B.Sc. Electronics Science

Syllabus

Affiliated College

2022 – 2023 onwards

THIRUVALLUVAR UNIVERSITY

(A State University, Accredited with "B+" Grade by NAAC,

Serkadu, Vellore, Tamil Nadu – 632 115

Program Educational Objectives (PEOs)	
The B. Sc. Electronics Science program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Provide graduates with a strong foundation in Electronics domain and to enable them to devise and deliver efficient solutions to challenging problems in Electronics, Communications and allied disciplines.
PEO2	Impart analytic and thinking skills to develop initiatives and innovative ideas for R&D, Industry and societal requirements.
PEO3	Provide sound theoretical and practical knowledge of Electronics, managerial and entrepreneurial skills to enable students to contribute to the wellbeing of society with a global outlook.
PEO4	Inculcate qualities of teamwork as well as social, interpersonal and leadership skills and an ability to adapt to evolving professional environments in the domains of engineering and technology.
PEO5	Motivate graduates to become good human beings and responsible citizens for the overall welfare of the society.
PEO6	Develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolves.
PEO7	To prepare graduates who will have knowledge, ability and courage to pursue higher studies and research.

Program Specific Outcomes (PSOs)	
After the successful completion of B. Sc. Electronics Science program, the students are expected to	
PSO1	Demonstrate proficiency in use of software and hardware required to practice electronics and communication profession.
PSO2	Graduates will be able to apply fundamentals of electronics in various domains of analog and digital systems
PSO3	Apprehend and analyse specific engineering problems of communication, electronic circuits, computer programming, embedded systems, and semiconductor technology by applying the knowledge of basic sciences, engineering mathematics and engineering fundamentals.
PSO4	Ability to communicate effectively with excellent interpersonal skills and demonstrate the practice of professional ethics for societal benefit
PSO5	Graduates will be able to apply fundamentals of electronics in various domains of analog and digital systems.
PSO6	Use embedded system concepts for developing IoT applications

Program Outcomes (POs)	
On successful completion of the B. Sc. Electronics Science program	
PO1	Engineering knowledge: Apply the knowledge of mathematics, Science, Engineering fundamentals and an engineering specialization to the solution of complex engineering problems
PO2	Problem analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusion using principles of mathematics and Engineering Sciences
PO3	Design/Development of solutions: Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental conditions.
PO4	Conduct investigation of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and Sustainability: Understand the impact of the professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, an as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Life-Long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

THIRUVALLUVAR UNIVERSITY, VELLORE – 632 115

B.Sc. Electronics Science Curriculum

(For the students admitted during the academic year 2022 – 23 onwards)

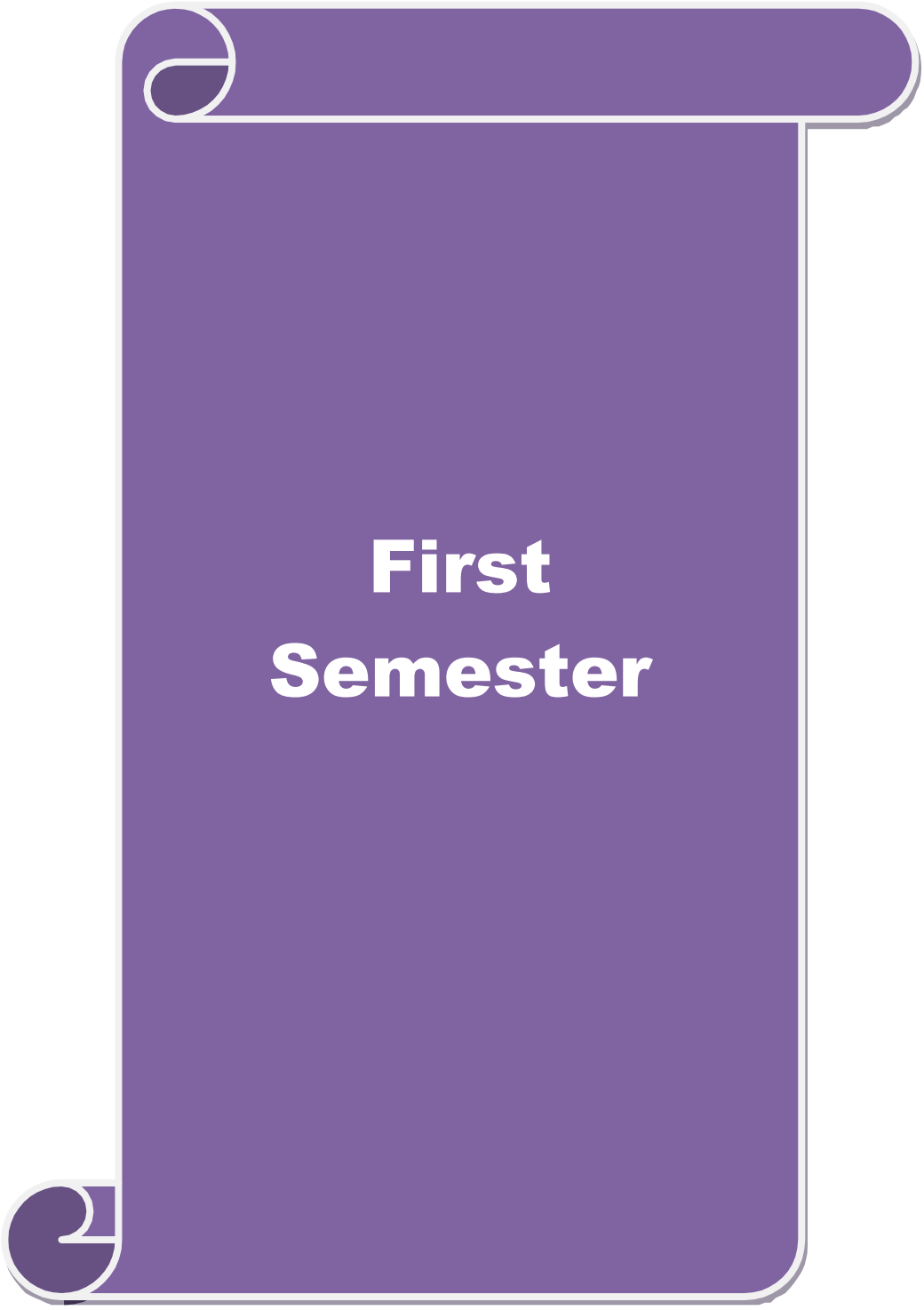
Paper type	Title of the Paper	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
FIRST SEMESTER							
Language-1	Tamil/Other Languages	4	6	--	25	75	100
English (CE)-1	Communicative English I	4	6	--	25	75	100
Core Theory-1	Fundamentals of Electricity and Electronics	4	6	--	25	75	100
Core Practical-1	Basic Electronics Lab	--	--	3	--	--	--
Allied-1	Basic Mathematics-1	4	7	--	25	75	100
English (PE)-1	Professional English I	3	6	--	25	75	100
Environmental Studies	Environmental Science	2	2	--	25	75	100
	Total	**22**	**33**	**3**	**150**	**450**	**600**
SECOND SEMESTER							
Language -2	Tamil/Other Languages	4	6	--	25	75	100
English (CE)-2	Communicative English II	4	4	--	25	75	100
Core Theory -2	Electromagnetism and AC Circuits	4	5	--	25	75	100
Core Practical-1	Basic Electronics Lab	3	--	3	25	75	100
Allied-2	Basic Mathematics II	4	6	--	25	75	100
English (PE)-2	Professional English II	4	6	--	25	75	100
Value Education	Value Education	2	2	--	25	75	100
Soft Skill	Soft Skill	1	2	--	25	75	100
NMSDC I : Language Proficiency for Employability	**Effective English**	2	2	--	25	75	100
	Total	**28**	**33**	**3**	**225**	**675**	**900**
THIRD SEMESTER							
Language -3	Tamil/Other Languages	4	6	--	25	75	100
English (CE)-3	Communicative English III	4	6	--	25	75	100
Core Theory -3	Semiconductor Devices and IC Fabrication Technology	4	5	--	25	75	100
Core Practical-2	Electronic Devices Laboratory	--	--	3	--	--	--
Allied-3	Basic Physics I	4	5	--	25	75	100
Skill based Subject	Programming in C with Practical (Internal Only)	3	3	--	25	75	100
Non-major Elective	**(To choose other department non major elective subject)**	2	2	--	25	75	100

