours	**60 hours**

Text Book(s)	
1	Electronic Communication Systems - George Kennedy, McGraw Hill Book Company, 4/e, 2005.
2	Basic Electronics - A Text Lab Manual - *Zbar, Malvino & Miller*, Tata McGraw Hill Publishing Co. Ltd.
3	Modern Digital Electronics - R.P. Jain, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4	Digital Principles and Applications - A.P.Malvino & D.P.Leach, 4/e, Tata McGraw Hill Publishing Co. Ltd.

Reference Books	
1	B.E.S. Practicals - R. Sugaraj Samuel & Horsley Solomon - Department of Electronic Science, C.T.M. College of Arts and Science, Chennai.
2	Linear Integrated Circuits - D. Roy Choudhury & Shail Jain, New Age International (P) Limited.
3	Fundamentals of Microprocessors-8085 - V. Vijayendran, S. Viswanathan (Printers & Publishers), Pvt. Ltd., 2002

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/117106086
2	https://nptel.ac.in/courses/117101106
3	https://nptel.ac.in/courses/122106025
4	https://nptel.ac.in/courses/113106062
5	https://nptel.ac.in/courses/117103064
6	https://nptel.ac.in/courses/108105158

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	M	S	S	M	L	S	M	S	M
CO3	M	M	L	M	M	M	L	M	M	M
CO4	L	L	M	M	L	S	M	L	L	L
*S-Strong; M-Medium; L-Low										

Fifth Semester

Paper Code		MICROPROCESSOR AND ITS APPLICATIONS	L	T	P	C
			5	0	0	4
Paper Type	Core Theory-V		Syllabus Version		2023-24	

Course Objectives:
Architecture of 8085 microprocessor instruction sets, addressing modes and programming exercises
Stacks and stack operations
Interfacing memory devices
Interfacing 8085 microprocessor with input/output devices
Interfacing programmable peripheral devices.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Illustrate the architecture, instruction set, addressing modes and programming of 8085 microprocessor.	**K2**
2	Demonstrate the concepts of advanced programming techniques in 8085 microprocessor.	**K3**
3	Elaborate the different types of memories in 8085 microprocessor.	**K6**
4	Design and develop the interfacing circuits for various applications using 8085 Microprocessor.	**K5**
5	Outline the procedure of interfacing various circuits with 8085 Microprocessor.	**K1**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create		

Unit:1	8085 MICROPROCESSOR ARCHITECTURE AND ISTRUCTION SET	12 hours

Architecture of 8085 microprocessor - Registers - Flags - ALU - Address and data buses - Demultiplexing the address / data bus - Control and status signals - Instruction set of 8085 - Addressing modes - Assembly language programming - Programs for addition, subtraction, multiplication and division of binary and BCD numbers (8-bit only)

Unit:2	STACK AND PROGRAMMIMG TECHNIQUES	12 hours

Stack and stack related instructions - Subroutines - Advanced programming techniques - Code conversions - Block transfer of data - Sorting of data - Time delays using single register and register pair - Delay calculations.

Unit:3	SEMICONDUCTOR MEMORIES AND INTERFACING I/O DEVICE	12 hours

Semiconductor memories - Classification - Instruction cycle, Machine cycle and T-state - Timing diagrams for opcode fetch, memory read, memory write, I/O read and I/O write machine cycles - Interfacing memory chips - Interfacing an input port - Interfacing an output port - I/O mapped I/O and memory mapped I/O techniques.

Unit:4	INTERRUPTS AND PROGRAMMABLE PERIPHERAL INTERFACE	12 hours

Interrupts - Hardware and software interrupts - Interrupt priorities - SIM and RIM instructions - Polled I/O and interrupt controlled I/O data transfer - Interfacing programmable devices - Programmable Peripheral Interface 8255 - Internal architecture - Control register and control word - Programming 8255 - Interfacing hex-keyboard and seven segment display.

Unit:5	INTERFACING PERIPHERALS AND APPLICATIONS	12 hours

Interfacing D/A converter and waveform generation - Interfacing A/D converters - Keyboard / Display Controller 8279 - Internal architecture and working - Programmable Interval Timer 8253/54 - Internal architecture and different modes of operation - Stepper motor interface - Temperature controller - Traffic lights controller

	Total Lecture hours	60 hours

Text Book(s)	
1	Microprocessor Architecture, Programming and Applications with the 8085 - Ramesh S. Gaonkar, 5/e, Penram International Publishing (India).
2	Fundamentals of Microprocessors-8085 - V. Vijayendran, S. Viswanathan (Printers & Publishers), Pvt. Ltd., 2002

Reference Books	
1	Microprocessor and its Applications - A. Nagoor Kani, 1/e, RBA Publications, Chennai.
2	Introduction to Microprocessors - Aditya P. Mathur, 3/e, Tata McGraw Hill Publishing Company Limited.
3	Fundamentals of Microprocessors and Microcomputers - B. Ram, Fifth Revised and Enlarged Edition, Dhanpat Rai Publications, New Delhi

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/108105102
2	https://www.youtube.com/watch?v=g1USSZVWDsY
3	https://onlinecourses.nptel.ac.in/noc22_ee13/preview
4	https://www.youtube.com/watch?v=l4dCVYxQ8DI
5	https://www.youtube.com/watch?v=7SKRwkgIOtU
6	https://nptel.ac.in/courses/108107029

Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	M	S	S	M	S	M	S
CO2	M	M	L	S	S	L	L	M	S	S
CO3	M	S	S	L	M	M	L	S	L	M
CO4	L	L	M	M	L	S	M	L	L	M
CO5	M	L	M	S	M	S	S	M	M	L

*S-Strong; M-Medium; L-Low

Paper Code		ELECTRICAL AND ELECTRONIC INSTRUMENTATION	L	T	P	C
			5	0	0	4
Paper Type	Core Theory-VI		Syllabus Version		2023-24	

Course Objectives:
Basic concepts of indicating instruments.
Various electronic instruments such as CRO, storage oscilloscopes, function generators, spectrum analyzer etc.,
Transducers, sensors and display devices

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Explain the functional elements of instruments, their errors, characteristics and various electrical and electronics instruments	K2
2	Evaluate unknown R, L, C and frequency using AC and DC bridges.	K1
3	Describe the working oscilloscopes in signal measurement.	K5
4	Discuss the role of Instrumentation Amplifiers and Signal Analyzers in measurement.	K6
5	Demonstrate the functionality of Transducer and Display Devices.	K3
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	DC AND AC INDICATING INSTRUMENTS	12 hours
Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter. Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt-hour meter.		

Unit:2	DC AND AC BRIDGES	12 hours
Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.		

Unit:3	OSCILLOSCOPES	12 hours
Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.		

Unit:4	INSTRUMENTATION AMPLIFIERS AND SIGNAL ANALYZERS	12 hours
Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyzer - Fundamentals of Spectrum Analyzer.		

Unit:5	TRANSDUCER AND DISPLAY DEVICES	12 hours
Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.		

		Total Lecture hours	60 hours

	Text Book(s)
1	Electronic Instrumentation and Measurement Techniques - W.D. Cooper & A.D. Helfrick, Prentice Hall of India.
2	Electronic Instrumentation and Measurement - Kalasi.

	Reference Books
1	A Course in Electrical and Electronic Measurement and Instrumentation - A.K. Sawhney, Dhanpat Rai and Sons.
2	Electronic Instrumentation and Measurements - P.B. Zbar, Mc Graw Hill International.
3	Measurement Systems Application and Design - Ernest O. Doebelin, 4/e, Tata McGraw Hill Publishing Co. Ltd.

