



PSGR Krishnammal College for Women



DEPARTMENT OF PHYSICS

MASTER OF PHYSICS

2022-24 BATCH



M. Sc Physics

PROGRAMME OUTCOMES

PLO1: To enhance the student's abilities, personal qualities and transferable skills which will give them an opportunity to develop as responsible citizens.

PLO2: To understand the laws, theorems and basic concepts in physics.

PLO3: To use a systematic concept-based problem-solving approach that can be applied to different conditions.

PLO4: To understand the physical of behavior of microscopic and macroscopic bodies.

PLO5: To pursue complex, open-ended investigation in physics.

PLO6: To understand the theories which describe the nature of physical phenomena and to establish them by experiments.

PLO7: To enhance the computational skills and to make the students to handle software with confidence.

PROGRAM SPECIFIC OUTCOMES

At the end of the programme the student will

- Be able to play an important role in the development of scientific technology.
- Gain expertise in using scientific equipment.
- Be able to carry out scientific projects.
- Be able to apply renewable energy.
- Be able to apply mathematical theory to physical systems.
- Secure jobs in research laboratories and medical institutions.
- Gain admission in research courses.
- Be able to make effective use of information technology.

DEPARTMENT OF PHYSICS
CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION

Programme & Branch MSc Physics								
Scheme of Examination (Applicable to students admitted during the academic year 2023-2024 onwards)								
Semester	Subject code	Title of the paper	Instructions Hours/week	Duration of exam in hours	Maximum marks			credits
					CA	ESE	Total	
I	MPS2201	Paper I- Mathematical Physics –I	6	3	50	50	100	4
	MPS2202	Paper II - Classical Mechanics	6	3	50	50	100	4
	MPS2203	Paper III - Thermodynamics & Statistical Mechanics	6	3	50	50	100	4
	MPS2204	Paper IV – Electronics	6	3	50	50	100	4
	MPS21P1	Practical-I General Practicals	3	.....	.....	.....	.....	....
	MPS21P2	Practical –II Electronics Practicals	3	.....	...	.....	.....	.....
II	MPS2205	Paper V - Mathematical Physics –II	5	3	50	50	100	4
	MPS2206	Paper VI- Quantum Mechanics –I	5	3	50	50	100	4
	MPS2207	Paper VII- Electromagnetic Theory	5	3	50	50	100	4
	MPS2208	Elective – I 1.Programming in C	4	3	50	50	100	3
	MPS2209	2. Nuclear Physics I						
	MPS17A1 MTH16A4	Inter Disciplinary Course- Biophysics Tensor & Numerical Methods	3	3	-	-	100	5
	MPS21P1	Practical-I General Physics	4	4	50	50	100	4
	MPS21P2	Practical –II Electronics Practicals	4	4	50	50	100	4

III	MPS2111	Paper IX- Condensed Matter Physics -I	4	3	50	50	100	5
	MPS2112	Paper X - Quantum Mechanics –II	4	3	50	50	100	5
	MPS2113	Paper VIII - Atomic and Molecular Spectroscopy	4	3	50	50	100	4
	MPS2114 MPS2115	Elective II 1. Advanced Microprocessor and Microcontrollers 2.Nuclear Physics II	4	3	50	50	100	4
	MPS19S1	Special Course Research Methodology	2	3	-	-	100	3
	MNM15CS	Cyber Security	2	2	100	-	Grade	-
	PGCE	Comprehensive Exam	-	2	-	-	Grade	-
	MPS21P3	Practical-III Advanced Practicals	5	6	50	50	100	4
	MPS21P4	Practical –IV Special Electronics	5	6	50	50	100	4
IV	MPS2210	Paper IX - Laser Physics	5	3	50	50	100	4
	MPS2216	Paper XII - Nuclear and Particle Physics	5	3	50	50	100	4
	MPS2217	Paper XIII – Condensed Matter Physics - II	5	3	50	50	100	4
	MPS16AC1 MPS16AC2	Advanced Learners' Course* 1.Communication systems 2.Advanced Experimental Techniques	-	3	-	-	100*	5*
	MPS21PROJ	Project	15	-	-	-	100	5

MPS2201	MATHEMATICAL PHYSICS - I	Category	L	T	P	Credit
			86	6	-	4

Preamble

The aim of this course is to provide the mathematical foundation in vectors, matrices, Complex numbers and special functions required for the description of the physical phenomena.

Prerequisite

- Basic idea on vectors, matrices , complex numbers, Partial Differential Equations , Special Functions

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Understand the basic principles of mathematical physics and its applications	K2
CLO 2	Analyse the nature of the problems in physics	K3
CLO 3	To improve their logical, mathematical and analytical skills in problem solving	K4
CLO 4	Formulate, interpret and draw inferences from mathematical solutions	K5
CLO 5	Develop expertise in mathematical techniques required in physics	K6

Mapping with Programme Outcomes

COs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO 1	S	S	S	S	M	S	M
CLO 2	S	S	S	S	S	M	S
CLO 3	S	S	S	S	S	M	M
CLO 4	S	S	S	M	S	M	M
CLO 5	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

Unit I – Vectors

17 Hrs

Gauss divergence theorem¹ & its physical interpretation - Gauss's Theorem – Stokes's theorem- Poisson's equations – curvilinear coordinates – orthogonal curvilinear coordinates – condition for orthogonality – **cylindrical coordinates**² – spherical polar coordinates. linear vector space, linear independence of vectors and dimensions, basis and expansion theorem, inner product and unitary spaces, Orthonormal sets, Schmidt's orthogonalisation method.

Unit II – Matrices

17 Hrs

Review of algebraic operations of matrices, sub matrices³, partitioning of matrices, **special types of matrices and their properties, vectors as matrices**⁴ and vector spaces, linear transformations, orthogonal and unitary transformation, eigen values, eigen vectors, Cayley Hamilton theorem, **Stochastic matrices, diagonalisation of matrices, power of a matrix, exponential of a matrix**⁵. Matrices in physics: rotation matrix, Pauli's spins matrices, Dirac matrices.

Unit III – Complex Variables

17 Hrs

Introduction, **regular functions, elementary functions and mapping**, contour integration, Cauchy's theorem, Cauchy's integral formula, Results based on contour formula, **Taylor's expansion**⁷, Laurent's expansion, Residue and contour integration, Cauchy's residue theorem, integration round the unit circle, evaluation of definite integrals - $\sin\theta$ and $\cos\theta$.

Unit IV – Partial Differential Equations

17 Hrs

Laplace equation, Poisson's equation, Heat flow equation, Wave equation, Helmholtz equation, Solution of Laplace equation in Cartesian co-ordinates, in two dimensional cylindrical co-ordinates, in two dimensional spherical polar co-ordinates, Solution of Poisson equation, **Diffusion equation or equation of heat flow. Solution of heat flow equation in one dimension**^{8,9}.

Unit V – Special Functions

18 Hrs

Series solution, **solution of Linear differential equation of first order**¹⁰, solution of second order linear differential equation with constant coefficients, power series solution- Frobenius' method, Legendre's equation, Legendre's function of I and II kind, Generating function of Legendre polynomial, Recurrence formula for $P_n(x)$, Bessel's function of I kind, recurrence function for $J_n(x)$, generating function for $J_n(x)$, Hermite differential equation, **Hermite polynomial, recurrence for Hermite polynomial**¹¹.

Text Book

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Sathya Prakash	Mathematical Physics with Classical mechanics	Sultan Chand & Sons	2014	6 th Edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Chattopadhyay P.K	Mathematical physics	New Age International- New Delhi	2004	1 st Edition.
2	Dass. H.K,	Mathematical Physics	S. Chand and Company Pvt. Ltd,	2014	7 th Edition.
3	Erwin Kreyzig	Advanced Engineering Mathematics	Wiley India Private Limited,	2011	10 th Edition.
4	Joshi A.W	Matrices and Tensors in Physics	Wiley Eastern Ltd,	2005	4 th edition
5	Pipes & Harvill	Applied Mathematics for Engineers and Physicists	McGraw Hill international Book company	2014	3 rd Edition.
6	Hans. J Weber and George. B.Arffen	Mathematical methods for Physicists	Academic Press	2011	7 th Edition.

Pedagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation, E-content link

Course Designers:

1. Mrs. S. Subanya
2. Mrs. D. Niveditha

E-Content link

1. <https://www.youtube.com/watch?v=vZGvgru4TwE>
2. <https://www.youtube.com/watch?v=CrafR-XZubw>
3. <https://www.youtube.com/watch?v=MqmYlQ9zxvw>
4. <https://study.com/academy/lesson/types-of-matrices-definition-differences.html>
5. <https://www.youtube.com/watch?v=LTb9V84hG9w>
6. <https://www.youtube.com/watch?v=NtM7qFcML>
7. <https://www.youtube.com/watch?v=3d6DsJlBzJ4>
8. https://www.youtube.com/watch?v=1X2MJH_MUgU
9. <https://www.youtube.com/watch?v=ky4J7btqfXI>
10. <https://www.youtube.com/watch?v=2G0nihWWG8Y>
11. <https://www.youtube.com/watch?v=5UEWlnZbbLQ>

MPS2202	CLASSICAL MECHANICS	Category	L	T	P	Credit
			86	6	-	4

Preamble

The aim of this course is to provide an in-depth knowledge of the principles of classical mechanics and the study of specific problems, viz. the two body central force problem and small oscillations.

Prerequisite

- Basic knowledge on differential calculus and Newtonian Mechanics
- Knowledge on rotational dynamics

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Study the applications of Newtonian mechanics in daily life	K2
CLO2	Understand the motion of bodies, including the special case in which bodies remain at rest in accordance with the Newtonian principles	K3
CLO3	Analyze the movement of macroscopic objects, like projectiles, and astronomical objects, such as spacecraft, planets, stars, and galaxies.	K4
CLO4	Develop knowledge of the behaviour of bodies under the influence of forces	K5
CLO5	Develop familiarity with the physical concepts and facilitate with the mathematical methods of classical mechanics	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO1	S	S	M	M	M	L	L
CLO2	S	M	S	M	M	L	L
CLO3	S	M	M	L	M	L	L
CLO4	S	M	M	M	M	S	L
CLO5	S	M	M	S	M	M	L

S- Strong; M-Medium; L-Low

Syllabus

Unit I: Fundamental principles of Lagrangian Formulation 16hrs

Mechanics of a particle- Mechanics of a system of particles- constraints- D'Alembert's principle and Lagrange's equations- Velocity – dependent potentials and the dissipation function- **simple application of the Lagrangian formulation**¹-Single particle in space-Atwood's machine^{2,3}-**bead sliding on a rotating wire**^{3,4}, linear harmonic oscillator- **simple pendulum**⁵.