	Total	**21**	**27**	**3**	**150**	**450**	**600**
FOURTH SEMESTER							
Language - 4	Tamil/Other Languages	4	6	--	25	75	100
English (CE)-4	Communicative English IV	4	6	--	25	75	100
Core Theory - 4	Analog and Digital Electronics	4	6	--	25	75	100
Core Practical - 2	Electronic Devices Laboratory	3	--	3	25	75	100
Allied-4	Basic Physics II	4	5	--	25	75	100
NMSDC II : Digital Skills for Employability	**Office Fundamentals**	2	2	--	25	75	100
Non-major Elective	**(To choose other department non major elective subject)**	2	2	--	25	75	100
	Total	**23**	**27**	**3**	**175**	**525**	**700**
FIFTH SEMESTER							
Core Theory - 5	Microprocessor and its Applications	4	6	--	25	75	100
Core Theory - 6	Electronic Communication Systems	4	6	--	25	75	100
Core Theory - 7	Electrical and Electronic Instrumentation	4	6	--	25	75	100
Core Practical -3	Analog and Digital IC Laboratory	--	--	3	--	--	--
Core Practical -4	Communication and Microprocessor Laboratory	--	--	3	--	--	--
Elective – 1 **(To choose any 1 subject out of 3)**	Medical Electronics	3	3	--	25	75	100
	Industrial Electronics						
	Data Processing and Personal Computers						
Skill based Subject	PCB Design and Fabrication	3	3	--	25	75	100
	Total	**18**	**24**	**6**	**125**	**375**	**500**
SIXTH SEMESTER							
Core Theory -8	Television and Video Engineering	4	6	--	25	75	100
Core Theory -9	Cellular Mobile Communication	4	6	--	25	75	100
Core Practical -3	Analog and Digital IC Laboratory	3	--	3	25	75	100
Core Practical -4	Communication and Microprocessor Laboratory	3	--	3	25	75	100
Core Project	Project	3	--	3	25	75	100
Core Internal	Industrial Training	4	--	--	100	--	100
Elective – 2	Power Electronics	3	3	--	25	75	100

(To choose any 1 subject out of 3)	Computer Networks						
	Robotics and Automation						
Elective – 3 **To choose any 1 subject out of 3)**	Microcontroller 8051 and its Applications	3	3	--	25	75	100
	Digital System Design						
	Programmable Logic Controller						
NMSDC III : Employability Readiness	**Project Based Learning 2**	2	2	--	25	75	100
Extension Activities	Extension Activities	1	1	--	100	--	100
	Total	**30**	**21**	**9**	**400**	**600**	**1000**
	Grand Total	**142**	**165**	**27**	**1225**	**3075**	**4300**

NON-MAJOR ELECTIVE SUBJECTS FOR OTHER DEPARTMENT STUDENTS

Course Title	Title of the Paper	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
THIRD SEMESTER							
Non-major Elective	Basic Electronics	2	2	--	25	75	100
	Total	2	2	--	25	75	100
FOURTH SEMESTER							
Non-major Elective	Fundamentals of Electronic Communication	2	2	--	25	75	100
	Total	2	2	--	25	75	100


First
Semester

Paper code		FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS	L	T	P	C
Paper type	Core Theory-1		6	0	0	4
			Syllabus Version		2022-23	

Course Objectives:

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

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	Understand the basics of P-N junction diode and Zener diode with its applications.	K2
5	Analyze the working of various configurations of Transistor and digital logic gates.	K3

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

Unit:1	ELECTROSTATICS	12 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. Electric dipole - Dipole moment - Intensity and potential due to a dipole - Statement and proof of Gauss law - Application of Gauss law to uniformly charged solid sphere.