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.youtube.com/watch?v=-WnGrJYlTAU
2	https://www.youtube.com/watch?v=UdSGUa5HfwU
3	https://www.youtube.com/watch?v=CzY2abWCVTY
4	https://www.youtube.com/watch?v=dYKY6n201sk
5	https://www.youtube.com/watch?v=o0LLV5GP6Ow
6	https://onlinecourses.nptel.ac.in/noc19_ee44/preview

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	L	S	L	M	S	M	S	M
CO2	M	L	S	L	M	L	S	L	L	L
CO3	S	S	M	M	S	M	M	M	M	S
CO4	L	M	M	L	M	L	M	S	L	M
CO5	M	S	L	S	S	M	M	S	L	S

*S-Strong; M-Medium; L-Low

Paper Code		**INTERNET OF THINGS**	**L**	**T**	**P**	**C**
Paper Type	Core Theory-VII		**5**	**0**	**0**	**4**
			Syllabus Version		**2023-24**	

Course Objectives:
To enable thestudentstolearnaboutIoTandalsotounderstandtheconceptof embedded devices andInterfacing sensors.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Studytheconcept ofbasicIoT	K1
2	Familiarizetheprincipleofconnecteddevices	K2
3	Gainknowledgeaboutembeddeddevices	K3
4	AnalyzedifferentsensorInterface technology	K4
5	Analyzethe IoTapplications	K4
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**IOT FUNDAMENTALS**	**12 hours**
Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT– TechnologiesforIoT–DevelopingIoTApplications–ApplicationsofIoT–Industrial IoT – Security inIoT		

Unit:2	**DESIGN PRINCIPLES FOR CONNECTED DEVICES**	**12 hours**
Introduction-IoT/M2msystems-CommunicationTechnologies-Datamanagement,data consolidation and Device management - Ease of Designing and Affordability.		

Unit:3	**PROGRAMMINGFUNDAMENTALSWITHC USINGARDUINOIDE**	**12 hours**
Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.		

Unit:4	**SENSORS ANDACTUATORS**	**12 hours**
AnalogandDigitalSensors–Interfacingtemperaturesensor,ultrasoundsensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.		

Unit:5	**SENDINGSENSORDATAOVERINTERNET**	**12 hours**
Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using ArduinoIDE–UsingWiFiandNODEMCUtotransmitdatafromtemperaturesensorto OpenSourceIoTcloudplatform.		

	Total Lecture hours	**60 hours**

	Text Book(s)
1	ArshdeepBahga,VijayMadisetti,―**InternetofThings:AHands-OnApproach**‟, 2014. ISBN: 978-0996025515
2	BorisAdryan,DominikObermaier,PaulFremantle,―**TheTechnicalFoundations Of Iot**‟, Artech Houser Publishers, 2017.

	Reference Books
1	MichaelMargolis,―**ArduinoCookbook**‟,O‟Reilly,2011
2	MarcoSchwartz,―**InternetofThingswithESP8266**‟,Packt Publishing,2016

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/106/105/106105166/IntroductiontoIoTPartI– Lecture1
2	-https://ocw.cs.pub.ro/courses/iot/courses/02ElectronicsforInternetofThings– Lecture II
3	https://nptel.ac.in/courses/106105166/Introduction toArduino–I– Lecture 22

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	M	M	S	M	M	S
CO2	S	M	M	M	M	M	S	L	L	L
CO3	S	S	S	M	M	L	L	L	M	M
CO4	M	M	M	S	S	S	L	L	M	M
CO5	M	M	S	S	M	L	M	M	S	M
*S-Strong; M-Medium; L-Low										

Paper Code		A. CELLULAR MOBILE COMMUNICATION	L	T	P	C
Paper Type		ELECTIVE - V	4	0	0	3
			Syllabus Version		2023-24	

Course Objectives:
Basics of digital cellular system, cordless telephony and cell structure
GSM wireless protocol and markup language fundamentals
Basics of WLL and Bluetooth technology

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Explain the principles of Mobile communication	**K5**
2	Discuss the cell structure and the process involved in cellular systems.	**K2**
3	Elaborate GSM technology and its associated operations.	**K3**
4	Explain the layers of wireless protocol and its related functions.	**K1**
5	Outline the different methods of wireless communication systems.	**K5**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create	

Unit:1	GSM TECHNOLOGY	12 hours
Advanced mobile phone service - Global system for mobile communication - Digital cellular system - Cordless telephony - Third generation wireless systems.		

Unit:2	DIGITAL CELLULAR SYSTEM	12 hours
7 Cell structure - Hand off - roaming management - Hand off detection - Channel assignment techniques - Interference - ACI, CCI - Intersystem hand off and authentication - Network signaling - Cellular digital packet data.		

Unit:3	NETWORK SIGNALLING	12 hours
GSM - Network signaling, mobility management, short message service - International roaming, administration and operation.		

Unit:4	WIRELESS TECHNOLOGY	12 hours
Wireless application protocol - Architecture - Datagram - wireless markup language, WML - Script wireless telephony applications.		

Unit:5	MOBILE GENERATION	12 hours
Generation of mobile services - Wireless local loop - Bluetooth technology – wifi technology.		

	Total Lecture hours	60 hours

Text Book(s)	
1	Mobile Communications - Jochen Schiller, 7/e, Pearson Education, 2003.
2	Principles of Wireless Networks - Kauch Pahalavan & Prahanet Krishnamoorthy, 2/e, Pearson Education, 2004.

	Reference Books
1	Wireless and Mobile Networks Architecture - Yi-Bing Lin & Imnch Chlantee, John Wiley, 2001.
2	Wireless and Mobile Communication - Rapparport, Pearson Education, 2001.

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.youtube.com/watch?v=kxOUCDjHg_Q
2	https://www.youtube.com/watch?v=dFkrjH8MFhQ
3	https://www.youtube.com/watch?v=t8a4GjVnqR8
4	https://www.youtube.com/watch?v=DPcqnhtvYm8
5	https://www.youtube.com/watch?v=u4L4GUmXHV8
6	https://nptel.ac.in/courses/106106167

Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	S	S	S	S	M	M	L	S
CO2	S	M	M	S	L	M	S	L	S	L
CO3	M	L	L	L	S	M	L	S	M	M
CO4	S	M	M	L	L	L	M	L	L	L
CO5	L	S	S	M	M	S	M	S	S	S
*S-Strong; M-Medium; L-Low									

Paper Code		**B. VLSI DESIGN**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper Type		**ELECTIVE – V**	**Syllabus version**		**2023-24**	

Course Objectives:

The objectives of this course are:

❖ To provide knowledge on Fabrication Process of NMOS,PMOS,CMOS AND BICMOS, Super integration concepts.

❖ To develop the skill to analyze the electrical properties of MOS transistor, designs tick diagrams and layout diagrams for MOS transistors, contacts and wires.

❖ To investigate the effect of floor planning, placement, routing and power delay estimation in physical design of digital circuits and memory design.

❖ To apply the concept of Combinational and Sequential Circuit Testing.