Unit II: Variational principles and Lagrange's equations: 17 hrs

Hamilton's principle- some techniques of the calculus of variations- derivation of Lagrange's equations from Hamilton's Principle- Extension of Hamilton's principle to non holonomic systems- **Advantages of a variational principle formulation**⁶ - conservation theorems and symmetry properties- Energy function and the conservation of energy.

Unit III: Two body central force problem 17 hrs

Reduction to the equivalent one-body problem- the equations of motion and first integrals-the equivalent one- dimensional problem and classification of orbits- law potentials- conditions for closed orbits (Bertrand's theorem) - **the Kepler problem: inverse square law of force**⁷- **the motion in time in the Kepler problem**⁷- The Laplace-Runge-Lenz vector-Scattering in a central force field- **transformation of the scattering problem to laboratory coordinates**⁸.

Unit IV: Small oscillations 17 hrs

Formulation of the problem - Eigen value equation and the principle axis transformation- frequencies of free vibrations- normal coordinates- **Free vibrations of a linear tri atomic molecule**⁹ - **Forced vibration and the effect of dissipative forces**¹⁰.

Unit V: Hamilton's Formulation 18 hrs

Legendre transformations and the Hamilton canonical equations of motion –**Cyclic coordinates**^{11,12} - Routh's procedure- Hamiltonian formulation of relativistic mechanics-**Derivation of Hamilton's equations from a variational principle**¹³- The principle of least action.

Poisson Brackets-definition-**invariance of Poisson- brackets with respect to canonical transformation**¹⁴ –Equations of motion in Poisson bracket form-**Jacobi's identity**¹⁴-infinitesimal contact transformations-interpretation in terms of Poisson brackets-The angular momentum and Poisson brackets.

Text Book

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1.	Herbert Goldstein	Classical Mechanics	Narosa Publishing House	2001	2 nd Edition
2.	Gupta, Kumar & Sharma	Classical Mechanics	PragatiPrakashan	2012	26th reprint
3.	. R G Takwale & P S Puranik	Classical Mechanics	Tata McGraw Hill Education	2010	2 nd Edition

			Pvt. Ltd,		
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Reference Books

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1.	Rana&Joag	Classical Mechanics	TMH	2010	6 th edition
2.	Douglas Gregory	Classical Mechanics	Cambridge University press	2008	1 st edition

Predagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation

Course Designers:

1.Dr.B.Punithaveni

References For E-Content:

1. <https://youtu.be/3iyDyoKZnrc>
2. <https://youtu.be/VwOrZ-jDqHY>
3. <https://youtu.be/OLJrY0v0yPI>
4. <https://youtu.be/PNnT9e7aTqc>
5. https://youtu.be/vJ2pyd_Ag3k
6. https://youtu.be/tN_dNwQmLqU
7. <https://slideplayer.com/slide/6379146/>
8. <https://youtu.be/0C1cbjA0HmU>
9. <https://youtu.be/CLKhkxaMURQ>
10. <https://youtu.be/nuZo8KYiWoo>
11. <https://youtu.be/m7XD44oG1b4>
12. <https://youtu.be/mQSWuwuwPxl>

MPS2203	THERMODYNAMICS AND STATISTICAL MECHANICS	Category	L	T	P	Credit
			86	4	-	4

Preamble

To acquire a sound understanding of the basic principles of statistical mechanics and its application to realistic problems

Prerequisite

- An idea on thermodynamical variables, quantum and classical statistics

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Learn relationship between equilibrium distributions and kinetic processes leading to equilibrium	K2
CLO2	Apply classical and quantum distributions in circumstances varying from standard examples to real statistical problems	K3
CLO3	Become aware of the richness and complexity of statistical behaviour exhibited by interacting systems and various approaches (phenomenological and microscopic) developed to comprehend such systems	K4
CLO4	Examine appropriate limiting behaviours in various statistical systems and to develop statistical description of system	K5
CLO5	Construct a partition function for a system in thermal equilibrium and use it to obtain thermodynamic quantities of interest.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO1	S	S	S	S	S	M	S
CLO2	S	S	S	M	S	S	S
CLO3	S	S	S	L	S	S	L
CLO4	S	S	M	S	S	S	L
CLO5	S	S	S	S	S	L	S

S- Strong; M-Medium; L-Low

Syllabus

Unit – I: Thermodynamics

18 hrs

Thermodynamic variables¹- extensive and intensive variables- **Zerth law of thermodynamics**² - equivalence of heat and work - **first law of thermodynamics**^{3,4} - Significance of the first law of thermodynamics - thermodynamic processes - reversible process – irreversible process - state variables and process variables - **definition of entropy**⁵ - **second law of thermodynamics**^{6,7} - entropy changes in irreversible processes - Maxwell's Thermodynamical relations - thermodynamic potentials – **Enthalpy**⁸, Helmholtz and the Gibbs functions- Phase transitions – Clausius - Clapeyron equation – van der waals equation of state.

Unit- II: Classical Statistics - I

17 hrs

Macroscopic and microscopic states⁹ - phase space - Volume in phase space - postulate of equal a priori probability - density distribution in phase space - Liouville's theorem, Maxwell-Boltzmann distribution law - **micro-canonical ensemble**^{10, 11} - **canonical ensemble**^{10, 11}- calculation of mean values and fluctuations in a canonical ensemble - fluctuation dissipation relation - energy fluctuations and heat capacity - Grand-canonical ensemble - fluctuations in number of particles.

Unit – III: Classical Statistics - II

17 hrs

Classical partition functions and their properties - Calculations of thermodynamic quantities - Chemical potential - Ideal mono atomic gas - entropy of mixing - Gibbs paradox – Equipartition theorem and its simple applications.i) Mean kinetic energy of a molecule in a gas ii) **Brownian motion**¹² iii) **Harmonic Oscillator**¹³ iv) Specific heat of solid. Maxwell velocity distribution, Doppler Broadening of Spectral lines.

Unit – IV: Quantum Statistical Mechanics – I

17 hrs

Ideal Bose systems

Symmetric and antisymmetric wavefunctions – The density matrix - **Quantum harmonic oscillator**¹⁴ - Einstein's theory of heat capacity - Debye's theory of heat capacity - Bose – Einstein statistics - **black body radiation**¹⁵- photon gas - Planck's law - Bose-Einstein Condensation - lambda transition – Liquid helium – **Super fluidity**^{16,17}

Unit-V: Quantum Statistical Mechanics - II

17 hrs

Fermi-Dirac statistics¹⁸ - **Fermi distribution**¹⁸ - **Fermi energy**¹⁸ - Mean energy of Fermions at absolute zero - Fermi energy as a function of temperature - electrons in metals - Electronic specific heat - **White Dwarfs**¹⁹- Compressibility of Fermi gas - Pauli's para magnetism - A relativistic degenerate electron gas.

Text Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Gupta Kumar	Elementary Statistical Mechanics	Pragati Prakashan	2011	24 th edition
2	Kerson Huang	Introduction to Statistical Physics	Taylor & Francis	2001	Indian Edition
3	B.B. Laud	Fundamentals of Statistical Mechanics	New age International Publishers	2011	1 st edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	K. Huang	Statistical Mechanics	John Wiley & Sons	2009	2 nd edition
2	L. D. Landau and E. M. Lifshitz	Statistical Physics	Pergamon Press	2011	3 rd edition
3	R.K.Pathria & Paul D. Beale	Statistical Mechanics	Elsevier-Butterworth Heinemann	2011	3 rd edition
4	F.Reif	Statistical Physics	Tata McGraw	2008	Special Indian Edition
5	Satya Prakash	Statistical Mechanics	Kedar Nath Ram Nath Publications	2011	Special Edition

Pedagogy

Chalk and Talk, ppt, group discussion, seminar, Interaction, problem solving

Course Designers:

1. Dr.N.Priyadharsini

References For E-Content:

1. <https://youtu.be/fTQslkc7f4g>
2. <https://youtu.be/-42JmVBdlM4>
3. <https://youtu.be/1OFIW8OXN64>
4. <https://youtu.be/dHdIH3l8FkM>
5. <https://youtu.be/870y6GUKbwc>
6. <https://youtu.be/y6pGjfi8FZw>
7. <https://youtu.be/mGDJO2M7RBg>

8. https://youtu.be/x_pbr5RFhVc
9. https://youtu.be/F_NmS-Wy2IE
10. https://youtu.be/VIVGP_IskQg
11. <https://youtu.be/8ttrMYZWNXc>
12. <https://youtu.be/V7VtOa8pHno>
13. <https://youtu.be/py3EWLkQaMs>
14. https://youtu.be/yG_Ot9rsNaw
15. <https://youtu.be/Na-mFjyP8eU>
16. <https://youtu.be/2Z6UJbwxBZI>
17. <https://youtu.be/dLcwmMGcfU8>
18. <https://youtu.be/Ww9wcs3yNWI>
19. <https://youtu.be/ITD8s-bLXSk>

MPS2204	ELECTRONICS	Category	L	T	P	Credit
			86	4	-	4

Preamble

This course deals with semiconductor device characteristics, Op-Amp characteristics and their applications & digital principles

Prerequisite

- Basic idea on semiconductor devices
- Concepts of amplifiers and oscillators

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of semiconductor devices.	K2
CLO2	Design counters and to explain power devices and their application in various fields	K3
CLO3	apply the concepts of operational amplifier to solve differential and simultaneous equations.	K4
CLO4	Solve problem related to semiconductor devices and oscillator circuit Familiarize the conversion of data from Analog to Digital and Digital to Analog	K5
CLO5	Take projects in electronics relevant to industrial and R &D needs	K6

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	S	L	L	M	L
CLO2	S	S	M	S	M	M	M
CLO3	S	S	S	M	L	M	M
CLO4	S	S	S	M	L	M	M
CLO5	S	S	S	M	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Electronic Circuits and Devices I:

18 hrs

Tunnel Diode- Structure-Characteristics- **applications**¹ - IMPATT- PNP diodes characteristics & **applications**² – Gunn diode- device operation-negative differential resistance, SCR-characteristics & **applications**³, Silicon Controlled Switch(SCS) – UJT structure & characteristics - UJT Oscillator - **Applications of UJT**⁴.