Unit:2	CAPACITORS	12 hours

Definition and unit of capacitor - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in a charged capacitors - Loss of energy on sharing of charges between two capacitors - Force of attraction between plates of charged parallel plate capacitor - Measurement of potential and dielectric constant. Type of capacitors - Mica capacitor, Electrolytic capacitors, Variable air capacitor - Uses of capacitors.

Unit:3	ELECTRICAL MEASUREMENTS	10 hours

Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low voltmeters - Calibration of Low range ammeter. Magnetic Effect of Current: Biot-Savart's law - Principle, construction and theory of a moving coil ballistic galvanometer - Measurement of figure of merit of B.G. - Comparison of capacitors using B.G.

Unit:4	DIODE CIRCUITS AND POWER SUPPLIES	12 hours

Junction diode characteristics - Half and full wave rectifiers - Expression for efficiency and ripple factor - Construction of low range power peak using diodes - Bridge rectifier - Filter circuits - Zener Diode - Characteristics - Regulated power supply using Zener diode - Clipper and Clamper using diodes. Differentiator and integrator using resistor and capacitor.

Unit:5	TRANSISTOR CIRCUITS	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 - Thevenin's and Norton's theorems. Basis logic gates AND, OR, and NOT - Construction using diodes and transistors.

Total Lecture hours	60 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 MATHEMATICS - I	L	T	P	C
Paper type		Allied-1	7	0	0	4
			Syllabus Version		2022-23	

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	12 hours
Partial fractions, Binomial, Exponential, Logarithmic Series [No Proof] Summation Problem.		
Unit:2	**THEORY OF EQUATIONS**	**12 hours**
Transformation of equations by increasing, decreasing and multiplying the roots by a constant, Reciprocal Equations, Newton's method (Problem Only)		
Unit:3	**MATRICES**	**12 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)**	**12 hours**
Operations on matrices, Adjoint and inverse of a matrix - Determinant of a matrix, Solving equations by matrix method & Cramer's rule.		
Unit:5	**TRIGNOMETRY**	**12 hours**
Expansions of sin nθ, cos nθ, tan nθ - Expansions of sinn θ, cos n θ - Expansions of sinθ, cosθ, tanθ in terms of θ (Simple Problem)		
	Total Lecture hours	**60 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										

Second Semester

Paper Code		ELECTROMAGNETISM AND AC CIRCUITS	L	T	P	C
Paper type		Core Theory-2	5	0	0	4
			Syllabus Version		2022-23	

Course Objectives:

The main objectives of this course are to develop the basic concepts of electromagnetic induction and its applications, 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	Explain the concept of electromagnetic induction and its applications	K2
2	Discuss the effect of alternating current on circuits containing passive components.	K1
3	Describe the fundamental behavior of AC circuits and solve AC circuit problems.	K4
4	Explain the working of amplifier with its types.	K3
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	ELECTROMAGNETIC INDUCTION & ALTERNATING CURRENT	12 hours

Expression for induced EMF - Self induction of a Solenoid - Mutual induction of a solenoid inductor - coefficient of Self induction of a solenoid inductor - Coefficient of coupling - Induction coil - Eddy current and its uses.

EMF induced in a coil rotating in a uniform magnetic field - Mean, RMS and peak values of alternating currents and EMF - Power factor in the case of an AC circuit containing i) Resistance ii) Inductance iii) Capacitance iv) Inductance and Resistance v) capacitance and resistance vi) LCR

Unit:2	AC CIRCUITS	12 hours

Construction and working of transformers - Losses - Tesla coil - Growth and decay of current in a circuit having L and R - Time constant - Growth and decay of charge in a circuit having C and R - Growth and decay of current in a charge having LCR - condition for discharge to be oscillatory - Frequency of oscillation. Production and distribution of three phase AC - Star and Delta connections - Advantages of AC over DC

Unit:3	P-N JUNCTION	12 hours

Semiconductors - Bonds in semiconductors - Intrinsic and Extrinsic semiconductors - n type and p type semiconductors - Majority and minority charge carriers. P-n junction - Mobile and immobile charges - Depletion region - Potential barriers - Depletion capacitance. Drift velocity and mobility of charge carriers - Expression for potential barriers and width of depletion region. Hall effect - Hall voltage and Hall coefficient - Experimental determination of Hall coefficient - Applications.

Unit:4	AMPLIFIERS	12 hours

General principles of small signal amplifiers - Classifications - RC Coupled amplifiers - Gain - Frequency response - Input and output impedance - Multistage amplifiers - Transformer coupled amplifiers - Equivalent circuits at low, medium and high frequencies – Emitter follower. 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 the case of various types of feedback - Analysis of voltage and current in feedback amplifier circuits.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Electricity and Magnetism - M. Narayanamoorthi & Others, National Publishing Co., Chennai.
2	Electricity and Magnetism - R. Murugeshan, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.