Expected Course Outcomes:

On successful completion of the course ,student will be able to:

1	Gain the knowledge on fabrication principles.	K1
2	Able to analyze the electrical properties of MOS transistors.	K4
3	Apply the appropriate layout design rule to create a VLSI layout for a design	K6
4	Understand the physical design steps and gain the knowledge on types of VLSI design styles.	K2
5	Gain the knowledge ,analyze and apply test principles to evaluate the VLSI designs.	K5

K1–Remember; K2–Understand; K3 –Apply; K4– Analyze; K5–Evaluate; K6 – Create

Unit:1		**VLSI TECHNOLOGY**	**15 Hours**

Fabrication sequence–process flow–Testing–Super integration concepts –Integrated Passive components – MOS Resistors and capacitors – Crossovers – NMOS – PMOS – CMOS – BICMOS fabrication processes – comparison.

Unit:2		**ELECTRICALPROPERTIESOF MOS DEVICES**	**15 Hours**

Drain to source current(I_{ds}) versus Drain to source voltage(V_{ds}) relationships – MOS Transistor threshold voltage(V_t)–MOS transistor trans-conductanceg_m and output conductance g_{ds}– figure of merit (ω_0) – pass transistor- pull – up to pull – down ratio.

Unit:3		**DESIGN PROCESSES**	**15 Hours**

VLSI design flow-stick diagram design rules with examples-Design rules for Layout diagrams of digital circuits–sheet resistance R_s–standard unit of capacitance–Inverter delays– Propagation delays- scaling of MOS circuits – limitations of scaling.

Unit:4		**VLSIPHYSICALDESIGNANDSTYLES**	**15 Hours**

PHYSICALDESIGN:

FloorPlanning–Placement–Routing–PowerDelayEstimation–ClockRouting–Power Routing.

VLSI DESIGNSTYLES:

Full Custom –Semicustom –Standard Cells–Gate Arrays–FPGAs–CPLDs.

Unit:5		**TESTINGOF VLSICIRCUITS**	**15 Hours**

TestPrinciples-BIST-TestBench-CombinationalCircuitTesting,SequentialCircuit Testing, Test Bench Techniques.

		TotalLectureHours	**75 Hours**

TextBooks	
1	BasicVLSIDesign,Douglas,3rdEdition,A.Pucknell,KamranEshraghian,PHI,New Delhi, 2011.
2	ModernVLSIdesign,WayneWolf,3rdEdition,PearsonEducation,New Delhi, 4th impression 2008.
ReferenceBooks	
1	IntroductiontoVLSICircuitsandSystems,John.P.Uyemura,JohnWiley,Student Edition,NewDelhi,Reprint 2006.
2	PrinciplesofCMOSVLSIDesign,N.H.EWeste ,K.Eshraghian,AdissonWesley,2nd Edition, NewDelhi.
3	ApplicationSpecificIntegratedCircuits,MichelJohnSebastianSmith,AddisonWesley, IndianEdition,4thIndianReprint2001,NewDelhi.
RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]	
1	https://nptel.ac.in/courses/117/101/117101058/
2	https://www.youtube.com/watch?v=9SnR3M3CIm4
3	https://www.youtube.com/watch?v=Y8FvvzcocT4

	MappingwithProgram Outcomes									
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	L	L	L	L	L	L	L	L
CO2	S	S	L	S	M	L	M	L	L	L
CO3	S	M	S	L	S	L	M	M	L	S
CO4	S	L	M	L	S	L	L	L	M	L
CO5	S	S	M	M	S	L	L	L	M	S

*S-Strong;M-Medium;L-Low

Paper Code		C. WIRELESS COMMUNICATION	L	T	P	C
			4	0	0	3
Paper Type		ELECTIVE – V	Syllabus version		2023-24	

Course Objectives:

The objectives of this course are:
- To acquire knowledge on Protocols and technologies used in wirelesscommunication
- To understand the knowledge of modern wireless communication systems
- To learn the basic concept of wireless networking, wireless systems and standards

Expected Course Outcomes:

On successful completion of the course ,student will be able to:

1	Understand the basics of wireless communication systems	K1
2	Acquire knowledge on various wireless communication protocols	K4
3	Focus on different types of wireless networks	K6
4	Compare multiple access techniques for wireless communication systems	K2
5	Apply the standards of wireless communication systems	K5

K1–Remember; K2–Understand; K3 –Apply; K4– Analyze; K5–Evaluate; K6 – Create

Unit:1	Introduction to Wireless Communication	15 Hours

Evolution of Wireless Communication - Examples of wireless communication systems - Comparison of wireless communication systems - Trends in Cellular Radio and personal communications - Problems

Unit:2	Modern Wireless Communication Systems	15 Hours

Second Generation (2G) Cellular Networks- Evolution to 2.5G Wireless Networks- GPRS for 2.5G GSM-Third Generation (3G) Wireless Networks-3G CDMA2000- Wireless Local Loops (WLL) - Wireless Local Area Networks (WLANs)

Unit:3	Multiple Access for Wireless Communication	15 Hours

Multiple access techniques - FDMA - TDMA - Spread spectrum Multiple Access: Frequency Hopped Multiple Access - Code Division Multiple Access - Space Division Multiple Access - Packet Radio Protocols: ALOHA - Slotted ALOHA - Carrier Sense Multiple Access.

Unit:4	Wireless Networking	15 Hours

Introduction - Limitation in Wireless Networking - development of wireless networks - Traffic Routing in wireless networks - Wireless data services- Common Channel Signalling (CCS) - Integrated Services Digital Network (ISDN) - Personal Communication Services - WLAN technology.

Unit:5	Wireless Systems	15 Hours

Wireless Systems and Standards: AMPS - Global System for Mobile - GSM System Architecture - GSM Channel types - CT2 standard for cordless Telephones - Personal Handy phone System - Wireless Cable Television.

		TotalLectureHours	75 Hours

TextBooks	
1	T. S. Rappaport, Wireless Communication Principles, 2nd Ed. (Pearson, 2012)
2	G. L. Stuber, Principles of Mobile Communication, 3rd Ed. (Springer India, 2011)
ReferenceBooks	
1	Andrea Goldsmith, Wireless Communications (Cambridge University Press; Illustrated edition, 2005)
2	J. Schiller, Mobile Communication, 2nd Ed. (Pearson Education , 2010)
3	A.F. Molisch, Wireless Communications (Wiley, 2005)
4	David Tse, Pramod Viswanath, Fundamentals of Wireless Communication (Cambridge University Press; 2005)
5	Andreas F. Molisch , Wireless Communications, (WSE,2013)
RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]	
1	https://nptel.ac.in/courses/117105132
2	https://www.edx.org/course/a-system-view-of-communications-from-signals-to-pa
3	https://www.classcentral.com/course/swayam-introduction-to-wireless-andcellular-communications-14166.

	MappingwithProgram Outcomes									
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	L	L	L	L	L	L	L	L
CO2	S	S	L	S	M	L	M	L	L	L
CO3	S	M	S	L	S	L	M	M	L	S
CO4	S	L	M	L	S	L	L	L	M	L
CO5	S	S	M	M	S	L	L	L	M	S

*S-Strong;M-Medium;L-Low

Paper Code		**A. MEDICAL ELECTRONICS**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper Type		**ELECTIVE – VI**	**Syllabus Version**		**2023-24**	
Course Objectives:						
The students will be able to handle most of the electronic instrumentation in the medical field						

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Illustrate different bioamplifiers used for the biosignal amplification.	**K2**
2	Outline the procedure used for the measurement of electrical parameters of the human body.	**K3**
3	Discuss the process used for the measurement of non-electrical parameters of the human body.	**K5**
4	Analyze the effect of different diagnostic and therapeutic application of electromagnetic radiation.	**K4**
5	Demonstrate the therapeutic applications high frequency radiations.	**K1**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**BIO-AMPLIFIERS**	**12 hours**
Bio potentials - Bio-electricity - Necessity for special types of amplifiers for biological signal amplifications - Different types of Bio-OP - Amps.		