Optoelectronics: Photo Resistor-Photo Diode - Photo Transistor, LEDs- Device structure and **Working principle**⁵.

Unit II: Electronic Circuits and Devices II:

17 hrs

The junction field effect transistor- **the pinch off voltage**⁶ (V_p)-the JFET volt-ampere characteristics- Biasing the FET- FET as a Voltage Variable Resistor - the FET small signal model- the common source Amplifier at low & High Frequencies - common Drain amplifier at low & High Frequencies - MOS structure and principle of operation – **current voltage characteristics**⁷. Logic gates using MOSFETs – Complementary MOSFETs.

Unit III : Operational Amplifier:

17hrs

The operational amplifier - parameters of op amps, Frequency Response of an amplifier, **the comparator**⁸, Basic Operational Amplifier applications-Differential DC amplifier- integrator and differentiator-Electronic analog Computation solving Simultaneous and Differential equations- **log and Exponential amplifiers**⁹.

Unit IV : Oscillators and Data Converters

17hrs

Wave Form Generators and Wave Shaping Circuits using Op amps – Phase Shift-Oscillator-Wien Bridge Oscillator-Crystal Oscillator- Multivibrators- Schmitt Trigger- Triangular Wave Generators – Pulse Generators - the weighted resistor D/A convertor- The R-2R ladder D/A converter – **Switches for D/A converters**¹⁰- **Inverted ladder D/A converter**¹¹- A/D converters- A counter type- successive Approximation converters. IC 555 Timer and its **Applications**¹².

Unit V : Registers and Counters

17hrs

The shift register, Serial in –Serial out, Serial in – Parallel out, **Parallel in – Serial out**¹³, Parallel in – Parallel out – Counters, methods to improve counter speed,- Mod-3 counters, Mod 5, Mod 7, Mod 9 and **decade counters**¹⁴, Ripple counter, the up-down ripple counter, the up-down synchronous counter, ring counters, **sequence generator**¹⁵.

Text Books

S.No.	Author	Title of the book	Publisher	Year of Publication	Edition
1	Jacob Millman & Arvin Grabel	Microelectronics	Tata McGraw Hill Publishing Company Ltd- New Delhi	1999	2 nd edition
2	Jacob Millman & Christos C Halkias	Integrated Electronics	Tata McGraw Hill Publishing Company Ltd- New Delhi	2005	41 st Reprint
3	Malvino Leach	Digital Principles and Applications	Tata McGraw Hill Publishing Company Ltd- New Delhi	1995	5 th Edition
4	Ramakant A.Gayakwad	Opamps and Linear Integrated Circuits	PHI Learning Pvt.Ltd, New Delhi	2000	4 th Edition.

5	Sze .S.M,	Semiconductor devices Physics and Technology	Wiley Student Edition	2012	2 nd Edition
6	V Vijayendran	Introduction to Integrated Electronics (Digital and Analog)	Viswanathan (Printers and Publishers) Pvt.Ltd,	2011 Reprint	

Reference books

S.No.	Author	Title of the book	Publisher	Year of Publication	Edition
1	Mehta V.K & Rohit Mehta	Principles of Electronics,	Tata McGraw Hill Publishing Company Limited New Delhi	2014	11 th edition
2	Gupta & Kumar,	Hand Book of Electronics,	Pragati Prakashan	2010	32 nd
3	Chatterji B.N	Digital Computer technology	Khanna Publishers Delhi	1986	2 nd Edition

Pedagogy

Chalk and Talk, Group Discussion, Demonstration, Problem solving, Seminar, Designing circuits, PPT and Assignment

Course Designers:

1. Dr.G.Vanitha
2. Mrs.T.Poongodi

References For E-Content:

1. <https://youtu.be/PuG8CCUbg58>
2. <https://youtu.be/Miu22EkyXyQ>
3. <https://youtu.be/8OgHY4-gcQw>
4. <https://youtu.be/ZOOUofPeSYY>
5. <https://youtu.be/NUR9tebFDRc>
6. <https://youtu.be/paK2Tjxuog0>
7. <https://youtu.be/-o39YVNMYYs>
8. <https://youtu.be/66Jl4YmpAMY>
9. <https://youtu.be/-qs3qJz6dTU>
10. <https://youtu.be/gSF6GVz9wV0>
11. <https://youtu.be/gcRBw--n9yw>

12. <https://youtu.be/7LmBcGiiYwk>
13. <https://youtu.be/TqHme0lvvCU>
14. https://youtu.be/fKVZpupyP_o
15. <https://youtu.be/XNAK-L7NIOM>

MPS21P1	PRACTICAL I - GENERAL PRACTICALS	Category	L	T	P	Credit
			-	-	4	4

Preamble

The aim of this course is to make the students gain a practical knowledge in the basics of Physics.

Prerequisite

- Basic experience in handling devices/instruments (UG level)

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	Understand the basics of experimental physics	K2
CLO2	Explore the concepts involved in the thermodynamics, heat and modern optics	K3
CLO3	Acquire strong laboratory skills	K4
CLO4	Enhance the skill to meet the present day requirements in industries, research fields	K5
CLO5	Create the knowledge of theories involved in physics using practical experiments	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO1	S	M	M	S	M	M	M
CLO2	S	M	S	M	M	S	S
CLO3	S	S	M	M	S	M	M
CLO4	S	M	M	M	M	M	M
CLO5	S	M	M	M	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

PRACTICAL I - GENERAL PHYSICS **(Examination at the end of Second Semester)** **Any Twelve Experiments**

1. Young's Modulus-Elliptical Fringes
2. Young's Modulus-Hyperbolic Fringes
3. Viscosity of a Liquid-Mayer's Oscillating Disc
4. Determination of
 - (i) Refractive Index of transparent solids and liquids using Laser source
 - (ii) Particle size (iii) Diffraction at a circular aperture (pin hole)
5. Study of characteristics of Laser
 - (i) Determination of Gaussian nature of laser source and evaluation of beam spot size.
 - (ii) Measurement of Laser beam divergence (iii) Absorption of light on various filters
6. Electronic Specific Charge - 'e/m' by Thomson's Method
7. Thermistor -Temperature Coefficient and Band Gap Energy
8. Magnetic Hysteresis loop tracing
9. Study of characteristics of optical fibre –
 - (i) Numerical aperture (ii) bending losses (iii) splice losses (iv) attenuation by fibre cut –Back method
10. Determination of Curie Temperature of Ferro electric solid
11. Characteristic study of Photo Transistor, photodiode and photovoltaic cell (solar cell)
12. Rydberg's constant – Solar/Hydrogen spectrum
13. Thickness of Wire by Air Wedge Diffraction
14. Determination of dipole moment of a liquid
15. Identification of prominent lines – Copper arc
16. Characteristic study of LED, LDR and Opto coupler.
17. Determination of reverse saturation current and material constant– p-n junction apparatus

Course Designers:

1. Dr. N.Priyadharsini

MPS21P2	PRACTICAL II-ELECTRONICS PRACTICALS	Category	L	T	P	Credit
			-	-	4	4

Preamble

The aim of this course is to make the students to practically learn the characteristics of different electronic circuits.

Prerequisites

- Basic experience in constructing and handling electronic circuits (UG level)

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	Understand the basic concepts in IC's, digital devices and C programming.	K2
CLO2	Apply circuit systems to construct electronic devices	K3
CLO3	Evaluate the functioning of circuits	K4
CLO4	Enhance the skill to meet the present day requirements in industries, research fields.,	K5
CLO5	Become proficient to be directly employed or start his/her own work as Electronic circuit Designer	K6

Mapping with Programme Outcomes

CLO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO1	S	M	M	S	M	M	M
CLO2	S	M	S	M	S	M	S
CLO3	S	S	M	M	M	M	S
CLO4	S	M	M	M	M	M	M
CLO5	S	M	M	M	M	M	S

S- Strong; M-Medium; L-Low

Syllabus

PRACTICAL II-ELECTRONICS PRACTICALS
(Examination at the end of second Semester)
Any Twelve Experiments

1. Design of Regulated and Dual Power Supply and Construction using fixed voltage regulator and 723.
2. Characteristics of UJT
3. UJT Relaxation Oscillator
4. FET –common source amplifier
5. FET –common drain amplifier
6. Op-Amp parameters
7. Wave Form Generators- using Op-Amp and Timer 555.
8. (i) Phase-Shift Oscillator (ii) Wien’s Bridge Oscillator using Op-Amp
9. Op-Amp – log and antilog amplifier
10. Sign Changer, Scale Changer, Summer and Subtractor- Op-Amp
11. Analog Computer Setup-Solving Simultaneous Equations
12. Schmitt Trigger using discrete components and OP-AMP/ Timer 555

By Simulation and using ICs

13. Flip-Flops (RS, JK , D)
14. Counters- Digital ICs
15. Shift register- Digital ICs
16. (i) Write a C program to calculate the De Broglie’s wave length $\left(\lambda = \frac{h}{p} \right)$
(ii) Write a C program to prove Heisenberg’s Uncertainty Principle
17. Write a C program to find the solution for the ground state of hydrogen atom
18. Write a C program to integrate a given function using Simpsons Rule.
19. Write a C program to study the Motion of a particle under the force $f(x) = -x$
20. Write a C program to calculate the bond length of NaCl

Course Designers:

Dr.G.Praveena

MPS2205	MATHEMATICAL PHYSICS-II	Category	L	T	P	Credits
			71	4	-	4

Preamble

This course aims at the introduction of advanced mathematical tools such as transforms, probability distribution and group theory.

Prerequisite

- Basic Idea on Series and transforms, probability

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic theories and formulas in solving the physical problems.	K2
CO2	Applications include boundary value problems in electrodynamics and diffusion, eigen value problems in quantum mechanics, and Green's function methods for scattering.	K3
CO3	Analyse the nature of the problem	K4
CO4	Capable of evaluating problem at higher order levels using advanced mathematical tools	K5
CO5	Enhances the mathematical implementation in physics.	K6

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Syllabus

Unit I – Fourier Series And Transform

14 Hrs

Evaluation of the coefficients of Fourier series^{1,2}, Dirichlet's theorem, Dirichlet's condition, Half range series, change of interval, Fourier series in the interval (0 to T) and uses of Fourier series. Applications Half and full wave rectifier. **Properties of Fourier series**³, Gibb's phenomenon, Parseval's identity of Fourier series, Fourier sine and cosine transforms of derivatives.