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.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=nGQbA2jwkWI
2	https://www.youtube.com/watch?v=KGJEn3SkaSw
3	https://www.youtube.com/watch?v=XUR-dnDa7eI
4	https://www.youtube.com/watch?v=CR1O8cRF5Bs
5	https://www.youtube.com/watch?v=FXnNprfCI_g
6	https://nptel.ac.in/courses/108104087

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

Paper Code		BASIC ELECTRONICS LAB	L	T	P	C
Paper type		Core Practical-1	0	0	3	3
			Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to understand the concepts and working of various instruments like Multimeter, CRO, AFO, galvanometer and its conversion into voltmeter and ammeter, PN Juntion 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 PN junction diode, Zener diode and Transistor with its applications.	K2
3	Analyze the working of galvanometer and CRO.	K3
4	Analyze the functionality of Transistor single stage amplifier, power supply, differentiator, integrator, clipper, clamper, LDR and relay	K5
5	Create the basic logic gates using diodes and transistor	K6

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

List of Experiments

1	Study of Multimeter – Checking of Components.
2	Colour Coding of Resistors & Resistance in Series and Parallel.
3	Verification of Ohm's Law.
4	Characteristics of PN junction diode.
5	Half wave rectifier using PN junction Diode.
6	Full wave rectifier using PN junction Diode.
7	Characteristics of Zener diode.
8	Regulated power supply using Zener diode.
9	Transistor characteristics in CE mode.
10	Conversion of galvanometer into voltmeter, ammeter and ohmmeter.
11	Uses of CRO - Measurement of voltage, current, frequency and phase - Displaying waveforms and Lissajou's figures - Study Experiment.
12	Transistor single stage amplifier - Frequency response.
13	Construction of low range power supply using rectifying diodes (5 V to 12 V).
14	Basic logic gates (AND, OR) using diodes.
15	Basic logic gates (AND, OR, NOT) using transistor.
16	Differentiating and integrating circuits using R and C.
17	Clipping and clamping circuits.
18	Uses of LDR and relay.

Total Lecture hours	**60 hours**

Text Book(s)	
1	Electricity and Magnetism - M. Narayanamoorthi & Others, National Publishing Co., Chennai.
2	Electricity and Magnetism - R. Murugeshan, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.

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.

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										

Paper Code		BASIC MATHEMATICS II	L	T	P	C
Paper Type		Allied - 2	6	0	0	4
			Syllabus Version		2022-23	

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	12 hours
Successive differentiation, nth derivative, Leibnitz Theorem (with out proof), Jocobians.		
Unit:2	**ORDINARY DIFFERENTIAL EQUATION**	**12 hours**
Second order linear differential equation with constant coefficient		
Unit:3	**PARTIAL DIFFERENTIAL EQUAITON**	**12 hours**
Formation of equation by elimination of constants and arbitrary functions.		
Unit:4	**VECTOR ANALYSIS**	**12 hours**
Scalar point function, vector point function, gradient, divergence, curl, irrotational, solenoidal, Line and surface integrals; Gauss, Green, Stoke's theorem (Statement Only)		
Unit:5	**INTEGRAL CALCULUS**	**12 hours**
Integration by part's, Bernoulli's formula, Properties of definite Integral, Reduction formulae for $\int \sin^n x\,dx$, $\int \cos^n x\,dx$.		
	Total Lecture hours	**60 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										

Third Semester

Paper Code		SEMICONDUCTOR DEVICES AND IC FABRICATION TECHNOLOGY	L	T	P	C
Paper Code		Core Theory - 3	5	0	0	4
			Syllabus Version		2022-23	

Course Objectives:

Structure, characteristics, working and applications of various diodes, UJT, SCR, TRIAC, JFET, MOSFET, etc.,

Principles of charge coupled devices, metal semiconductor junction characteristics, and Monolithic IC fabrication technology.

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	Discuss the characteristics of UJT and SCR and obtain its equivalent circuits.	K6
4	Examine the characteristics of MIS, MIM diodes and other electronic devices.	K4
5	Illustrate the IC fabrication process with packaging standards and symbols.	K2

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

Unit:1	TRANSISTORS –WORKING,MODES AND APPLICATIONS	12 hours

Transistors - Working of PNP and NPN transistors - Transistor connections - Relation between β and α - Expression for collector current - Transistor characteristics in CE mode - Transistor as an amplifier and oscillator its performance - Semiconductor devices numbering system - Phototransistor.

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	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:4	SPECIAL PURPOSE 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:5	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.

	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 PHYSICS I	L	T	P	C
Paper Type		Allied 3	5	0	0	4
			Syllabus Version		2022-23	

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	MOMENT OF INERTIA AND GRAVITATION	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	SOUND AND ULTRASONICS	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
6	https://archive.nptel.ac.in/courses/115/105/115105129/

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		PROGRAMMING IN C WITH PRACTICAL (INTERNAL ONLY)	L	T	P	C
Paper Type		Skill based Subject	3	0	0	3
			Syllabus Version		2022-23	

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 - Multifile programs. Pointers: Pointer declaration - Pointer arithmetic - Pointers and arrays - Pointer operation - Passing pointers to a function - Passing function to a function.		
Unit:4	**STRUCTURES AND UNIONS**	**12 hours**
Structure definition - Processing a structure - Structures and pointers - Passing structure to a function - Self-referential structures - Unions.		
Unit:5	**DATA FILES**	**12 hours**
Opening, Closing, Creating, Processing data files - Register variables and bitwise operations - Command line parameters - C preprocessor.		
	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
6	https://nptel.ac.in/courses/106104128

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										

Fourth Semester

Paper Code		ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
Paper type		Core Theory -4	6	0	0	4
			Syllabus Version		2022-23	

Course Objectives:

The main objectives of this course are to study the Analog Circuits and Digital Circuits.