Unit:2	**BIO-POTENTIAL RECORDING**	**12 hours**
ECG - EEG - EMG - ERG - Specific types of electrodes used - Different lead systems - their waveforms.		

Unit:3	**MEASUREMENT OF BIOLOGICAL PARAMETERS**	**12 hours**
Measurement of respiration rate - Measurement of heart beat rate - Measurement of temperature - Measurement of blood pressure - Patient monitoring set up - Blood flow meters EM and plesthsmographic technique.		

Unit:4	**HIGH ENERGY RADIATION APPLICATION**S	**12 hours**
Applications of X-ray and gamma ray for diagnostics and therapeutic applications - Application of Lasers in biological medium.		

Unit:5	**HIGH FREQUENCY APPLICATIONS**	**12 hours**
Diathermy effect - Short, wave diathermy - Ultrasonic diathermy - Microwave diathermy.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Biomedical Instrumentation - M. Arumugham, 2/e, Anuradha Agencies Publishers

Reference Books	
1	Clinical Engineering - Jacobster & Webster, PHI.
2	Applied Biomedical Instrumentation - Geddes & Baker, John Wiley & Sons.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=98lRv_8rQmo
2	https://www.youtube.com/watch?v=UTudEz0U_fo
3	https://www.youtube.com/watch?v=TsMrTlENq2E
4	https://www.youtube.com/watch?v=AcX0603el7o
5	https://www.youtube.com/watch?v=noGgl62liRw
6	https://archive.nptel.ac.in/courses/108/105/108105091/

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	L	L	S	M	M	M	M	L	M
CO2	L	S	M	S	L	S	S	L	M	M
CO3	S	M	S	L	S	M	M	L	M	L
CO4	S	M	M	S	M	S	L	S	L	M
CO5	M	L	S	M	L	L	M	S	S	L
*S-Strong; M-Medium; L-Low										

Paper Code		**B. POWER ELECTRONICS**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**3**
Paper Type		**ELECTIVE – VI**	**Syllabus Version**		**2023-24**	

Course Objectives:
The working of power semiconductor devices such as power diode, power transistor, TRIAC, MOSFET, IGBT.
The different types of rectifiers for single phase and three phase controls.
The working of inverters, choppers and cycloconverters and their application in industry

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Describe the fundamentals and key characteristics of power semiconductors Devices	**K3**
2	Analyze the electrical parameters of different phase controlled converters with various loads	**K2**
3	Explain the Principle of various inverter topologies	**K5**
4	Discuss the working of Choppers and Cycloconverters	**K1**
5	Describe the operation various Control circuits and application power semiconductors Devices	**K2**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1		**POWER SEMICONDUCTOR DEVICES**	**12 hours**
Power diode, Power transistor, TRIAC, MOSFET and IGBT - turn on methods, driver circuits - SCR characteristics - Two transistor analogy - Methods of turning ON and turning OFF - Series and parallel connections of SCRs.			

Unit:2		**PHASE CONTROLLED CONVERTERS**	**12 hours**
Single phase controlled rectifier - Half wave controlled rectifier with 1.Resistive load 2.RL load 3. RL load and battery - Full wave controlled rectifier with above types of loads - Three phase controlled rectifier - HVDC transmission.			

Unit:3		**INVERTERS**	**12 hours**
Single phase and three phase inverters - Series and parallel inverters - Bridge inverters - Current source inverter.			

Unit:4		**CHOPPERS AND CYCLOCONVERTERS**	**12 hours**
Various types of DC choppers - Step up chopper - AD chopper - Single phase AC chopper - Step up and step down cycloconverters - Three phase to single phase and three phase to three phase cycloconverters.			

Unit:5		**CONTROL CIRCUITS AND APPLICATION**	**12 hours**
Generation of control pluses - Microprocessor based implementation - Static circuit breakers for DC and AC circuits - Regulated power supply - UPS - SMPS.			

		Total Lecture hours	**60 hours**

Text Book(s)	
1	Power Electronics - M.H. Rashid, Prentice Hill of India Private Limited.
2	Power Electronics - P.C. Sen, Tata McGraw Hill Publishing Co. Ltd.

Reference Books	
1	Thyristorised Power Controllers - G.K. Debye, Wiley Eastern Ltd.
2	An Introduction to Thyistors and Their Applications - M. Ramamoorthy, 2/e, East West press.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=Ylfh2gOE3Qc
2	https://www.youtube.com/watch?v=d9J1KSYeKQg
3	https://www.youtube.com/watch?v=kI-TmerCvDE
4	https://www.youtube.com/watch?v=SKCby1u5i2Y
5	https://www.youtube.com/watch?v=V17X-Xzbz-Y
6	https://nptel.ac.in/courses/108105066

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	L	S	S	S	M	M
CO2	S	M	L	S	L	L	S	M	M	S
CO3	M	L	L	M	M	M	S	S	M	S
CO4	M	S	M	L	S	L	L	L	S	M
CO5	L	L	M	M	S	M	M	M	S	M
*S-Strong; M-Medium; L-Low										

Paper Code		**C. INDUSTRIAL ELECTRONICS**	L	T	P	C
			4	0	0	3
Paper Type		**ELECTIVE – VI**	**Syllabus Version**		**2023-24**	

Course Objectives:
the applications of devices such as thyratron, ignitron, thyristor, SCR, UJT in industry
the construction of power supplies
the working of motors and their control
the Principles of welding and heating

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Describe the various power semiconductor devices and their application	**K2**
2	Discuss the working of different types of power supplies.	**K5**
3	Explain the operation of various Motors and its Control mechanism.	**K1**
4	Discuss the process and importance of welding and heating in industries.	**K3**
5	Outline the role of relays, ultrasonic waves and lasers in industries.	**K4**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1		**INDUSTRIAL ELECTRONIC DEVICES**	**12 hours**
Characteristics and applications of Thyratron, Ignitron, Thyristor, SCR and UJT - AC and DC switches - Over voltage protection - Flashers - Static circuit breakers.			

Unit:2		**POWER SUPPLIES**	**12 hours**
DC voltage regulators - Different types of series voltage regulators - voltage and current regulation - Controlled rectifiers and inverters - Uninterruptible power supplies, Switched Mode Power Supply (SMPS).			

Unit:3		**MOTORS AND CONTROLS**	**12 hours**
DC motors I Automatic regulation of speed and overload - Reversing motors - AC motors - Induction motors - Speed control - Synchronous motors.			

Unit:4		**WELDING AND HEATING**	**12 hours**
Principle and theory of induction heating - Dielectric heating - Resistance welding - Control process - Sequence timer - Synchronous Welding control - Temperature control circuits.			

Unit:5		**APPLICATION IN INDUSTRY**	**12 hours**
Relays and their characteristics and applications - Generation, detection and application of Ultrasonic - Application of LASER in Industry.			

