

SEMESTER V
Core Paper VII
MATHEMATICAL PHYSICS

Instructional Hrs.:75

Sub. Code: 16PHUC507

Max. Marks: CIA-25; ESE-75

Credits: 5

Objective: To enable the students to solve various mathematical problems and to understand how mathematics and physics are related.

UNIT - I

17Hrs.

Vector Analysis:

Meaning of dot products and vector products - Scalar valued function and vector valued function - Plotting scalar and vector fields - Examples from physics - Gradient of a scalar function - Directional derivative - Examples - Divergence of a vector function - Curl of a vector function - Physical meaning of gradient operation, divergence and curl.

Line integral - surface integral and volume integral - Stoke's theorem - Gauss's divergence theorem - Green's theorem

Unit II

Matrices:

15 Hrs.

Matrices - Symmetric matrix, anti-symmetric matrix - Hermitian matrix, skew Hermitian matrix - Orthogonal matrix - Unitary matrix, Eigen value and Eigenvector of matrices - Cayley-Hamilton's theorem - Proof - Inverse of a matrix - Rank of a matrix - elementary row or column transformation.

Unit- III

Ordinary Differential Equations:

20 Hrs.

First and second order ordinary differential equations with constant coefficients - Initial value problem - Method of finding solutions - Superposition principle - Wronskian-Second order differential equations with variable coefficients - Definition of ordinary and singular points - Power Series Solution - Solutions about ordinary point and singular point.

UNIT- IV

12 Hrs.

Probability and Statistics:

Probability: Basic definition - Classical probability and empirical probability - Properties of probability - Conditional probability - Joint probability - Addition law and multiplication law of probability.

Statistics: Measures of central tendency - Mean, median and mode - Skewness and kurtosis.

Probability distribution - Random variables - Binomial distribution, Poisson's distribution, Normal (Gaussian) distribution and Standard normal distribution - Expectation values - Moments and moment generating functions - variance and standard deviation.

UNITV

11 Hrs.

Beta, Gamma Functions:

Definition of Gamma function - Fundamental property of gamma function and values of Gamma function - Definition of beta function - Different forms of beta function - Relationship between beta and gamma functions - Delta function - Basic properties.

Text Books

1. **Zill D. G. and Cullen M. R.**, “Advanced Engineering Mathematics”, (Unit I, II & III) Narosa, 2006.
2. **Kreyszig E.**, “Advanced Engineering Mathematics”, (Unit I, II, III & IV) Wiley Eastern, 2015.
3. **Dass H.K.**, “Mathematical Physics”, (Unit IV &V), S.Chand & Company, New Delhi, 2010.
4. **Satya Prakash**, “Mathematical Physics”,(Unit IV), S.Chand & Company, New Delhi, 2014

Reference Books

1. **Gupta B.D.**, “ Mathematical Physics” , S.Chand & Company, New Delhi, 4th Edition, 2009.
2. **Arfken, Weber and Harris**, “Mathematical Methods for Physicists A Comprehensive Guide”, Elsevier Publication, 7th Edition.

SEMESTER VI
Elective Paper III
COMMUNICATION ELECTRONICS

Instructional Hrs: 60
Max. Marks: CIA-25; ESE-75

Sub. Code: 16PHUE603
Credits: 4

Objectives: The syllabus envisages in providing the necessary theory and analog and digital communication principles and applications. Communication techniques hold the key for development.

UNIT I **12Hrs.**

Modulation

Modulation - Definition - Types of Modulation AM, FM, PM - Amplitude Modulated Voltage - Wave Form of Amplitude Modulated Wave - Balanced Modulator - SSB Generation - Suppression of Carrier - Frequency Modulation - Definition and Expression - Phase Modulation - Definition - Comparison of AM, FM And PM.

UNIT II **10 Hrs.**

Demodulation:

Definition - Diode Detection of AM Signals - FM Detection - Foster Seely Discriminator - Radio Receivers: Straight Receivers - TRF Receivers - Super Heterodyne Receivers - Block Diagram- Explanation of Each Stage - FM Receivers - Block Diagram.