Expected Course Outcomes:

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

1	Discuss the DC and AC characteristics of Operational amplifier	K1
2	Develop electronic circuits using Op-amp.	K2
3	Describe the working of Oscillators and its types.	K4
4	Design various combinational and Sequential circuits using logic gates	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	OPERATIONAL AMPLIFIER & CIRCUITS	12 hours

Principles - Transfer characteristics - Various offset parameters - Differential gain - CMRR - Slew rate - Bandwidth. 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.

Unit:2	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 - UJT relaxation oscillator. Monostable multivibrator, bistable multivibrator and astable multivibrator - Schmitt trigger.

Unit:3	NUMBER SYSTEM AND BOOLEAN ALGEBRA	12 hours

Decimal, binary, octal, hex numbers, conversion from one to another - codes, BCD, excess 3, gray codes conversion from one to another. 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:4	COMBINATIONAL & SEQUENTIAL CIRCUITS	12 hours

Arithmetic building blocks, Basic Adders and Subtractors, BCD adders - Data processing circuits, multiplexers, demultiplexers, encoders, decoders - TTL, CMOS digital logic families. 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	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		ELECTRONIC DEVICES LABORATORY	L	T	P	C
			0	0	3	3
Paper type		Core Practical - 2	Syllabus Version		2022-23	

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

List of Experiments

1	IC Regulated power supply.
2	Characteristics of UJT.
3	Characteristics of SCR.
4	SCR power control.
5	Characteristics of TRIAC.
6	Characteristics of JFET.
7	FET as an amplifier.
8	Source follower.
9	JFET multivibrator.
10	Emitter follower.
11	Darlington pair amplifier.
12	Transistor Hartley oscillator.
13	Transistor Colpitts oscillator.
14	Transistor phase shift oscillator.
15	Transistor Wien bridge audio oscillator.
16	Transistor monostable multivibrator.
17	Resistivity and Hall coefficient - Four probe method.
18	Energy band determination.

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	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/117101106
3	https://nptel.ac.in/courses/113106062
4	https://nptel.ac.in/courses/113106039
5	https://onlinecourses.nptel.ac.in/noc21_ee80/preview
6	https://nptel.ac.in/courses/108106181

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										

Paper Code		BASIC PHYSICS II	L	T	P	C
Paper Type		Allied 4	5	0	0	4
			Syllabus Version		2022-23	

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
6	https://nptel.ac.in/courses/115103101

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										

Fifth Semester

Paper Code		MICROPROCESSOR AND ITS APPLICATIONS	L	T	P	C
Paper Type		Core Theory -5	6	0	0	4
			Syllabus Version		2022-23	

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 - I0nstruction 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										

Course Code		ELECTRONIC COMMUNICATION SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core Theory -6	6	0	0	4
			Syllabus Version		2022-23	

Course Objectives:
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 and their applications
T/ransmission and detection of digital signals.
Fundamentals of antenna, their characteristics and types

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

Unit:1	**AMPLITUDE MODULATION TECHNIQUES**	**12 hours**
Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Generation and detections circuits - Balanced Modulator - DSB/SC and SSB Modulation - VSB modulation. Block diagram of AM Radio transmitter and super heterodyne Receiver.		
Unit:2	**FREQUENCY MODULATION TECHNIQUES**	**12 hours**
Frequency Modulation - Definition - Derivation of Modulated wave - Generation of FM - Varactor diode and Reactance tube Modulators - Detectors - Balanced slope detector, Foster Seeley discriminator, ratio detector - Block diagram of FM transmitter and receiver.		
Unit:3	**PULSE MODULATION TECHNIQUES**	**12 hours**
Pulse Modulation - Sampling theorem - PAM, PWM, PPM, PCM - quantizing, sampling, coding, decoding, quantization error, delta modulation and adaptive delta modulation.		
Unit:4	**MULTIPLEXING TECHNIQUES**	**12 hours**
Multiplexing - FDM, TDM, CDMA - ASK, FSK, PSK - Advantages of Digital Communication - Introduction to Microwave, Fiber optic, Satellite Communications - RADAR - range equation.		
Unit:5	**ANTENNA**	**12 hours**
Antenna – Radiation Pattern - Efficiency – Directivity - Directive gain - Bandwidth, Beam width and polarization - Dipole - Folded dipole - Yagi - Uda - Helical - Discone - Parabolic - Dish Antennas - Ground wave, sky wave and space ware propagation.		
	Total Lecture hours	**60 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=oYRMYSlVj1o
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		ELECTRICAL AND ELECTRONIC INSTRUMENTATION	L	T	P	C
Paper Type		Core Theory -7	6	0	0	4
			Syllabus Version		2022-23	

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		MEDICAL ELECTRONICS	L	T	P	C
Paper Type		Elective Paper-1	3	0	0	3
			Syllabus Version		2022-23	

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 APPLICATIONS**	**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		INDUSTRIAL ELECTRONICS	L	T	P	C
Paper Type		Elective Paper-1	3	0	0	3
			Syllabus Version		2022-23	

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		DATA PROCESSING AND PERSONAL COMPUTERS	L	T	P	C
Paper Type		Elective Paper-1	3	0	0	3
			Syllabus Version		2022-23	