		Total Lecture hours	**60 hours**

Text Book(s)	
1	Industrial Electronics - G.K. Mithal, 14/e, Khanna Publishers , New Delhi.
2	Industrial and Power Electronics - C. Rai, Umesh Publications, New Delhi

Reference Books	
1	Electronics and Industry - M.G. Chute & R.D. Chute, McGraw Hill.
2	Industrial Electronics - Neol Morris, 2/e, Tata McGraw Hill.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=ViIOmXnoEC0
2	https://www.youtube.com/watch?v=x3Z7lyKG3g0
3	https://www.youtube.com/watch?v=4agZpzYRu2A
4	https://www.youtube.com/watch?v=R5ecGEVXtUQ
5	https://archive.nptel.ac.in/courses/104/104/104104085/
6	https://nptel.ac.in/courses/108104140
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	M	S	S	L	S
CO2	M	S	M	M	M	L	S	L	M	S
CO3	L	M	L	L	M	L	M	M	L	L
CO4	S	S	L	M	S	M	M	S	L	M
CO5	L	L	M	L	S	S	L	M	S	L
*S-Strong; M-Medium; L-Low										

Paper Code		**COMMUNICATION AND MICROPROCESSOR LAB**	**L**	**T**	**P**	**C**
			0	**0**	**5**	**4**
Paper Type		**Core Practical – 5**	**Syllabus Version**		**2023-24**	

Course Objectives:
AM, FM and PM modulation and detection techniques.
Adder, subtractor circuits and counters using logic gates.
Application of microprocessor in basic mathematical function, code conversion and DAC.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Design and verify the concepts of Analog Modulation	**K3**
2	Design and verify the concepts of Digital Modulation	**K3**
3	Application of Microprocessor in Basic mathematical function	**K5**
4	Programming for Code Conversion using 8085	**K5**
5	Programming for Digital Clock and other Applications	**K6**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create	

List of Experiments	
1	Amplitude modulation and detection.
2	Frequency modulation and detection.
3	Pulse Amplitude modulation and detection.
4	Pulse Width modulation and detection.
5	Pulse Position modulation and detection.
Microprocessor Practical Experiments	
1	Addition, Subtraction, Multiplication and Division - 8 bit.
2	BCD Addition, Subtraction, Multiplication
3	Block move & block Exchange
4	Square & Square root of 8 – bit numbers
5	Ascending/Descending order.
6	Code conversions: A. Binary to ASCII, B. ASCII to Binary
7	Code conversions: A. BCD to ASCII, B. ASCII to BCD
8	Clock program
9	Flashing LEDs.
10	Wave generation using DAC interface.
11	Interfacing a DC stepper motor
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Electronic Communication Systems - George Kennedy, McGraw Hill Book Company, 4/e, 2005.
2	Microprocessor Architecture, Programming and Applications with the 8085 - Ramesh S. Gaonkar, 5/e, Penram International Publishing (India).
3	Fundamentals of Microprocessors-8085 - V. Vijayendran, S. Viswanathan (Printers & Publishers), Pvt. Ltd., 2002

Reference Books	
1	Basic Electronics - A Text Lab Manual – Zbar, Malvino & Miller, Tata McGraw Hill Publishing Company Limited.
2	B.E.S. Practicals – R. Sugaraj Samuel & Horsley Solomon – Department of Electronic Science, C.T.M. College of Arts and Science, Chennai
3	Microprocessor and its Applications - A. Nagoor Kani, 1/e, RBA Publications, Chennai.
4	Introduction to Microprocessors - Aditya P. Mathur, 3/e, Tata McGraw Hill Publishing Company Limited.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/108107029
2	https://nptel.ac.in/courses/106106167
3	https://nptel.ac.in/courses/117102059
4	https://onlinecourses.swayam2.ac.in/cec21_cs16/preview
5	https://www.youtube.com/watch?v=0DcxmkLbBuE
6	https://www.youtube.com/watch?v=mHvV_Tv8HDQ

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	M	S	S	M	L	S	M	S	M
CO3	M	M	L	M	M	M	L	M	M	M
CO4	L	L	M	M	L	S	M	L	L	L
CO5	S	M	M	S	S	M	S	S	S	M
*S-Strong; M-Medium; L-Low										

Sixth Semester

Paper Code		**MICROCONTROLLER 8051 AND ITS APPLICATIONS**	**L**	**T**	**P**	**C**
			6	**0**	**0**	**4**
Paper Type		**Core Theory - VIII**	**Syllabus Version**		**2023-24**	

Course Objectives:
The architecture of 8051 Micro-controller
The interrupts, counter, timer and serial data transmission
The instruction set and simple programs
Tnterfacing peripherals

Expected Course Outcomes:	
On the successful completion of the course, students will be able to:	
1	Explain the basic architecture of 8051 with its associated components.	**K6**
2	Demonstrate the functions of Counter, Timer, Serial data input / Output and Interrupts of 8051	**K2**
3	Illustrate the Instruction set, addressing modes and programming of 8051 microcontrollers.	**K1**
4	Discuss the data move operations, jump and call instructions programs of 8051.	**K4**
5	Describe the functions and interfacing of different peripheral ICs with 8051	**K3**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create	

Unit:1		**MICROPROCESSOR AND MICRO-CONTROLLER**	**12 hours**

Microprocessor and Micro-controller - 8051 Micro-controller hardware: 8051 oscillator and clock - Program counter and data pointer - A and B CPU register - Flags and PSW - Internal memory - Internal RAM - Stack and stack pointer - Special function registers - Internal ROM. Input / output pin, ports and circuits - External memory.

Unit:2	**COUNTER AND TIMER**	**12 hours**

Counter / Timer interrupts - Timing - Timer modes of operation - Counting. Serial data input / Output: Serial data interrupt - Data transmission - Data reception - serial data transmission modes. Interrupts: Timer flag interrupt - Serial port interrupt - External interrupt - reset - Interrupt control - Interrupt priority - Interrupt destination - Software generated interrupts.

Unit:3	**MOVING DATA AND INSTRUCTIONS**	**12 hours**

Introduction - Addressing modes - Byte level logic operations - Bit level logic operations - Rotate and swap operations - Simple program. Arithmetic Operations: Introduction - Flags - Incrementing and Decrementing - Addition - Subtraction - Multiplication and Division - Simple Program.

Unit:4	**JUMP AND CALL INSTRUCTIONS**	**12 hours**

Introduction - External data move - code memory read only data move - PUSH and POP - Opcodes - Data exchange - Simple Programs. Jump and Call instructions: Introduction - Jump and call program range - Jumps - Calls and subroutine - Interrupt and returns - more detail on interrupts - Simple programs.

Unit:5	**MICROCONTROLLER INTERFACING**	12 hours
Keyboard interfacing - Display interface - 7 segment and LCD display - D/A conversion - A/D conversion - Stepper motor Interface.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	The 8051 Microcontroller and Architecture, Programming and Applications - Kenneth J. Ayala, 2/e, Penram International.
2	The 8051 Microcontroller and Embedded System - Mohamed Ali maszidi & Janice Gillespie Maszidi, Pearson Education.

Reference Books	
1	The 8051 Microcontroller and Architecture - Predko Mic, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=dcNk0urQsQM
2	https://www.youtube.com/watch?v=7l3-iq6OtEE
3	https://www.youtube.com/watch?v=sLbw1stNkXM
4	https://www.youtube.com/watch?v=AIoSgVjW06w
5	https://www.youtube.com/watch?v=AvUTg_pVmXE
6	https://nptel.ac.in/courses/117104072

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	L	S	M	M	S	S	M	S
CO2	M	M	L	M	S	M	L	M	L	M
CO3	M	S	S	L	L	S	L	L	S	M
CO4	L	S	M	M	M	L	M	M	S	S
CO5	L	L	M	S	S	M	S	M	M	L
*S-Strong; M-Medium; L-Low										

Paper Code		**A. TELEVISION AND VIDEO ENGINEERING**	**L**	**T**	**P**	**C**
			5	**0**	**0**	**3**
Paper Type		**ELECTIVE - VII**	**Syllabus Version**		**2023-24**	
Course Objectives:						
Principles of TV system, and overall view of complete TV system such as picture tube, transmitter, receiver, etc.,						
World TV transmission standards.						
Working of black and white and color TV receiver electronics.						
Working of video cassette recorder and player.						