Unit II – Laplace Transform

14 Hrs

Properties of Laplace transforms^{4,5}, Laplace transform of the derivative of a function, Laplace transform of integral, Laplace transform of periodic functions, Inverse Laplace transform, properties, Faltung theorem, Evaluation of inverse Laplace transform by convolution theorem, applications of Laplace transform.

Unit III – Dirac Delta Function and Green's Function

14 Hrs

Dirac delta function, properties, Fourier transform of delta function, Laplace transform of delta function, derivative of delta function, completeness condition in terms of Dirac delta function, three dimensional Dirac delta function.

Green's function for one dimensional case, general proof of symmetry property of Green's function, Eigen function, Green's function for Poisson's equation and solution of Poisson's equation.

Unit IV – Probability

14 Hrs

Mathematical definition of priori probability⁶, **sample space**⁷, **mutually exclusive events**⁸, **theorem of total probability**⁸, compound events and theorems of compound probability, binomial and multinomial theorem of probability, Laplace-de-Moivre limit theorem, Measures of central tendency, measures of dispersion, Karl Pearson's coefficient of correlation, standard deviation. Theoretical distribution- Binomial, Poisson and Normal distribution.

Unit V – Group Theory

15 Hrs

Concept of a group, abelian group, generation of finite group, cyclic group, group multiplication table^{9,10}, rearrangement theorem, subgroups, cosets, conjugate elements and classes, product of classes, complexes, Isomorphism, homomorphism, permutation groups, Cayley's theorem, representation of groups square and triangle only, reducible and irreducible representations, orthogonality theorem

Books for Study:

1. Sathya Prakash, Mathematical Physics with Classical mechanics, Sultan Chand & Sons, 6th Edition
2. BSRajput, Mathematical physics, Pragati Prakashan, 21st Edition

Reference Books:

- CO1. Dass.H.K, Mathematical Physics, S.Chand and Company Pvt.Ltd, 6th Edition
- CO2. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley India Private Limited, 8th Edition
3. Eugene Butkov, Mathematical Physics, Addison Wesley London 1973, 1st Edition
4. Gupta Mathematical Physics, Vikas Publishing House Pvt.Ltd, 2006, 3rd Edition
1. Joshi A. W, Elements of Group Theory for Physicists, John Wiley & Sons (Asia) Pvt.Ltd 3rd Edition
 2. Weber and George. B.Arken, Mathematical methods for Physicists, Hans. J., Academic Press, 6th Edition

E-content

12. <https://www.youtube.com/watch?v=52r-fBTWcww>
13. <https://www.youtube.com/watch?v=x04dnqg-iPw>
14. <https://www.youtube.com/watch?v=FQdhWQ9Z6mk>
15. <https://www.youtube.com/watch?v=zModDQ-ST30>
16. <https://www.youtube.com/watch?v=M-dy4MJAnN0>
17. <https://www.youtube.com/watch?v=CDwDliZsFS4>
18. <https://www.youtube.com/watch?v=leVm6xuKdlU>
19. https://www.youtube.com/watch?v=sMh8tsW_b_I
20. <https://youtu.be/S2Bsw0aix6g>
21. <https://www.youtube.com/watch?v=yF5t2BwMiwU>

Pedagogy

Chalkandtalk,PPT,Seminar,Groupdiscussion, e-contents

CourseDesigners:

- a. Mrs.S.Subanya
- b. Mrs.D.Niveditha

MPS2206	QUANTUMMECHANICS-I	Category	L	T	P	Credits
			71	4	-	4

Preamble

The aim of this course is to build a strong base on the basic facts of quantum mechanics and to make students understand the methods that are required for the accurate description of various microscopic systems.

Prerequisite

- CO1. Fundamental knowledge on classical mechanics
- CO2. Basic idea on operators and wave equations

Course Outcomes

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

CO Number	CLO Statement	Knowledge Level
CO1	Understand the central concepts and basic formalisms of quantum mechanics; and the set of mathematical tools needed to formulate problems in quantum mechanics.	K2
CO2	Solve problems in one, two and three dimensions, such as barrier potentials, harmonic oscillator, rigid molecule, hydrogen atom etc., and on systems of identical particles, e.g. determine the symmetry properties of the wave function, and the total spin.	K3
CO3	Establishing the relations and validating various results. Inspecting on the quantum effects on various spectra. Comparing the properties of various quantities, methods and so on. Give concise physical interpretations, and arguments for the validity of the methods.	K4
CO4	Integrate several components of the course like quantum states, symmetries, angular momentum etc in the context of finding solution to the problems in atomic and molecular physics	K5
CO5	Present the tools, methodologies, language and conventions of quantum mechanics from this course to prove and test ideas and explanations on various problems involving many body systems.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	L	L	L
CO2	S	S	S	S	S	M	M
CO3	S	S	S	S	S	M	M
CO4	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

Unit I

14

hrs

General formalism of quantum mechanics: Linear Vector Space¹-Linear Operator-Eigen Functions and Eigen Values²-Hermitian Operator-Postulates of Quantum Mechanics-Simultaneous Measurability of Observables-General Uncertainty Relation-Dirac's Notation- Equations of Motion; Schrodinger³, Heisenberg and Dirac representation-momentum representation.

Unit II

14 hrs

Energy Eigen value problems Particle in a box-Linear Harmonic oscillator⁴- Tunnelling through a barrier-particle moving in a spherically symmetric potential- System of two interacting particles-Rigid rotator⁵- Hydrogen atom⁶

Unit III

15 hrs

Angular Momentum Orbital Angular Momentum-Spin Angular Momentum-Total Angular Momentum Operators⁷-Commutation Relations of Total Angular Momentum with Components⁸-Ladder operators-Commutation Relation of J_z with J_+ and J_- - Eigen values of J^2 , J_z - Matrix representation of J^2, J_z, J_+ and J_- - Addition of angular momenta-Clebsch Gordon Coefficients - Properties.

Unit IV

14 hrs

Approximate Methods: Time Independent Perturbation Theory in Non-Degenerate Case-Ground State of Helium Atom-Degenerate Case-First order perturbation theory for Degenerate level⁹-Stark Effect in Hydrogen¹⁰ - Spin-orbit interaction¹¹-Variation Method & its Application to Hydrogen Molecule-WKB Approximation.

Unit V

14 hrs

Many Electron Atoms Indistinguishable particles - Pauli principle- Inclusion of spin - spin functions for two-electrons- The Helium Atom¹³ - Central Field Approximation - Thomas-Fermi model of the Atom¹⁴- Hartree Equation-Hartree-Fock equation.

Books for Study & Reference:

20. P.M. Mathews & K. Venkatesan, A Text Book of Quantum Mechanics, Tata McGraw Hill 2010.
21. G. Aruldhas, Quantum Mechanics, Prentice Hall of India 2006.
22. David J. Griffiths, Introduction to Quantum Mechanics, Pearson Prentice Hall 2005.
23. L. I. Schiff, Quantum Mechanics, McGraw Hill 1968.
24. A. Devanathan, Quantum Mechanics, Narosa Publishing, New Delhi.
25. R. Shankar, Principles of Quantum Mechanics, Springer 2005.

Reference for E-content

1. <https://www.youtube.com/watch?v=y3ARLfm-52w>
2. <https://www.youtube.com/watch?v=cUUFik0ISuY>
3. <https://www.youtube.com/watch?v=IMFgfqRZYoc>
4. https://www.youtube.com/watch?v=4FjX_TTzHYw
5. <https://www.youtube.com/watch?v=iNqnrJ5JjZg>
6. <https://www.youtube.com/watch?v=ACY-Wbudg0o>
7. <https://www.youtube.com/watch?v=xoCHe0mtxu0>
8. <https://www.youtube.com/watch?v=0ROXdIoJZZQ>

9. <https://www.youtube.com/watch?v=GWCXKzDY-Y0>
10. <https://www.coursera.org/lecture/approximation-methods/stark-effect-Khbgm>
11. https://www.youtube.com/watch?v=UI_xLwq_W2U
12. <https://www.youtube.com/watch?v=DpNZ70Uam0M>
13. <https://www.youtube.com/watch?v=Mc7i0OeFr1Q>

Pedagogy

ChalkandTalklectures,GroupDiscussion,Seminar,Interaction,PowerPointPresentation

Course Designers

1. Dr.G.Praveena

MPS2207	ELECTROMAGNETICTHEORY	Category	L	T	P	Credits
			71	5	-	4

Objective

Students will develop a physical understanding of electromagnetic fields and waves to unify their understanding of electricity and magnetism

Prerequisite

Undergraduate-level course in electricity and magnetism
Mathematical methods

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize the fundamentals of Electrostatics and Magnetostatics	K2
CO2	Analyse the concept of Electrodynamical fields	K3
CO3	Apply the concept of electromagnetic theory in electromagnetic waves	K4
CO4	Understand the transverse behaviour of electromagnetic waves in different geometries of wave guides	K5
CO5	Formulate electromagnetic wave equations for different propagating media and to determine the flow of energy and wave velocity	K6

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Syllabus

Unit I: Electrostatics and Magnetostatics

14 Hrs

Coulomb's Law¹, Gauss's Law and applications², potential function, field due to a continuous distribution of charge, equi-potential surfaces, Poisson's equation³, Laplace's equation⁴, method of electrical images- spherical conductor when earthed, insulated conducting sphere near a point charge capacitance, electrostatic energy, boundary value problems with dielectrics, the electro-static uniqueness theorem for field of a

charge distribution

Unit II: Magnetostatics

14 Hrs

Lorentz force, electric current-**Ampere's law and applications**⁵-Long straight wire, Circular coil, Solenoid, Ampere's law for a current element -Ampere's law in differential vector form - **Biot-Savart law**⁶, Magnetic scalar potential- Importance - Applications - magnetic dipole, Circular coil and Vector potential - Importance - Applications- Magnetic dipole, Long current carrying wire, equation of continuity-magnetization

Unit III: Applied Electromagnetic Waves

14 Hrs

Equation of continuity for time varying fields - inconsistency of ampere's law - **Maxwell's equations - derivations**⁷ - electromagnetic waves in free space - uniform plane wave propagation and its characteristics - wave equations for conducting medium - **Maxwell's equation in phasor form**⁸ - wave propagation in lossless, conducting and dielectric media - depth of penetration

Unit IV: Electromagnetic Waves in Bounded Media & Power Flow

14 Hrs

Poynting's theorem - statement and proof⁹ - Interpretation of Poynting's vector - Power flow for a plane wave - power flow in a concentric cable and conductor having resistance - Instantaneous, average and complex Poynting vector - power loss in a plane conductor and a resonator - Boundary conditions - proof - reflection of plane waves by a perfect conductor for normal and oblique incidence - reflection of plane waves by a perfect dielectric for normal and oblique incidence - **Brewster's angle**¹⁰.