Course Objectives:
Principle of data processing, storage devices,
Various languages, compilers, DBMS, etc.,
Architecture of personal computers and their various operating systems.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Categorize the types of Personal Computers and its accessories.	K2
2	Explain the different types of storage media used in personal computers.	K3
3	Discuss the process of establishing Communication with Computers by various devices.	K5
4	Elaborate the concept of disk operating system.	K4
5	Explain about UNIX system and PC Applications.	K1
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	PERSONAL COMPUTER	12 hours
Types of personal computers - Theory of personal computer development - The microprocessor revolution - A typical personal computer configuration - Motherboard expansion slots - Parallel and serial interfaces - RAM - CPU - Keyboard - Monitor - MGA - CGA - EGA - VGA - SVGA.		
Unit:2	**STORAGE MEDIA**	**12 hours**
Types of data processing - Data processing cycle - Expanded data processing cycle - Data processing operations - Data organization - Pen drive - Hard disk - Floppy disks - Winchester drives - Compact disks.		
Unit:3	**COMMUNICATION WITH COMPUTER**	**12 hours**
I/O devices - Mass storage devices - File maintenance procedure - Input/Output systems and procedures - Introduction to languages - High level, Assembly level and Machine level - Introduction to translation mechanism - Compilers, Interpreters, Linkers, Loaders - DBMS.		
Unit:4	**DISK OPERATING SYSTEM**	**12 hours**
Overview of MS-DOS - Command summary - DIR, SORT, TYPE, CD, FORMAT, etc. and their usage - The DOS boot mechanism - COMMAND.COM - IBMDOS.COM - IBMBIO.COM - An overview of DOS file system - Batch files - AUTOEXEC.BAT Windows (Concept only).		
Unit:5	**UNIX**	**12 hours**
An overview of UNIX files system. PC Applications: Spreadsheets - Word processing - LAN - Information Technology - Internet - Intranet - Email - www.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Fundamentals of Computers - V. Rajaraman, Prentice Hall of India Private Limited, 3/e.
2	Data Processing - Lipschutz & Lipschutz.

Reference Books	
1	Computer Data Processing - Gordon Davis.
2	Introduction to Data Processing - Gregg.
3	The IBM Technical Reference Manual.
4	The DOS Reference Manual.
5	Introduction to UNIX - R. Thomas & Yates.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=ItxwyMR0SnY
2	https://www.youtube.com/watch?v=vosdynQouXw
3	https://www.youtube.com/watch?v=OmYHJShD_QM
4	https://www.youtube.com/watch?v=EbxukDnRqSQ
5	https://www.youtube.com/watch?v=BFhIldUx5mI
6	https://nptel.ac.in/courses/106106144
Course Designed By:	

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

Paper Code		PCB DESIGN AND FABRICATION	L	T	P	C
Paper Type		Skill based Subject	3	0	0	3
			Syllabus Version		2022-23	

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 – Cooling requirement and package density – Layout check. Basic artwork approaches – Artwork taping guidelines – General artwork rules – Artwork check and Inspection.

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 – Coating process for wet film resists – Exposure and further process for 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 – Man Soldering – Solder mask – Safety, health and medical aspects in Soldering practice.

Unit:5	DESIGN RULES AND AUTOMATION	12 hours

Reflection – Crosstalk – Ground and Supply line noise – Electromagnetic interference from pulse type EM fields and automation – 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
6	https://nptel.ac.in/courses/117108140
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										

Sixth Semester

Paper Code		TELEVISION AND VIDEO ENGINEERING	L	T	P	C
Paper Type		Core Theory -8	6	0	0	4
			Syllabus Version		2022-23	

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 - VHF Tuner - IF Subsystems - Video amplifiers - Sync processing and AFC circuit - Deflection oscillators.		
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		CELLULAR MOBILE COMMUNICATION	L	T	P	C
Paper Type		Core Theory -9	6	0	0	4
			Syllabus Version		2022-23	

Course Objectives:

The basic principles of the modern mobile and wireless communication systems and their generation

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Explain the functioning of basic cellular communications systems	K2
2	Discuss the components of mobile devices and it's working.	K1
3	Elaborate the concept of Cellular Technology	K5
4	Describe the process of messaging and security features in cell phones.	K2
5	Outline the Mobile Standards in practice.	K6

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

Unit:1	INTRODUCTION TO CELLULAR SYSTEM	12 hours
Advanced mobile phone service - Global system for mobile communication - Digital cellular system - Cordless telephony - Third generation wireless systems.		
Unit:2	**CHANNEL TECHNIQUES**	**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	**GLOBAL SYSTEMS**	**12 hours**
GSM - Network signaling, mobility management, short message service - International roaming, administration and operation.		
Unit:4	**WIRELESS COMMUNICATION**	**12 hours**
Wireless application protocol - Architecture - Datagram - Transport layer securities - Transaction protocol - Session protocol application environment, wireless markup language, WML - Script wireless telephony applications.		
Unit:5	**GENERATION OF MOBILE DEVICES**	**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=wSrYSUGUwR8
2	https://www.youtube.com/watch?v=9Apn2EQ-zos
3	https://www.digimat.in/nptel/courses/video/106106167/L01.html
4	https://www.youtube.com/watch?v=zrjmpyc8YrE
5	https://www.youtube.com/watch?v=bm53RpK-S2k
6	https://nptel.ac.in/courses/106106167

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

Paper Code		ANALOG AND DIGITAL IC LABORATORY	L	T	P	C
Paper Type		Core Practical - 3	0	0	3	3
			Syllabus Version		2022-23	

Course Objectives:

the construction of dual power supply using Zener diode and IC application of Op-amp
Universality of NAND and NOR gates and verification of Boolean identities using them
Multi-vibrators and their applications

Expected Course Outcomes:

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

1	Develop Power supply using diode & IC	K1
2	Construct circuitry and demonstrate the working of various applications of Op-amp	K5
3	Verify the truth table, Boolean identities and Combinational logic using Universal gate and Flip-flop	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