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Outline the characteristic of video capturing devices.	**K2**
2	Describe the working of Television and its related accessories.	**K1**
3	Explain the operation of Television architecture and its associated components.	**K4**
4	Discuss the functionality of advanced television concepts.	**K6**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**TELEVISOIN – FUNDAMENTALS,CAMERA TUBES AND PICTURE TUBE**	**12 hours**
Characteristics of Human eye - Theory of scanning - Camera tubes - Vidicon - Silicon diode array vidicon - Picture tubes - Composite video signal.		

Unit:2	**TRANSMITTING AND RECEIVING ANTENNAS**	**12 hours**
Television transmitters - Television signal propagation - Television transmission antennas - Television receiver antennas - Colour Television Antennas - Television receiver.		

Unit:3	**COLOUR TELEVISION-TYPES AND CHARACTERISTICS**	**12 hours**
Colour Television systems - Colour characteristics - Colour Television Camera - Colour picture tube - Colour signal generation - PAL, NTSC, SECAM - Comparison.		

Unit:4	**COLOUR TV RECEIVER**	**12 hours**
Colour Television receivers - PAL D Colour receiver, AGC, Sync - Separators and deflection circuits, Luminance channel, Colour signal processing , separation of U and V modulation products - Subcarrier generation and control.		

Unit:5	**SPECIAL TYPES OF TELEVISION**	**12 hours**
Special Topics in Television - Digital tuning techniques - Remote control - Cable Television - Satellite TV - video tape recorders - Video disc systems - Digital TV - Fundamentals of Digital TV.		

	Total Lecture hours	**60 hours**

Text Book(s)	
1	Television and Video Engineering - G. Nagarajan, 2/e, A.R.S Publications, 2005.
2	Monochrome and Color Television - R.R. Gulati, 1/e, New Age International Publishers, 2003.

Reference Books	
1	Basic Television - Principles and Servicing - Bernard Grob, 4/e, McGraw Hill, 1975.
2	Television and Video Engineering - A. M. Dhake, 2/e, Tata McGraw Hill Publishing Company Ltd., 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://byjus.com/biology/structure-of-eye/
2	https://www.youtube.com/watch?v=40eNsj9MGlU
3	https://www.youtube.com/watch?v=q9lbFw8oeVE
4	https://www.youtube.com/watch?v=MixpSjcga1U
5	https://www.youtube.com/watch?v=_nGnRvyHMEI
6	https://nptel.ac.in/courses/106106090

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	M	S	S	M	L	S	M	S	M
CO3	M	M	L	M	M	M	L	M	M	M
CO4	L	L	M	M	L	S	M	L	L	L
*S-Strong; M-Medium; L-Low										

Paper Code		**B. DIGITAL SYSTEM DESIGN**	L	T	P	C
			5	**0**	**0**	**3**
Paper Type		**ELECTIVE - VII**	**Syllabus Version**		**2023-24**	
Course Objectives:						
The fundamentals of Boolean algebra and simplification of Boolean functions.						
The combinational logic circuits and their design using HDL.						
The sequential logic circuits and their design using HDL.						

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Simplify of Boolean functions using Karnaugh map and tabulation methods.	**K2**
2	Design various combinational circuits using logic gates	**K5**
3	Design MSI Devices and verify its functionality.	**K1**
4	Design and analyze the various synchronous sequential circuits using flip-flops	**K3**
5	Design and implement the asynchronous sequential circuits	**K6**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**BOOLEAN ALGEBRA AND LOGIC GATES**	**12 hours**
Review of binary number systems - Binary arithmetic - Binary codes - Boolean Algebra and theorems - Boolean functions - Simplifications of Boolean functions using Karnaugh map and tabulation methods - Logic gates.		

Unit:2	**COMBINATIONAL LOGIC**	**12 hours**
Combinational circuits - Analysis and design procedures - Circuits for arithmetic operations - Code conversions - Introduction to Hardware Description Language (HDL).		

Unit:3	**DESIGN WITH MSI DEVICES**	**12 hours**
Decoders and Encoders - Multiplexers and Demultiplexers - Memory and programming logic - HDL for combinational circuits.		

Unit:4	**SYNCHRONOUS SEQUENTIAL LOGIC**	**12 hours**
Sequential circuits - Flip-flops - Analysis and design procedures - State reduction and state assignments - Shift registers - Counters - HDL for sequential logic circuits, shift registers and counters.		

Unit:5	**ASYNCHRONOUS SEQUENTIAL LOGIC**	**12 hours**
Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables - Race free state assignment - Hazards		

	Total Lecture hours	**60 hours**

Text Book(s)	
1	Digital Logic and Computer Design - M. Morris Mano, Prentice Hall of India Private Limited.
2	Digital System design- Morris Mano Hill Published by India Education Service Pvt.
3	A Verilog HDL Premier - J. Baskar, Pearson Education.

Reference Books	
1	Analysis and Modeling of Digital Systems - Zain Allabedin Navabee, 2/e , McGraw Hill Publishing Co. Ltd., New Delhi.
2	An Engineering Approach to Digital Design - Fletcher, Prentice Hall of India Private Limited.
3	Modern Digital Electronics - R.P. Jain, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4	Digital Fundamentals - T.L. Floyd, 8/e, Pearson Education.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=JQBRzsPhw2w
2	https://www.youtube.com/watch?v=_yHo2qq82P0
3	https://www.youtube.com/watch?v=XBcHnz08ZW8
4	https://www.youtube.com/watch?v=MiuMYEn3dpg
5	https://www.youtube.com/watch?v=QfIoAPio8oE
6	https://nptel.ac.in/courses/108106177

Mapping with Programme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	L	S	S	S	S	S	S
CO2	M	L	S	M	S	M	S	S	M	S
CO3	M	L	L	S	L	M	M	M	S	M
CO4	L	S	L	M	M	S	M	M	L	M
CO5	L	M	M	S	M	S	S	L	L	S
*S-Strong; M-Medium; L-Low										

Paper Code		**C. ROBOTICS AND AUTOMATION**	L	T	P	C
			5	**0**	**0**	**3**
Paper Type		**ELECTIVE - VII**	Syllabus Version		2023-24	

Course Objectives:
To introduce the concepts of Robotic system, its components and instrumentation and control related to robotics. Vision equipment, Image processing, Concept of low level and high level vision.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Explain the robot technology as their fundamental principles, laws and illustrate the various drive systems with control strategy.	**K5**
2	Discuss the concepts of sensors and vision systems used to control the robots.	**K1**
3	Outline kinematics, programming language and & automation in robot	**K3**
4	Enumerate the usage of Programmable Logic Controllers in robotics	**K4**
5	Describe the process of computer numerical control in robots.	**K6**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create	

Unit:1	**CLASSIFICATION OF ROBOTIC SYSTEMS, DRIVES AND CONTROL**	**12 hours**
Basic structure of a robot - Classification of robots: Cartesian, Cylindrical, Spherical, Articulated, SCARA. Accuracy, resolution and repeatability of robots. Robot application in manufacturing: Material transfers - Machine loading and unloading - Processing operations - Assembly and inspection. SYSTEMS: Hydraulic and Pneumatic systems: cylinders, control valves, hydro motor. Types of mechanical power drive, rotary to linear motion conversion mechanisms. Robot end effectors. Servomotors – operation, stepper motors - control loops using current and voltage amplifier. Robot controllers - configuration of robot controller.		