Unit V: Guided Waves and Wave Guides

15 Hrs

Waves between parallel planes - Transverse electric waves - Transverse magnetic waves characteristics of TE and TM waves - Transverse electromagnetic waves - Attenuation in parallel plane guides - **attenuation for TE waves, TM waves and TEM waves**¹¹ - Rectangular guides - Transverse magnetic waves and Transverse electric waves in rectangular guides - Field configurations for dominant TM and TE modes - **Impossibility of TEM wave in wave guides**¹² - Transmission line analogy for waveguides - Q factor of wave guides.

Text Books

1. Chopra Agarwal, Electromagnetic Theory, K.Nath and Co., 5th edition.
2. Edward C, Jordan & Keith G., Balmain, Electromagnetic Waves and Radiating Systems, Prentice Hall of India, New Delhi, 1997, 2nd Edition.
3. Gupta, Kumar, Singh, Electrodynamics, Pragati Prakashan, Meerut, 20th edition.

Reference Books

- CO1. D.Griffiths, Introduction to Electrodynamics, Prentice Hall of India, New Delhi, 1999, 3rd Edition.
- CO2. J.D.Jackson, Classical electrodynamics, Wiley-Eastern Ltd-New Delhi, 1999, 3rd Edition.

E-content

- <https://www.physicsclassroom.com/class/estatics/Lesson-3/Coulomb-s-Law>
- <https://collegedunia.com/exams/applications-of-gauss-law-physics-articleid-10>
- <https://www.youtube.com/watch?v=1VRIw36CAWs>
- <https://www.youtube.com/watch?v=XtHif0xNhjE>
- <https://www.youtube.com/watch?v=UUfZR33Fb1Y>
- <http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/Biosav.html>
- <http://hyperphysics.phy-astr.gsu.edu/hbase/electric/maxeq.html>
- [https://eng.libretexts.org/Bookshelves/Electrical_Engineering/Electro-Optics/Book%3A_Electromagnetics_I_\(Ellingson\)/09%3A_Plane_Waves_in_Loseless_Media/9.01%3A_Maxwell%E2%80%99s_Equations_in_Differential_Phase_Form](https://eng.libretexts.org/Bookshelves/Electrical_Engineering/Electro-Optics/Book%3A_Electromagnetics_I_(Ellingson)/09%3A_Plane_Waves_in_Loseless_Media/9.01%3A_Maxwell%E2%80%99s_Equations_in_Differential_Phase_Form)
- <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://marwaricollege.ac.in/study-material/525532270Poynting%20vector%20and%20poynting%20theorem.pdf>
- <https://vlab.amrita.edu/index.php?brch=189&cnt=1&sim=333&sub=1>
- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://hsic.sjtu.edu.cn/Assets/userfiles/sys_eb538c1c-65ff-4e82-8e6a-a1ef01127fed/files/Lec6%20Transmission%20Lines%20and%20waveguides%EF%BC%88I%EF%BC%89.pdf
- <https://www.youtube.com/watch?v=G8u2WEBF7MY>

Pedagogy

Chalk and Talk, ppt, Video lecture, group discussion, seminar, Interaction, problem solving

Course Designers

1. Dr.N.Priyadharsini

MPS2208	PROGRAMMING IN C	Category	L	T	P	Credits
			56	4		3

Preamble

The objective of introducing this paper is to give the students a working knowledge of the most popular and widely used programming languages of modern days, namely 'C' language.

Prerequisite

- Basic understanding of computer programming terminologies
- Logic building skills

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	It provides a comprehensive introduction to the C programming language, emphasizing portability and structured design	K2
CO2	Emphasis is given to the processing of command line arguments and environment variables so students will be able to write flexible user friendly programs	K3
CO3	It will give a solid platform to understand and get ready for advanced levels of C programming	K4
CO4	prepare for small/medium scale problems	K5
CO5	Comprehensive hands on exercises are integrated throughout to reinforce learning and develop real competency	K6

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Syllabus

Unit I

11Hrs

An overview of C - **Brief History of C** - **Structured Language**¹ - **Structured Language**² - **C Programming Language** - The form of C program - Compiling a C program - **Datatypes - Identifiers - Variables**³ - Scope of variables - Variable Initialization - Constants.

Unit II

11Hrs

Operators – Assignment – Arithmetic - Increment/Decrement³ – Relational - logical- Bitwise- Ternary- Address and pointer operator- Size Of – Comma – Dot - Arrow operator - The [] and () **operators – Expressions**⁴.

Unit III

11Hrs

Selection statements - Iteration Statements - **Jump Statements**⁵ - Expression Statements - Block Statements - **Functions - General form of Functions - Function Arguments**⁶ – call by value, reference- Return Statement – Recursion- Declaring variable length parameter list.

Unit IV

12Hrs

Arrays - Single dimension - Generating a pointer to an array - Passing Single dimension arrays to functions – Strings - Two dimensional arrays - Arrays of strings - Multidimensional Arrays - Array Initialization - Variable length arrays - Structures - **Array of Structures with simple example**⁷ - Passing structures to functions - **Arrays and structures within structures**⁸.

Unit V

11Hrs

Pointers - Pointer Expressions - Pointers and arrays - **Initializing pointers**⁹ - **Pointers to Functions**¹⁰ - Files - File system basics - fseek() and random access I/O - **fscanf() and printf()**¹¹.

Text Book

1. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2007, 3rd Edition

Reference Books

1. Herbert Schildt, C Complete Reference, Tata McGraw-Hill, 2001, 4th Edition,

Pedagogy:

Chalk and talk, PPT, Seminar, Group discussion, Interaction.

Reference for E-content

1. <https://www.youtube.com/watch?v=gEJBFKDkqTE>
2. <https://www.youtube.com/watch?v=HucJhUkDJuk>
3. <https://www.youtube.com/watch?v=bS6uNMmIoQ0>
4. https://www.youtube.com/watch?v=t_u516mLEbk
5. <https://www.youtube.com/watch?v=Bv1LcqhqnZs>
6. <https://www.youtube.com/watch?v=f--fD8Y0RnA>
7. <https://www.youtube.com/watch?v=OuOlrC1WYPo>
8. <https://www.youtube.com/watch?v=46-J15Jb37I>

9. <https://www.youtube.com/watch?v=b3G9RjG4I2s>
10. <https://www.youtube.com/watch?v=gaszuaFXRTA>
11. <https://www.youtube.com/watch?v=3irECJphMwU>

CourseDesigners:

1. Dr.M.Lavanya

MPS2211	CONDENSED MATTER PHYSICS I	Category	L	T	P	Credit
			58	2	-	5

Preamble

The objective of introducing this paper is to provide an in-depth knowledge of crystal structure, properties of crystals, superconductivity and different dielectric related properties.

Prerequisite

0. Quantum Mechanics
1. An undergraduate level course in solid state physics

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamentals of crystal structure, vibrational and electrical properties	K2
CLO2	Apply reciprocal lattice to the crystal structure and explain how it gives rise to band structure and Brillouin zone. Apply quantum mechanics for theoretical and numerical calculations	K3
CLO3	Analyse the microscopic structure of the material and how it is mirrored in macroscopic aspect	K4
CLO4	Evaluate the structure of materials by crystal structure and band theory	K5
CLO5	Create an ability to identify relevant principles, mathematical techniques and laws when dealing with problems in condensed matter physics	K6

Mapping with Programme Outcomes

COs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	S	M	S	L	M
CLO2	S	S	S	M	M	M	M
CLO3	S	L	S	M	S	L	M
CLO4	S	S	S	M	M	L	M
CLO5	S	M	S	M	S	L	M

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Crystal structures

11 hrs

Introduction- lattice points and space lattice-basis and crystal structure – **unit cells and lattice parameters - unit cells versus primitive cell- crystal systems – crystal symmetry**¹ – the twenty three symmetry elements in cubic crystal-to show that five-fold rotation axis is not compatible with a lattice – combination of symmetry elements- Rotation-Inversion axis – translation symmetry elements – Space groups – **Bravais space lattice**^{1,2}- **Directions, planes and miller indices**³-important planes and directions in a cubic crystal-**allotropy and polymorphism**⁴.

Unit II: X-ray crystallography and defects in solids

11 hrs

Reciprocal Lattice- Graphical demonstration of the Reciprocal Lattice-Vector algebraic discussion of Reciprocal Lattice-Spacing of planes of crystal lattice-**relation between crystal lattice axes and crystal Reciprocal Lattice axes**⁵-Brillouin zones-Brillouin zone for simple cubic lattice,bcc lattice, fcc lattice- Reciprocal Lattice to bcc lattice- Reciprocal Lattice to fcc lattice-X-ray diffraction-Bragg's law-**Crystal imperfections - Point defects-Vacancies-Interstitialcies**⁶-**Schottky defects and Frenkel defects**⁷-Line imperfections-Edge dislocation-**Screw dislocation**^{8,9}-Burgers Vector .

Unit III :Lattice vibrations and thermal properties

12 hrs

The concept of the lattice mode of vibration¹⁰-**Elastic vibrations of continuous media- Phase velocity-group velocity**¹¹-Vibrations of one dimensional monatomic linear lattice- Vibrations of one dimensional diatomic linear lattice-The concept of phonons-Momentum of phonons-Inelastic scattering of photons by phonons- Inelastic scattering of X-rays by phonons- Inelastic scattering of neutrons by phonons-**Specific heat-Einstein's theory of Specific heat-Debye's theory-Debye's approximation**-Thermal conductivity.