UNIT III **14 Hrs.**

Digital Communication:

Introduction to Digital Communication System - Pulse Code Modulation - Amplitude Shift Keying (ASK) - Band Width and Frequency Spectrum of ASK - Binary ASK Modulator - Coherent ASK Detector- Non Coherent ASK Detector - Frequency Shift Keying (FSK)

Bandwidth of Binary FSK - Detection Of FSK Using PLL- Phase Shift Keying (PSK) - Generation of binary PSK-DPSK- Generator and Demodulator- Advantages and Disadvantages of Digital Modulation.

UNIT IV **12 Hrs.**

Broad Band Communication:

TDM, FDM, Integrated Digital Network: ISDN - Broadband ISDN - Basic Concepts of LAN: BUS Topology - Star Topology - Ring Topology - Hybrid Topology - Private Branch Exchange (PVBX) - Modems Classification.

UNIT V **12 Hrs.**

Fiber Optics and Satellite Communication:

Optical Communication - Basic Fiber Optic System; Advantages - Optical Fiber Construction Modes of propagation - Numerical Aperture - Losses in Optical Fiber - Optical Communication System.

Introduction to Satellite Communication System - Basic Components - Telemetry Tracking and Command System (Block Diagram) - Satellite Links.

Text Books

1. **Anokh Singh & Chabra A.K.**, “Principles Of Communication Engineering”, S.Chand & Company, New Delhi 2006.
2. **Deshponde N.D, Deshpande D.A & Rangole.**, “Communication Electronics” , TMG, New Delhi, 2002.
3. **Gupta & Kumar**, “Hand book of Electronics”, Pragati Prakhasan, Meerut (2012)
4. **Theraja B.L.**, “Basic Electronics”, S.Chand & Company, New Delhi, 5th Edition , 2009.

Reference Books

1. **George Kennedy.**, “Electronic Communication System”, Tata McGraw Hill, New Delhi, 4th Edition, 2004.
2. **Kennedy and Davis** , “Electronics Communication Systems”, TMH, 6th Edition
3. **Robert M., Gagliarasi .**, “Satellite Communication”, CBS, New Delhi, 1994.

CODE	COURSE TITLE
18PHUC406	DIGITAL ELECTRONICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	4

Preamble

To impart the basic knowledge of digital principles and application of the knowledge to analyze/design the basic logic circuits, combinational and sequential circuits.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1.	Recognize and converts different types of codes and number systems which are used in computer system and digital communication.	K1
CO2.	Optimize simple logic using K-map and simplify Boolean laws using the basic Boolean property.	K2
CO3.	Relate logical processes and implement logical operation using combinational logic circuits.	K2
CO4.	Analyze and design sequential and counter circuits	K3
CO5.	Classify the different types of magnetic memory and semiconductor memory	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1.	S	S	S	S	S
CO2.	S	S	S	M	S
CO3.	S	S	S	S	S
CO4.	S	S	S	S	S
CO5.	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

12 Hrs.

Number system and Codes: Decimal, Binary, Octal, Hexadecimal- Conversion of Number system- Binary Coded Decimal – Alphanumeric Codes - ASCII Code – EBCDIC Code – Error Detecting and Correcting Code: Hamming code – Parity – Even Parity and Odd Parity Method.

UNIT II

12 Hrs.

Logic gates and Boolean Algebra: Positive and Negative logic – Logic Gates - NAND, NOR, XOR, XNOR – Action and Truth Table – Laws and Rules of Boolean Algebra and simplifications - *De Morgan's Theorem and Proof* – *K-map* – *Pairs, Quads, Octets, Don't care condition. Logic Diagram.*

UNIT III

12 Hrs.

Arithmetic and Logic Circuits: Half Adder – Full Adder – Half Subtractor – Full Subtractor – Parallel Binary Adder – Parallel Binary Subtractor - Decimal to BCD Encoder – 1- of 16 Decoder, BCD to Decimal Decoder 4 bit D/A Converter – 2 bit simultaneous A/D Converter .