Unit:2	**SENSORS AND VISION SYSTEMS**	**12 hours**
Types of sensors, tactile sensors, proximity sensors and speed sensors – Encoder, resolvers. Vision systems: Image processing and analysis, Segmentation, Feature extraction, Object Recognition.		

Unit:3	**ROBOT PROGRAMMING & AUTOMATION**	**12 hours**
Lead through programming - Textual programming, programming examples - Social and Economical Aspects of Robots - Typical layouts of robots in Industries. AUTOMATION: Advantages of automation, building blocks of automation. Automatic feeding lines, material-handling devices, ASRS, transfer lines, automatic inspection, intelligent automation.		

Unit:4	**PROGRAMMABLE LOGIC CONTROLLERS (PLC)**	**12 hours**
Basics of PLC, Architecture of PLC, Advantages, Types of PLC, Types of Programming - Simple process control program's using Relay Ladder Logic. Introduction to PLC networking. Introduction to HMI, DCS and SCADA systems.		

Unit:5	**COMPUTER NUMERICAL CONTROL (CNC)**	**12 hours**
Block diagram of a CNC control system, Advantages, Power supply, CPU. CNC and PLC interfacing, Control loops. Feedback devices in CNC machine, analog and digital CNC systems. Introduction to FMS.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	1. Mikell P. Groover, "Automation Production systems and Computer Integrated, Manufacturing", Prentice-Hall, India, New Delhi, 1987. / Pearson Education, NewDelhi

Reference Books	
1	W. Bolton, "Mechatronics", Pearson Education Asia, 2002.
2	K.S. Fu, R.C. Gonzalez and C S G Lee, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill, New Delhi, 1987.
3	Mikell P. Groover, "Industrial Robotics - Technology, Programming and Applications", McGraw Hill, New Delhi, 1986

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=0qQKM2XYDDI
2	https://www.youtube.com/watch?v=J_KoRp8SnoE
3	https://blog.robotiq.com/what-are-the-different-programming-methods-for-robots
4	https://www.youtube.com/watch?v=zN55V_5bRWE
5	https://www.mechanicalbooster.com/2017/01/what-is-cnc-machine.html
6	https://nptel.ac.in/courses/112101098

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	S	S	M	S
CO2	M	M	L	M	L	M	L	M	S	M
CO3	L	L	M	M	M	M	L	M	S	L
CO4	L	M	M	S	S	S	M	L	L	M
CO5	S	S	S	S	M	S	S	S	M	M
*S-Strong; M-Medium; L-Low										

Paper Code		**A. COMPUTER NETWORKS**	L	T	P	C
			5	**0**	**0**	**3**
Paper Type		**ELECTIVE - VIII**	**Syllabus Version**		**2023-24**	

Course Objectives:
provides a general introduction to computer networking that would be useful to all personnel who deal with distributed systems
encompassing both technical and managerial aspects.
to help students better understand the challenges and opportunities faced by modern business,
topics include LAN and WAN implementations, the Internet and internet applications.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Illustrate various Network structures and explain ISO OSI layers	**K3**
2	Describe the role of communication and physical layer protocols in computer networks	**K1**
3	Describe the concepts of data link layer services and protocols with various connecting devices	**K5**
4	Analyze the operations of the network layer protocols and its applications.	**K6**
5	Explain the Presentation layer and application layer protocols and various other networks.	**K4**
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**INTRODUCTION TO COMPUTER NETWORK**	**12 hours**
Network structure Point to Point, Broadcast, Multicast - Horizontal and vertical distribution - Star, Mesh, tree, bus structures - OSI 7 layer model - Architecture - Functions of layers - Packet switches, circuit switching and message switching.		

Unit:2	**THE PHYSICAL LAYER**	**12 hours**
Physical layer - Transmission media - Channel allocation methods - ALOHA, S-ALOHA, FINITE ALOHA - LAN Protocols IEEE802.3, 802.4, 802.5, 802.6 and 802.11.		

Unit:3	**THE DATA LINK LAYER**	**12 hours**
Data link layer - Framing - Error detection - Error correction - CRC - Stop and wait - Go band N - Sliding window Protocol - Selective repeat.		

Unit:4	**THE NETWORK LAYER**	**12 hours**
Network layer - Routing algorithms and congestion control algorithms - Repeaters, Bridges, Routers and Gateways, Internetworking - Introduction to transport layer and session layer.		

Unit:5	**THE APPLICATION LAYER**	**12 hours**
Presentation layer - coding, compression and cryptography - Introduction to Application layer - High performance networks - ATM, Fast Ethernet, FDDI, DQDB, SONET and SDH.		

	Total Lecture hours	**60 hours**

Text Book(s)	
1	Computer Networks - Andrew S. Tanenbaum, 4/e, Pearson Education, 2005.
2	Data and Computer Communication - W. Stallings, 7/e, Pearson Education, 2006.

Reference Books	
1	Introduction to Data Communications and Networking - Behrouz & Forouzan, 4/e, McGraw Hill Book Company, 2004.
2	Telecommunication Networks - Protocols Modeling and Analysis - Misha Stewartz, 2/e, Pearson Education, 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://archive.nptel.ac.in/courses/106/105/106105183/
2	https://www.youtube.com/watch?v=OaeGni4QBdA
3	https://www.youtube.com/watch?v=pi7mMjiixiY
4	https://www.youtube.com/watch?v=XRlg0GR4p-8
5	https://www.youtube.com/watch?v=J7QXMLTul3Q
6	https://nptel.ac.in/courses/106105183

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	L	S	M	S	M	S	S	S
CO2	M	M	S	S	L	S	L	S	S	S
CO3	S	S	S	M	S	M	S	M	M	M
CO4	M	M	M	M	S	M	S	M	L	M
CO5	M	L	M	M	M	L	M	L	M	L
*S-Strong; M-Medium; L-Low										

Paper Code		B. AUTOMOTIVE ELECTRONICS	L	T	P	C
			4			3
Paper Type		ELECTIVE - VIII	Syllabus Version		2023-24	

Course Objectives:

The main objectives of this course are to:

- ❖ TounderstandtheconceptsofAutomotiveElectronicsanditsevolutionandTrends automotive systems &subsystems overview.
- ❖ Tounderstandsensorsandsensormonitoringmechanismsalignedtoautomotive Systems, different signal conditioning techniques, interfacing techniques and actuator
- ❖ To understand, design and model various automotive control systems using Model based development technique.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Obtain an overview of automotive components and subsystems	K2
2	Interface automotive sensors and actuators with microcontrollers	K4
3	Understandthedesigncycles,communicationprotocolsandsafetysystemsemployed Into day's automotive industry.	K2
4	Understand the engine management systems	K2
5	Analyse Engine Management System	K4

K1-Remember;**K2**-Understand; **K3**-Apply;**K4** -Analyze; **K5** -Evaluate;**K6** – Create