Unit IV: Free Electron Fermi Gas

11 hrs

Classical free electron theory of metals- Drawbacks of classical theory¹² – **Quantum theory of free electrons**¹³-**Free particle- tunnel effect**¹⁴- Particle in a box (one dimensional)- three dimension box - density of states-Hall effect- Fermi – Dirac distribution function- heat capacity of electron gas- effect of temperature on Fermi Dirac function- electrical conductivity from quantum mechanical consideration.

Unit V: Band Theory

11 hrs

Failure of Sommerfeld's free electron theory-Band theory of solids¹⁵-Kronig - Penney model-construction of one, two and three dimensional Brillouin zones - Extended, Reduced and Periodic zone schemes – Number of possible wave function in a band-motion of electron in one dimensional periodic potential- Effective mass of an electron - **Distinction between metals, semiconductors, and insulators using band theory**¹⁶.

Text Book

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Pillai.S.O	Solid State Physics	NewAge Publishers	2015	7 th Edition
2	Saxena, Gupta	Solid State Physics	Pragati Prakashan	2008	12 th Edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Charles Kittel	Introduction to solid state physics	Wiley India Pvt Ltd	2010	7 th Edition
2	Wahab	Solid State Physics	Narosa Publishing House	2011	2 nd Edition

Pedagogy

Chalk and Talk, PPT, Seminar, Group Discussion, Interaction and E-content

Course Designer

1. Dr.P.Meena

Reference for E-content

<https://nptel.ac.in/courses/113106032/4%20-%20Crystal%20structure.pdf>
<https://www.youtube.com/watch?v=NYVSI83KiKU>
https://www.youtube.com/watch?v=LcoUFX3_A1s
<https://www.differencebetween.com/difference-between-polymorphism-and-allotropy/>
<https://www.youtube.com/watch?v=ZIK4Nvxdfu8>
<https://www.youtube.com/watch?v=-0OogxCtjN0>
<https://archive.nptel.ac.in/courses/113/104/113104081/>
https://onlinecourses.nptel.ac.in/noc18_mm11/preview
<file:///C:/Users/lenovo/Downloads/9781461492863-c1.pdf>
<https://www.youtube.com/watch?v=kygXzJa7tX4>
[https://phys.libretexts.org/Bookshelves/Electricity and Magnetism/Book%3A Electromagnetics II \(Ellingson\)/06%3A Waveguides/6.01%3A Phase and Group Velocity](https://phys.libretexts.org/Bookshelves/Electricity_and_Magnetism/Book%3A_Electromagnetics_II_(Ellingson)/06%3A_Waveguides/6.01%3A_Phase_and_Group_Velocity)
<https://slideplayer.com/slide/9087707/-free>
<https://www.youtube.com/watch?v=L-eOdZFt9BY>
<https://www.youtube.com/watch?v=gNdIQVJhFoM>
CO1. <https://www.youtube.com/watch?v=ots5zxbrlUk>

MPS2212	QUANTUM MECHANICS-II	Category	L	T	P	Credit
			58	2	-	5

Preamble

The aim of this course is to build a strong base on the advanced concepts in quantum mechanics and to make students understand the methods that are required for the accurate description of various microscopic systems.

Prerequisite

4. Basics of time dependent and Independent Perturbation theories
5. Ideas on quantum field theory and relativistic wave equation

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of perturbation theory and approximation methods; and the set of mathematical tools needed to formulate problems in quantum mechanics.	K2
CLO2	Solve problems in and on systems of identical particles, e.g. determine the symmetry properties of the wave function, and the total spin.	K3
CLO3	Establishing the relations and validating various results. Comparing the properties of various quantities, methods and so on. Give concise physical interpretations, and arguments for the validity of the methods.	K4
CLO4	Integrate several components of the course like quantum states, symmetries in the context of finding solution to the problems in molecular and elementary particle physics	K5
CLO5	Present the methodologies, language and conventions of quantum mechanics from this course to prove and test ideas and explanations on various problems involving various systems of particles	K6

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	L	L	L	L	L
CLO2	S	S	S	S	S	M	M
CLO3	S	S	S	S	S	M	M
CLO4	S	S	S	S	S	S	M
CLO5	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

Unit I: Time Dependent Perturbation Theory

11 hrs Time

Dependent Perturbation Theory- Introduction-First Order perturbation- Harmonic perturbation-Transitions to continuum states- Fermi's Golden rule-Transition Probability-**Selection Rules for Dipole Radiation**^{1,2,3}-Adiabatic Approximation-**Sudden approximation**⁴.

Unit II: Scattering Theory

11 hrs

Scattering cross section - Scattering amplitude -**Laboratory and centre of mass coordinate systems**⁵ – Partial waves - Phase Shifts - Scattering by Coulomb and **Yukawa potential**⁶– Born approximation -Validity of Born approximation.

Unit III: Theory of Radiation (Semi Classical Treatment)

11hrs

Laser Theory - Einstein's Coefficients - Spontaneous and Induced Emission of Radiation from Semi Classical Theory^{7,8}-Radiation Field as an Assembly of Oscillators-Interaction with Atoms- Emission and Absorption Rates-Density Matrix and its Applications.

Unit IV: Elements of field quantization

11 hrs

Quantization of the Wave Fields –**Quantization of Lagrangian**⁹and Hamiltonian equation-Quantization of the Non-relativistic Schrodinger equation-**Number operators- Creation and Destruction–Anti Commutation Relations**¹⁰-Quantization of the electromagnetic field (Energy and Momentum).

Unit V: Relativistic Quantum Mechanics

12 hrs

Klein Gordon Equation- Interpretation of the Klein Gordon Equation-Charge and Current Density-**Application to the Study of Hydrogen like atom**¹¹-**Dirac's relativistic equation for a free particle**¹²- Dirac matrices-Dirac's equation in Electromagnetic Field-Negative energy states.

Text Books:

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	G. Aruldas	Quantum Mechanics	PHI	2011	2 nd edition
2	David J. Griffiths	Introduction to Quantum Mechanics	Pearson Prentice Hall	2007	2 nd edition
3	Mathews and Venkatesan	A textbook of Quantum Mechanics	TMH	2012	2 nd edition
4	SathyaPrakash & Swati Saluja	Quantum Mechanics	Kedarnath Ramnath Publishers	2011	2 nd edition

Reference books:

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	A.K. Ghatak and S. Loganathan	Quantum Mechanics	McMillan	2011	4 th edition
2	Gupta, Kumar, Sharma	Quantum Mechanics	Jai Prakash Nath & Co	2010	29 th edition
3	Schiff	Quantum Mechanics	TMH	2010	2 nd edition

Pedagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, Power Point Presentation

Course Designers:

1. Dr. G. Praveena
2. Mrs. T. Poongodi

Reference for E-content:

- https://quantummechanics.ucsd.edu/ph130a/130_notes/node422.html
- http://web.phys.ntnu.no/~stovneng/TFY4215_2019/lecturenotes/lecturenotes16.pdf
- <https://farside.ph.utexas.edu/teaching/qm/Quantum/node86.html>
- [http://electron6.phys.utk.edu/PhysicsProblems/QM/6-Time dependent%20approximations/sudden.html](http://electron6.phys.utk.edu/PhysicsProblems/QM/6-Time%20dependent%20approximations/sudden.html)
- <https://youtu.be/ywPp6DaX47Y>
- https://youtu.be/7KVHMxo_4
- <https://www.youtube.com/watch?v=049abZcKErY&t=2193s>
- <https://www.youtube.com/watch?v=5Kia0HHmkHY>
- <https://www.physics.purdue.edu/~clarkt/Courses/Physics662/ps/qftch21.pdf>
- <https://www.chm.uri.edu/dfreeman/chm532/aa.pdf>
- <https://youtu.be/zVnJ4NAfJzE>
- <https://youtu.be/2d2wP6MSiqM>

MPS2213	ATOMIC AND MOLECULAR SPECTROSCOPY	Category	L	T	P	Credit
			58	2	-	5

Preamble

To develop the relevant knowledge of analytical tools to elucidate the various kinds of molecular structure and understand the instrumental aspects of specific spectroscopic techniques

Prerequisite

2. Basic principles on spectroscopy, Quantum and classical mechanics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Attain basic knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy	K2
CLO2	Identify the specific and suitable molecular spectroscopy methods for solving given scientific problem	K3
CLO3	Apply formalisms based on molecular symmetry to predict spectroscopic properties	K4
CLO4	Examine and analyze spectroscopic data collected by various analytical methods discussed in the course.	K5
CLO5	Solve problems related to the structure, purity and concentration of chemicals and to study molecular interactions by choosing suitable spectroscopic methods and interpreting corresponding data.	K6

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	S	S	S	M	S	M
CLO2	S	S	S	S	S	M	M
CLO3	S	S	S	M	S	S	M
CLO4	S	S	S	M	S	S	M
CLO5	S	S	M	S	S	S	S

S- Strong; M-Medium; L-Low

Unit I: Atomic & Microwave Spectroscopy

11hrs

Quantum states of an electron in an atom

Interaction of light with matter - Spectra of Alkali Metal Vapours- *Normal Zeeman Effect- Anomalous Zeeman Effect*-Magnetic Moment of Atom and the G Factor - Lande's 'g' Formula - Paschen Back Effect-Hyperfine Structure of Spectral Lines.

Microwave Spectroscopy: The Rotation of molecules- Rotational spectra- Diatomic molecules- poly atomic molecules-**Techniques and Instrumentation- Chemical analysis by Microwave Spectroscopy**¹.

Unit II: Infrared & Raman Spectroscopy

11hrs

Infra-red spectroscopy:

The Vibrating Diatomic molecule- the diatomic vibrating rotator- the vibration-rotation spectrum of Carbon Monoxide- breakdown of the Born-Oppenheimer Approximation: the interaction of rotation and vibrations-**The vibrations of Polyatomic molecule**^{2,3,4}- Techniques and Instrumentation.

Raman Spectroscopy:

* Introduction- Pure rotational Raman Spectra*- Vibrational Raman Spectra- Polarization of Light and the Raman Effect- **Structure Determination from Raman and Infra-red spectroscopy- techniques and Instrumentation**^{2,3,4}.

Unit III: Electronic Spectra: Fluorescence & Phosphorescence Spectroscopy

12hrs

Electronic Excitation of Diatomic Species-Vibrational Analysis of Band Systems of Diatomic Molecules- Deslandres Table-Intensity Distribution- Franck Condon Principle-Rotational Structure of Electronic Bands-Resonance and Normal Fluorescence-Intensities of Transitions-Phosphorescence Population of Triplet State and Intensity-**Experimental Methods-Applications of Fluorescence and Phosphorescence**^{5,6,7}.