UNIT IV

12 Hrs.

Sequential Circuits: Introduction – R.S Flip Flop, Clocked Flip Flop, JK Flip Flop, D Flip Flop – *Master Slave JK Flip Flop – Construction Circuits – Working- Truth tables- timing diagram.*

Counters:

Synchronous counter: Ring Counter- Asynchronous counter: Ripple Counter, Mod counters: Mod 3, Mod 5, Mod 10-logic diagram with truth tables.

UNIT V

12 Hrs.

Magnetic Memory: Magnetic Cores – Magnetic Core Logic – Coincident Current Memory – Memory Addressing.

Semiconductor Memory: Metal Oxide Semiconductor Memeor (MOS) – Random Access Memory (RAM), Read Only Memory (ROM), PROM, & EPROM- Basics.

Note: *Italics*denotes Self study Topics

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Malvino.	Digital Computer Electronics	Tata McGraw Hill, New delhi,	2013, 3 rd Edition
2.	Malvino & Leach	Digital principles and applications	Tata McGraw Hill, New Delhi	2006, 6 th Edition
3.	Thomas C Barte	Digital computer fundamentals	Tata McGraw Hill, New Delhi	2001, 6 th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Jain.R.P	Modern Digital Electronics	Tata McGraw Hill, New Delhi	2006, 3 rd Edition
2.	Morris Mano.M	Digital Logic & Computer Design	Prentice Hall India, New Delhi	2000, 1 st Edition, Reprint
3.	William H.Gothmann	Digital electronics	Prentice Hall India, New Delhi	2006, 2 nd Edition
4.	Anokh Singh, Chhabra A.K	Fundamentals of Digital Electronics and Microprocessors	S.Chand& Company Ltd., New Delhi	2003, 2 nd Revised Edition

Web Resources

1. www.khanacademy.org/math/algebra-home/alg-intro-to-algebra#algebra-alternate-number-bas
2. <https://www.youtube.com/watch?v=gjCpKPqIJUU>
3. <https://www.youtube.com/watch?v=dmBc-E3EpgA>

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar
-

SEMESTER VI
Part IV: SKILL BASED SUBJECT- IV
MEDICAL PHYSICS

Instructional Hrs : 45

Sub. Code: 17PHUS604

Max. Marks: CIA-25; ESE-75

Credits: 3

Objective:

To provide opportunities and necessary skills for the students to take up a career as clinical technician, radiologist etc., in health related industries.

UNIT I

Human Physiological Systems:

Introduction – Cells & Their Structures- Nature Of Cancer Cells- Transport Of Ions Through The Cell Membrane – Resting & Action Potentials- Bio Electric Potentials – Different Systems Of Human Body.

UNIT II

Electrodes And Transducers:

Types Of Electrodes – Chemical Electrodes - pH Electrodes – PCO₂ Electrodes – PO₂ Electrode. Piezo – Electric Type – Thermo Electric Type – Photo Voltaic Type.

UNIT III

Radiology :

Introduction – X – Ray Machine – Imaging Techniques: Ultra Sonograph, MRI (Qualitative Study) Angiography – Effects Of Radiation Exposure – Radiation Protection – Radio Isotopes In Medicine.

UNIT IV

Bio Potential Recorders:

Introduction – Basic Ideas Of Electrocardiography (ECG), Echo Cardiography And Electroencephalography (EEG).

UNIT V

Physiological Assist devices:

Introduction – Basic Ideas Of Pacemaker, Artificial Heart Valves And Defibrillators – Heart Lung Machine – Kidney Machine – Dialysis – Hemodialysis.

TEXT BOOK

1. Arumugam M., “Biomedical instrumentation”, Anuradha Agencies, kumakonam., First

Edition, 1992.

REFERENCE BOOKS

1. **Khandpur R.S.**, “*Biomedical instrumentation*”, Tata McGraw Hill, New Delhi,
First

Edition, 2004.

2. **Leslie Cromwell**, “*Biomedical Instrumentation & Measurements*”, Prentice Hall
Of India,

New Delhi, 2nd Edition, 1996.