Unit:1	INTRODUCTION	18hours

AutomotiveComponent,Operation,ElectricalWiringTerminalsandSwitching,MultiplexedWiring Systems,CircuitDiagramsandSymbols.ChargingSystemsandStartingSystems:ChargingSystems Principles, Alternations and Charging Circuits, New Developments, Requirements of the Starting System, Basic Starting Circuit

Unit:2	IGNITION SYSTEMS	18hours

IgnitionFundamental,ElectronicIgnitionSystems.ProgrammedIgnition,
Distribution Less Ignition, Direct Ignition, Spark Plugs. Electronic Fuel Control: Basics of Combustion,EngineFuellingandExhaustEmissions,ElectronicControlofCarburetionPetrolFuel Injection, Diesel Fuel Injection

Unit:3	INSTRUMENTATIONSYSTEMS	18hours

Introduction to Instrumentation Systems, Various Sensors Used for Different Parameters, Sensing Driver Instrumentation Systems, Vehicle Condition Monitoring Trip Computer, Different Types of Visual Display

Unit:4	ELECTRONICCONTROLOFBRAKINGAND TRACTION	18 hours

IntroductionandDescriptionControlElementsandControlMethodology,ElectronicControlof AutomaticTransmission:IntroductionandDescriptionControlOfGearShiftandTorqueConverter Lockup, Electric Power Steering, Electronic Clutch

Unit:5	ENGINEMANAGEMENT SYSTEMS	18hours
Combined Ignition And Fuel Management Systems, Exhaust Emission Control, Digital Control Techniques, Complete Vehicle Control Systems, Artificial Intelligence and Engine Management, Automotive Microprocessor Uses. Lighting and Security Systems: Vehicles LightingCircuits,SignallingCircuit,CentralLockingandElectricWindowsSecuritySystems, Airbags and Seat Belt Tensioners, Miscellaneous Safety and Comfort Systems		
	Total Lecture hours	**90hours**

TextBook(s)

1	TOMDENTON,**AutomobileElectricalandElectronicSystems**,EdwardArnoldpb.,1995

ReferenceBooks

1	1.DONKNOWLES,**AutomotiveElectronicand ComputercontrolledIgnition Systems,Don**
2	WILLIAM,T.M.,**AutomotiveMechanics**,McGrawHillBookCo.,
3	WILLIAM,T.M.,**AutomotiveElectronicSystems**,HeiemannLtd.,London,1978.
4	RonaldKJurgen,**AutomotiveElectronicsHandbook**,McGrawHill, Inc,1999.

RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]

1	https://nptel.ac.in/courses/107/103/107103084/
2	https://nptel.ac.in/courses/107/106/107106088/
3	https://www.youtube.com/watch?v=vJ4EfyGXehg
4	https://www.youtube.com/watch?v=BG4N2dBgJrQ

MappingwithProgramme Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10
CO1	S	S	S	M	M	M	S	L	L	S
CO2	S	S	S	M	M	M	S	L	L	L
CO3	S	S	S	M	M	L	L	S	S	M
CO4	M	M	M	S	S	S	L	L	M	M
CO5	M	M	S	S	S	L	M	M	S	S

*S-Strong;M-Medium;L-Low

Paper Code		C. Arduino with Sensors	L	T	P	C
			5	0	0	3
Paper Type		ELECTIVE - VIII	Syllabus version		2023-24	

Course Objectives:

The objectives of this course are:
- ❖ To provide knowledge on fundamentals of Advanced Computer design.
- ❖ Tounderstandtheconceptofinstructionlevelparallelism,pipeliningandmemoryhierarchy associated with it.
- ❖ To enhance the knowledge on advanced processors.

Expected Course Outcomes:		
On successful completion of the course, student will be able to:		
1	Gain the knowledge on advanced computer design principles.	K1
2	Able to analyze the parallel computer model with instruction level parallelism.	K4
3	Gain the knowledge on pipelining.	K2
4	Understand the memory hierarchy in developing an advanced computer.	K2
5	Apply the multiprocessor concepts in advanced processors.	K3
K1– Remember;K2–Understand; K3 –Apply; K4– Analyze; K5–Evaluate;K6 – Create		

Unit:1	Arduino and Sensors	18 Hours

Microcontroller - Install the Software - The Integrated Development Environment (IDE) - Our first circuit-Updated Circuit-Our First Program-Comments- Gotchas

Unit:2	Embedded "C":	18 Hours

"Blinky"-IFStatements-ELSEStatements-WHILEstatements-Whatistruth(true)-Combinations -FOR statements - Our New Circuit - Introducing Arrays
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Unit:3	Input and Output:	18 Hours

Input-Pushbuttons-Potentiometers-RGBLEDs-SoundCircuit-Simplenote-Music-Music with functions–Making a digital thermometer –Serial Monitor-Measuring the temperature-Hooking up the LCD - Talking to the LCD - Bringing it all together

Unit:4	Sensors-1:	18 Hours

Introduction - Photo Cell (Light Sensor) - Tilt Sensor Reed Switch (Magnetic Field Detector) - Piezo Element (Vibration sensor)

Unit:5	Sensors-2:	18 Hours
	One Servo-Joystick Pan/Tilt bracket –Adding a firing mechanism	
	Total Lecture Hours	**90 Hours**

TextBooks	
1	"IntroductiontoArduino",AlanG.Smith,2011,ISBN:1463698348andISBN-13:978-1463698348.

ReferenceBooks	
1	"ExploringArduino:ToolsandTechniquesforEngineeringWizardry"byJeremyBlum**,**ISBN- 10 1118549368, Publisher Wiley 2013.

RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]
1	https://nptel.ac.in/courses/106/103/106103206/
2	https://www.youtube.com/watch?v=v7iefsovo9M
3	https://www.youtube.com/watch?v=L9X7XXfHYdU&list=PLxCzCOWd7aiHMonh3G6QNKq53C6oNXGrX

	MappingwithProgram Outcomes									
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	L	L	L	L	L	L	L	L
CO2	S	M	L	L	M	L	M	L	L	M
CO3	S	M	S	L	L	L	L	L	L	M
CO4	S	S	L	L	L	L	L	L	L	L
CO5	S	S	M	M	M	L	M	L	L	M

*S-Strong;M-Medium;L-Low

Paper Code		**MICROCONTROLLER 8051 LAB**	**L**	**T**	**P**	**C**
			0	**0**	**6**	**4**
Paper Type		**Core Practical – 6**	**Syllabus Version**		**2023-24**	

Course Objectives:

The main objectives of this course are to:

To introduces the assembly language programming of Microcontroller

To develop the student's Assembly language programming skills and gives practical training of interfacing the peripheral devices with the Microcontroller

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Apply the fundamentals of assembly level programming of microcontroller	**K3**
2	Design and Develop program for real time interface	**K6**

K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create

Minimum of Eight Experiments from the list

1	Addition/ Subtraction of8 / 16bitData
2	Multiplication/division8bitData
3	Block Data Transfer
4	Smallest/Largest of N Numbers
5	To Arrange in Ascending/Descending Order
6	Sum of N 8 bit Numbers
7	1'sand2'sComplimentofanArray(8/16bit)
8	DAC Interface
9	Stepper Motor Interface
10	Rolling and Blinking of a Message
11	Hex Key board interface

	Total Lecture hours	**60 hours**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	M	S	S	M	L	S	M	S	M
CO3	M	M	L	M	M	M	L	M	M	M
CO4	L	L	M	M	L	S	M	L	L	L
CO5	S	M	M	S	S	M	S	S	S	M

*S-Strong; M-Medium; L-Low