Unit IV: NMR & NQR Spectroscopy

11hrs

NMR Spectroscopy: Quantum Mechanical and Classical Description-Bloch Equation-Relaxation Processes-Experimental Technique-Principle and Working of High Resolution NMR Spectrometer-**Chemical Shift- NMR Imaging- Interpretation of certain NMR spectra (Ethanol, 1 – Nitropropane, methyl ethyl ketone)**⁸.

NQR Spectroscopy: Fundamental Requirements-basic Principle - Half integral spins- Experimental Detection of NQR Frequencies-Determination of molecular structure.

Unit V: ESR & Mossbauer Spectroscopy

11hrs

ESR Spectroscopy: Basic Principles Theory of ESR-Resonance conditions--**Experiments-ESR Spectrometer-Applications**^{9,10}- ESR Spectrum-Crystalline solids and free radicals in liquids- Hyperfine Structure

Mossbauer Spectroscopy: Mossbauer Effect-Recoilless Emission and Absorption-

Mossbauer Spectrum-Experimental Methods¹¹- Hyperfine Interaction-Chemical Isomer Shift-Magnetic Hyperfine and Electric Quadrupole Interaction

Text Book

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Straughen & S. Walker	Spectroscopy: Volumes I, II and III	Springer Publishers	1976	First Edition
2	Aruldas	Molecular Structure and Spectroscopy	Prentice Hall Private Ltd	2007	2 nd Edition
3	Banwell	Fundamental of molecular spectroscopy	Tata Mc Graw Hill Publishing Company	2015	4 th Edition
4	B.K. Sharma	Spectroscopy	Krishna's Educational Publishers	2014	23 rd Edition
5	Y.R. Sharma	Elements of Organic Spectroscopy	S. Chand Publishers	2014	Revised Edition

Reference Books

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Barrow	Introduction to molecular spectroscopy	Tata McGraw-Hill Publishers	1962	International student Edition
2	R. Wilfred Sugumar	Molecular and Atomic Spectroscopy	MJP Publishers	2008	First Edition

Course Designers:

1. Dr. N.Priyadharsini
2. Dr.G.Vanitha

Reference for E-content:

26. <https://www.youtube.com/watch?v=ullasT35FyY>
27. https://www.youtube.com/watch?v=xi_KmMCd66U&list=PL9AUXQTZw3Su3ipjaPbC7iDVgzJ44n8XW&index=4
28. <https://www.youtube.com/watch?v=qo1RMoaqs2A&list=PL9AUXQTZw3Su3ipjaPbC7iDVgzJ44n8XW&index=5>
29. <https://www.youtube.com/watch?v=XPBUhnwCEUc&list=PL9AUXQTZw3Su3ipjaPbC7iDVgzJ44n8XW&index=6>
30. <https://www.youtube.com/watch?v=SbRsfUJ0jw4>
31. <https://www.youtube.com/watch?v=L7ACivhHQeo>
32. <https://www.youtube.com/watch?v=9sUrrffI7Xs>
33. <https://drive.google.com/file/d/0B2518YmfGRksRmN3UzVSdWZzWU0/view?usp=sharing&resourcekey=0-auAHZINd51hIVcJaEwfHig>
34. <https://www.youtube.com/watch?v=Xfg2VRtSUjk>
35. <https://www.youtube.com/watch?v=F5hOI2XUkgE>
36. <https://slideplayer.com/slide/6374537/>

MPS2114	ADVANCED MICROPROCESSOR AND MICROCONTROLLER	Category	L	T	P	Credit
			58	2	-	4

Preamble

To make the students aware of the development of advanced microprocessors and microcontrollers and give them training in writing program in assembly language of 8085.

Prerequisite

- Basic idea on assembly language

Course Outcomes

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

Mapping with Programme Outcomes

CLO Number	CLO Statement	Knowledge Level
CLO1	Understanding the basic concepts of architecture and assembly language programming of 8085 microprocessor and microcontroller	K2
CLO2	Apply the acquired knowledge in the mnemonics of 8085 to write microprocessor programs	K3
CLO3	Analyze the interfacing concepts and explaining the memory and addressing modes	K4
CLO4	Write a assembly language program with 8085 & 8051	K5
CLO5	Create a program with interfacing concepts of real world input and output devices	K6

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	M	S	M	S	S	L
CLO2	S	S	M	S	M	M	M
CLO3	S	S	M	M	S	M	M
CLO4	S	S	M	S	M	S	M
CLO5	S	S	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

Unit I: Microprocessor Architecture and Instruction set **11hrs**

8 bit Microprocessor - 8085 microprocessor architectures - 8085 pin description - Microprocessor - Communications and Bus timings - **Control Signals**¹ - **Example of an 8085 based Microcomputer**^{2,3} - **Instruction set** - **Data transfer Operations**⁴ - **Arithmetic Operations**⁵ - **Logical Operations**⁶ - **Branch Operations**⁷ - Instruction format

Unit II: Software Programs (using 8085) **11hrs**

Addition - Subtraction - Multiplication - Division - BCD Arithmetic - Choosing the biggest and smallest numbers from a list - Time delays - **Illustrative Programs - Hexadecimal counter**⁸ - **Square wave generator**⁹

Unit III: 16 & 32 Bit Microprocessors **12hrs**

16 bit Microprocessors - Intel 8086 - pin description for minimum mode - pin description for maximum mode - Internal Architecture - programming model - **memory segmentation**¹⁰ - **Instruction set**¹¹ - **Coprocessing**¹² - **Memory interfacing - I/O interfacing**¹⁴ - Intel 80186¹⁵ and 80286 - **32 bit Microprocessors** - Intel 80386/80486 - Intel Pentium processor¹⁶

Unit IV: Interfacing memory and I/O devices **11hrs**

Basic Interfacing concepts - Memory-Mapped I/O - Programmable Peripheral Interface (8255A) - 8254 Programmable Interval timer - DMA Controller - **8259A Programmable Interrupt Controller**.^{17,18}

Unit V: 8051 Microcontroller **11hrs**

Architecture - Microcontroller 8051 data memory hardware programs and - **External memory**¹⁹ - **counters**^{20,21} - serial data I/O - **interrupts**.²²

Text Book

1. Gaonkar, Microprocessor Architecture Programming and Applications, 4th Edition.

Reference Books

1. Kenneth J. Ayala, The 8051 Microcontroller, architecture, programming and applications, Delmar Learning (ISE), 2004.

Pedagogy: Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers:

Dr J. Balavijayalakshmi

References For E-Content:

<https://slideplayer.com/slide/12329568/>
<https://slideplayer.com/slide/3944521/>
<https://slideplayer.com/slide/6029325/>
https://youtu.be/eTVL_T3Gjr0
<https://youtu.be/0OGZF9-TqQM>
<https://youtu.be/5xbo6efNPng>
<https://youtu.be/vi4yZOWgDc8>
<https://youtu.be/NfLotcMpA3Q>
<https://slideplayer.com/slide/9428542/>
<https://youtu.be/8qGYdGLbwpc>
<https://youtu.be/66F1Qb03Ad0>
https://youtu.be/3_ggsKT6QaA
<https://slideplayer.com/slide/10023207/>
<https://slideplayer.com/slide/2289810/>
<https://slideplayer.com/slide/1509837/>
<https://youtu.be/FgkdNCuySDI>
<https://slideplayer.com/slide/2327129/>
<https://slideplayer.com/slide/5851064/>
<https://youtu.be/dM2swIpGk0Y>
<https://slideplayer.com/slide/3944927/>

MPS22S1	RESEARCH METHODOLOGY	Category	L	T	P	Credit
			28	2	-	3

Preamble

This paper aims to develop the skills of students in doing research and compiling their results in an effective manner.

Prerequisite

Idea on ordinary and partial Differential equations

Basic programming

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic principles and carry the knowledge forward which can be applied in different areas of research.	K2
CLO2	Emphasize on the analytical methods and their computational implementation using calculations of software such as Matlab	K3
CLO 3	Develop skills on problem solving using various mathematical tools.	K4
CLO 4	Expose the students to the use of mathematics which they can applying contemporary Physics research.	K5
CLO5	Get a clear idea on the basic numerical methods and the ways to evaluate the accuracy and effectiveness of the research findings.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	L	S	M	M	S	L	L
CLO2	L	S	S	M	M	L	M
CLO3	L	S	S	M	S	L	M
CLO4	L	S	M	M	M	L	M
CLO5	L	M	S	M	S	L	S

S-Strong;M-Medium; L-Low

Syllabus

Unit I: High Performance Computing using Matlab

5

Hrs

Matlab:

Introduction - **Matrices and vectors- Matrix and Array Operations**¹- Creating and using **INLINE** functions- using built in- functions and on-line help- *saving and loading data* -Scriptfiles-functionfiles.

Unit II: Data Analysis:

5 Hrs

Introduction - Measures of central value- mean, median, mode, geometric mean and harmonic mean^{2,3}, Karl Pearson coefficient of skewness and correlation, Rank correlation coefficient, Regression analysis, difference between correlation and regression.

Unit III: Ordinary Differential Equations:

6 Hrs

Power series approximations – Taylor series – Taylor series method for simultaneous first order differential equations – Taylor series method for second order differential equation- **Euler's method– Improved and Modified Euler method**⁴-Milne's Predictor– Corrector method.

Unit IV: Partial Differential Equations:

5 Hrs

Difference quotients – **Graphical representation of Partial quotients – Classification of PDE of the second order**^{5,6,7} – Elliptic equations – Standard five point formula – Diagonal five-point formula– Solution of Laplace's equation by Liebmann's iteration

Unit V: Research Ethics and Responsible Conduct in Research

6 Hrs

Brief history and analytical basis of research ethics, responsible conduct in research (Honesty in Science: Integrity, Authorship, Conflicts of Interest, Privacy and Confidentiality, Informed Consent, Risk/Benefit Assessment), **The legal regulation of research ethics in India (From UGC, MHRD and other governing agencies), Regulatory requirements relevant to international research**^{8,9}.