List of Experiments

1	Construction of dual power supply using Zener diodes.
2	Construction of dual power supply using IC.
3	Op-amp - Inverting and Non-inverting modes, unity follower.
4	Op-amp - Summing amplifier - Inverting and Non-inverting modes.
5	Op-amp - Integrator and Differentiator.
6	Op-amp - Square wave generator.
7	Op-amp - Sine wave generator.
8	Instrumentation Amplifier.
9	Astable, multivibrators using 555 timer.
10	Schmitt trigger using 555 timer.
11	Monostable multivibrator using 555 timer.
12	Verification of Universal gate – NAND.
13	Verification of Universal gate – NOR.
14	Verification of basic Boolean identities using NAND gates.
15	Verification of basic Boolean identities using NOR gates.
16	Sum of Products and Product of Sums - NAND gates.
17	Sum of Products and Product of Sums - NOR gates.
18	Study of RS, D and JK flip flops.
19	Half, Full and BCD adders using simple logic gates.
20	Half, Full and BCD adders using NAND gates.
21	Half and Full subtractors using simple logic gates.
22	Half and Full subtractors using NAND gates.
23	Study of 7490 BCD counter, divided by (1 to 10) as scalar.
24	BCD to seven-segment decoder using 7447/7448.

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										

Paper Code		COMMUNICATION AND MICROPROCESSOR LABORATORY	L	T	P	C
Paper Type		Core Practical – 4	0	0	3	3
			Syllabus Version		2022-23	

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	Reversing an array & searching an elements from array
6	Picking up the largest/smallest in an array.
7	Ascending/Descending order.
8	Code conversions:
	a Binary to BCD
	b BCD to Binary
9	Code conversions:
	a Binary to ASCII
	b ASCII to Binary
10	Code conversions:
	a BCD to ASCII
	b ASCII to BCD
11	Clock program
12	Flashing LEDs.
13	Wave generation using DAC interface.
14	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										

Paper Code		POWER ELECTRONICS	L	T	P	C
Paper Type		Elective Paper-2	3	0	0	3
			Syllabus Version		2022-23	

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		COMPUTER NETWORKS	L	T	P	C
Paper Type		Elective Paper-2	3	0	0	3
			Syllabus Version		2022-23	

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		ROBOTICS AND AUTOMATION	L	T	P	C
Paper Type		Elective Paper-2	3	0	0	3
			Syllabus Version		2022-23	

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		MICROCONTROLLER 8051 AND ITS APPLICATIONS	L	T	P	C
Paper Type		Elective Paper-3	3	0	0	3
			Syllabus Version		2022-23	

Course Objectives:
the architecture of 8051 Micro-controller
the interrupts, counter, timer and serial data transmission
the instruction set and simple programs
interfacing 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		DIGITAL SYSTEM DESIGN	L	T	P	C
Paper Type		Elective Paper-3	3	0	0	3
			Syllabus Version		2022-23	

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=QfloAPio8oE
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		PROGRAMMABLE LOGIC CONTROLLER	L	T	P	C
Paper Type		Elective Paper-3	3	0	0	3
			Syllabus Version		2022-23	

Course Objectives:

To learn about the programmable logic control and circuit and describe the general type of application in which a programmable logic controller would best be used, and give examples.

Expected Course Outcomes:

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

1	Discuss the configuration different types of Programmable Logic Devices.	K2
2	Understand the basics of PLC system and its components.	K1
3	Develop the basic programming techniques of PLC and ladder logic.	K6
4	Use Timer instructions to build basic programming of PLC	K4

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

Unit:1	INTRODUCTION TO PROGRAMMABLE LOGIC	12 hours

programmable Logic structures, Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs), Programmable Gate Arrays (PGAs), Field Programmable Gate Arrays (FPGAs) Sequential network design with Programmable Logic Devices (PLDs) Design of sequential networks using ROMs and PLAs Traffic light controller using PAL.

Unit:2	PROGRAMMABLE LOGIC CONTROLLERS	12 hours

Introduction Parts of PLC Principles of operation PLC sizes PLC hardware components I/O section Analog I/O section Analog I/O modules, digital I/O modules CPU Processor memory module Programming devices Diagnostics of PLCs with Computers.

Unit:3	PLC PROGRAMMING	12 hours

PLC programming Simple instructions Programming EXAMINE ON and EXAMINE OFF instructions Electromagnetic control relays Motor starters Manually operated switches Mechanically operated and Proximity switches Output control devices Latching relays PLC ladder diagram Converting simple relay ladder diagram in to PLC relay ladder diagram.

Unit:4	PLC INSTRUCTIONS	12 hours

Timer instructions ON DELAY timer and OFF DELAY timer counter instructions Up/Down counters Timer and Counter applications program control instructions Data manipulating instructions math instructions.

Unit:5	APPLICATIONS OF PLC	12 hours

Applications of PLC Simple materials handling applications Automatic control of warehouse door Automatic lubricating oil supplier Conveyor belt motor control Automatic car washing machine Bottle label detection Process control application.

	Total Lecture hours	60 hours

Text Book(s)	
1	Charles H. Roth, Jr “Fundamentals of Logic Design ", Fourth Edition, Jaico Publishing house, 1999.
2	Frank D. Petruzella " Programmable Logic Controllers ", McGraw- Hill book, company, 1989.
3	Siemens “PLC Handbook ".

Reference Books	
1	William I. Fletcher “An Engineering Approach to Digital Design ", Prentice, Hall of India Ltd., New Delhi, 1999

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=jySpg72Vbc4
2	https://www.youtube.com/watch?v=uOtdWHMKhnw
3	https://www.youtube.com/watch?v=ic9crSVVF9Q
4	https://www.youtube.com/watch?v=IGMrEAay1gA
5	https://www.youtube.com/watch?v=UQ16Cous_tY
6	https://nptel.ac.in/courses/108105063

Mapping with Programme Outcomes

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

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

Non Major Elective

Paper Code		BASIC ELECTRONICS	L	T	P	C
Paper Type		Non-major elective 1	2	0	0	2
			Syllabus Version		2021-22	

Course Objectives:
The concepts of electronic states and band structure formation and design amplifiers
The concepts of Power Supplies and amplifiers with active loads
The concepts of high frequency response of amplifiers

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Outline the operation of basic components used in Electronics	K2
2	Discuss the working of power supply and its variants.	K3
3	Elaborate the working of different configurations of amplifier.	K1
4	Illustrate the usage of transistor as an oscillator and switching circuits.	K6
5	Recall various number systems and truth tables of logic gates	K5
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 –** Create		

Unit:1	BASIC COMPONENTS USED IN ELECTRONICS	12 hours
Resister, capacitor, inductor and their different types - Diodes - Light Emitting diode (LED), Photo diode - Zener diode - LCD - solar cell.		
Unit:2	**POWER SUPPLIES**	**12 hours**
Need of a power supply - Types of power supplies - Different types of unregulated and regulated power supplies - IC Regulated power supply - switched mode power supply.		
Unit:3	**AMPLIFIERS**	**12 hours**
Transistor as an amplifier - Types of Amplifiers - Single stage amplifier - Amplifiers with feedback - Negative feedback amplifiers.		
Unit:4	**OSCILLATORS & SWITCHING CIRCUITS**	**12 hours**
Transistor as an oscillator - Barhausen criteria - Hartley and colpitt's oscillators - Multivibrators - Differentiating circuits - integrating circuits - clipping and clamping circuits.		
Unit:5	**DIGITAL ELECTRONICS**	**12 hours**
Analog and digital signals - Digital circuits - Binary number system - conversion of Binary to decimal - decimal to binary - logic gates - OR gate - AND gate - NOT gate - Combination of Logic gates - NAND and NOR as universal building blocks.		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Principles of Electronics - V.K. Mehla - S.Chan Publication, New Delhi
2	Electronic devices and circuits - G.J.Mithal, Khana publishers, New Delhi
3	Modern Physics - R.Murugesan - S.Chan publication, New Delhi
4	Basic Electronics - B.L. Theraja - S.Chan publication, New Delhi

Reference Books	
1	Electronic devices and circuits - B.Sasikala, S.Poornachandra Scitech publication India Pvt. Ltd., Chennai.
2	Electronic devices and Application and integrated circuits - Mathur kul shresh the & Chandra Umesh publication, New Delhi.
3	Hand book of Electronics - Gupta & Kumar, Pragathi prakashan, Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=WxiOQvq2P-k
2	https://www.youtube.com/watch?v=x2wqwqUhMdE
3	https://www.youtube.com/watch?v=m4sjTt7rhow
4	https://www.youtube.com/watch?v=SrvkXEIWuK4
5	https://www.youtube.com/watch?v=m5rEKAqHyKo
6	https://onlinecourses.nptel.ac.in/noc21_ee55/preview

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	L	L	M	S	L	M	S	S
CO5	S	L	M	S	M	L	L	S	S	M
*S-Strong; M-Medium; L-Low										

Paper Code		FUNDAMENTALS OF ELECTRONIC COMMUNICATION	L	T	P	C
Paper Type		Non-major elective 2	2	0	0	2
			Syllabus Version		2022-23	

Course Objectives:
Various modulation and demodulation techniques of analog communication.
Analyze different parameters of analog communication techniques and also pulse modulation and demodulation techniques

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Elaborate the concepts of basic communication systems.	K2
2	Explain the methodology of amplitude modulation, frequency and phase modulation techniques used in analog communication	K6
3	Discuss the functionality of transmitter and receiver circuits.	K4
4	Describe the principle of operation of television circuits.	K2
K1 - Remember; **K2 -** Understand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6 -** Create		

Unit:1	**NEED OF MODULATION**	**12 hours**
Block diagram - information source and input transducer - Transmitter medium - Noise - Receiver - Destination - Necessity for modulation - Types of communication systems.		
Unit:2	**AMPLITUDE MODULATION**	**12 hours**
Definition - AM waveforms - Frequency spectrum and hand width - Modulation index - DSB - SC, SSB, Independent SB, Vestigial SB - Comparison and application of various AM schemes.		
Unit:3	**FREQUENCY AND PHASE MODULATION**	**12 hours**
Definition - Relationship between FM & PM - Frequency deviation - Spectrum and transmission BW of FM, comparison of AM and FM systems.		
Unit:4	**RADIO TRANSMITTER AND RECEIVER**	**12 hours**
AM transmitters - High level and low level transmitters - SSB transmitters - FM transmitters - Block diagram - stereo FM transmitter. AM receivers - operation - performance parameters - Communication Transceivers - Block diagram - SSB receiver - FM receivers - Block diagram.		
Unit:5	**TELEVISION FUNDAMENTALS**	**12 hours**
Television of TV system - Block diagram - Scanning - Synchronisation - VSB transmission and reception Colour signal transmission.		
	Total Lecture hours	**60 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	Basics of electronic Communications NIIT, prentice - Hall Pvt. Ltd, New Delhi, 2007.
2	Modern digital and analog communications - BP lathi third edition 1998, Oxford University press.
3	Communication System: Analog & digital Singh and sapre, TMH 1995.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=6RIWZGxFqK8
2	https://www.youtube.com/watch?v=Yryi1bbmUjU
3	https://www.youtube.com/watch?v=IgkngDjNJwo
4	https://www.youtube.com/watch?v=JYsii7Efzqw
5	https://www.youtube.com/watch?v=40eNsj9MGlU
6	https://onlinecourses.nptel.ac.in/noc21_ee30/preview

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