Text Book

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Rudrapratapsingh	Getting started with MATLAB	Pragathi prakas han	2012	31 st Revised

					edition
2	Gupta S.P	Statistical Methods	Sultan Chand & Sons	2021	46 th Revised edition
3	P.Kandasamy, K. Thilagavathy and K. Gunavathi	Numerical methods	S. Chand and Company Ltd	2007	2 nd edition
4	Dr. M.K. Venkataraman	Numerical Methods in Science and Engineering	The National Publishing Company	2011	5 th edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	John.H.Mathews	Numerical methods for mathematics, science and engineering.	Prentice.Hall of India Private Limited	1994	2 nd Edition,
2	S.Rajasekaran	Numerical methods in science and engineering,	Wheeler Publishing	1992	First reprint
3	Role of the Ethics Committee: Helping To Address Value Conflicts or Uncertainties Author links open overlay panel Mark P.Aulisio, Robert M.Arnold				
4	Research Regulatory Compliance 1st Edition (Mark Suckow, Billy Yates Book ISBN:9780124200654)				
5	Recent research ethics policy from Government of India.				

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers

2. Mrs.S.Subanya
3. Mrs.D.Niveditha

Reference Links for e-content:

- <https://www.youtube.com/watch?v=9k-V3rNNDDg>
- <https://www.toppr.com/guides/business-mathematics-and-statistics/measures-of-central-tendency-and-dispersion/harmonic-geometric-mean/>
- <https://www.youtube.com/watch?v=6DYtC7rVuY>

3<https://www.khanacademy.org/math/ap-calculus-bc/bc-differential-equations-new/bc-7-5/v/eulers-method>

<https://www.youtube.com/watch?v=-Ox2m-X88Yg>

<https://www.khanacademy.org/math/multivariable-calculus/multivariable-derivatives/partial-derivatives/v/partial-derivatives-and-graphs>https://www.youtube.com/watch?v=bPsMdVz_azg

<https://www.youtube.com/watch?v=4tRCov8pVgQ>

<https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf>

MPS21P3	PRACTICAL III - ADVANCED PRACTICALS	Category	L	T	P	Credit
			-	-	5	4

Preamble

The aim of this course is to make the students have hands on training in doing experiments in Optics and Electricity and Magnetism.

Prerequisite

- Experience in calibrating and handling instruments

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO 1	Understand the basics of experimental physics	K2
CLO 2	Explore the concepts involved in the thermodynamics, heat and modern optics	K3
CLO 3	Inculcate strong laboratory skills	K4
CLO 4	Enhance the present day requirements in industries, research fields.,	K5
CLO 5	Create the knowledge of theories involved in physics using practical experiments	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO 1	S	S	M	S	M	M	L
CLO 2	S	M	S	M	M	S	M
CLO 3	S	S	M	M	S	M	M
CLO 4	S	M	M	S	M	S	S
CLO 5	S	S	M	M	M	S	S

S- Strong; M-Medium; L-Low

PRACTICAL III - General
(Examination at the end of Second Semester)

Any Twelve Experiments

1. AIO Band
2. (i) Identification of prominent lines – Fe arc
(ii) Identification of prominent lines – Brass arc
3. Absorption spectrum-KMnO₄
4. Michelson Interferometer
5. Susceptibility of a given solid by Guoy method
6. Susceptibility of a given liquid by Quincke's Method
6. Compressibility of a Liquid-Ultrasonic Method
7. Variation of Hall Effect with temperature
8. Thickness of a film- Ellipsometer
9. Faraday effect apparatus-Determination of Verdet's Constant
10. Diffraction of light by (i) Single slit (ii) Double slit (iii) Transmission grating
(iv) Single wire (v) Cross wire (vi) Wire mesh
11. Determination of dielectric constant of a substance
12. Resistivity by Four-probe method and band gap of semiconductor
13. Kelvin's Double Bridge-Determination of Very Low Resistance & Temperature
Coefficient of Resistance.
14. Analysis of X-ray diffraction pattern
15. Study of FTIR spectrum and TGA

Course Designers:

Dr.M.Lavanya

MPS21P4	PRACTICAL IV – SPECIAL ELECTRONICS	Category	L	T	P	Credit
			-	-	5	4

Preamble

The aim of this course is to make the students practically learn the applications of the Op amp, IC 555 Timer and Microprocessors and to study the functioning of A/D Converters, D/A Converters and Microprocessor.

Prerequisite

Skill in constructing electronic circuits

Course Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO 1	To make the student understand the basic concepts in IC's, digital devices and Microprocessor	K2
CLO 2	Various applications of electronic devices and circuit systems	K3
CLO 3	Inculcate strong laboratory skills	K4
CLO 4	Enhance the present day requirements in industries, research fields.	K5
CLO 5	To produce electronic professionals who can be directly employed or start his/her own work as Electronic circuit Designer	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO 1	S	S	M	S	M	S	M
CLO 2	S	M	S	M	M	S	M
CLO 3	S	S	M	M	S	M	M
CLO 4	S	M	S	M	S	M	M
CLO 5	S	M	S	M	M	S	M

S- Strong; M-Medium; L-Low

PRACTICAL IV - ELECTRONICS
(Examination at the end of Second Semester)

Any Twelve Experiments

1. Op-Amp: Simultaneous Addition & Subtraction
2. Op-Amp: Instrumentation Amplifier-Light Intensity-Inverse Square Law
3. Op-Amp: (i) V to I & I to V Converter
4. Op-Amp: Analog Computation-First Order Differential Equation
5. Op-Amp Comparator-Zero Crossing Detector, Window Detector, Time Marker
6. IC 555 Timer Application- Monostable & Astable multivibrator, voltage controlled oscillator
7. A/D Converters-Any One Method
8. D/A Converters-Binary Weighted & Ladder Methods
9. IC Counters with Feedback
10. Microprocessor: LED Interfacing
11. Microprocessor: Stepper Motor Interfacing
12. Microprocessor: ADC Interface-Wave Form Generation
13. Microcontroller: Blinking of LEDs either 8051 or 16F84
14. Microcontroller: Controlling LED with switch.
15. Microcontroller: DC motor control.
16. Microcontroller: triangle wave generator-Using 8085 Simulator
17. Write an assembly language program to perform
 - (i) simple arithmetic operations – addition, subtraction, multiplication and division.
 - (ii) increment and decrement
18. Write an assembly language program to arrange the given set of numbers in
 - (i) ascending and descending order
 - (ii) Maximum and minimum of numbers.

19. Write an assembly language program to perform (i) Binary to BCD conversion
(ii)BCD to Binary conversion.

CO1. Op amp – Integrator, differentiator, Time marker

Course Designers:

- Dr.J.Balavijayalakshmi

MPS2210	LASER PHYSICS	Category	L	T	P	Credits
			58	2		4

Preamble

The main objective of this course is to provide a wide knowledge about the Fundamentals of lasers, characteristics, types of laser beams and applications.

Prerequisite

Basic knowledge of Optics, Electromagnetism and Quantum mechanics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
➤	Understand and explain the principles and design considerations of various lasers, modes of their operation and areas of their application.	K2
➤	Apply skills in applying the basics of Gaussian beam and solve numericals using ABCD law.	K3
➤	Analyse laser devices, its characteristics at a quantitative level.	K4
➤	Evaluate problems at higher order levels.	K5
➤	Innovate and design new types of laser beams for commercial applications.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
37.	S	M	M	S	S	M	M
38.	M	S	M	M	S	M	M
39.	M	S	M	M	S	M	M
40.	M	S	M	M	S	M	M
41.	S	S	S	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

Unit –I

11 Hrs

Lasers: Fundamentals and Types

Basic Construction and Principle of Lasing- *Einstein Relations and Gain Coefficient^{1,2}-
 Creation of a Population Inversion*- Three-Level System - Four-Level System -Threshold Gain Coefficient for Lasing- Laser types-He-Ne Laser-CO₂ Laser- Nd:YAG Laser- Semiconductor Laser.

Unit – II **11 Hrs**
Laser Operation

Optical Resonator-**Laser Modes-Axial modes- Transverse modes**^{3,4}- Modification in Basic Laser Structure- Basic Principle of Mode Locking- Active Mode Locking -Passive Mode Locking- Q Switching- Pulse Shaping-application of lasers in SMILE surgery

Unit – III **11 Hrs**
Laser Beam Characteristics

Introduction to Gaussian Beam-**width-Divergence-Radius of Curvature-Rayleigh Range-Guoy Phase**⁵ –formulation of ABCD matrix method –ABCD matrix of some optical system- ABCD Law for Gaussian Beam-The Complex Radius of Curvature

Unit – IV **11 Hrs**
Focusing of laser beam

Diffraction- limited spot size-tight focusing of light angular spectrum representation of optical near field-aplanatic lens-Focusing of higher-order laser modes-Radially polarized doughnut mode-Azimuthally polarized doughnut mode-applications-applications-near field optical recording-**optical tweezers**^{6,7}-**STED microscopy**^{8,9}

Unit – V **12 Hrs**
Surface Plasmons

Introduction-Optical properties of noble metals-**Drude–Sommerfeld theory**- Surface Plasmon polaritons at plane interfaces- Properties of surface plasmon polaritons- Excitation of surface plasmon polaritons- **Surface plasmon sensors**¹⁰.

Text Book

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Dr. M.N. Avadhanulu Dr. P.S. Hemne	An Introduction to Lasers theory and applications	S. Chand	2013	2 nd edition
2	Subhash Chandra Singh, Haibo Zeng, Chunlei Guo and Weiping,Cai,	Nanomaterials: Processing and Characterization with Lasers	Wiley-VCH Verlag GmbH & Co. KGaA	2012	1 st edition
3	L. Novotny and B. Hecht	Principles of Nano optics	Cambridge University Press	2006	1 st edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Orazio Svelto	Principles of lasers	Springer	2008	4 th edition
2	Walter Koechner	Solid state Laser Engineering	Springer	2006	2 nd edition
3	B.B. Laud	Lasers and Nonlinear Optics	New Age International (P) Ltd	2011	3 rd edition
4	Bahaa E. A. Saleh, Malvin Carl Teich	Fundamentals of Photonics	John Wiley & Sons, Inc.,	1995	1 st edition
5	R.G. Driggers, C. hoffman Marcel Dekker	Encyclopedia of Optical Engineering,	Springer	2003	2 nd edition
6	W.M. Steen, J. Mazumder	Laser Material Processing	Springer	2010	3 rd edition

References For E-Content

1. <https://youtu.be/2Oswmij538Q>
2. <https://youtu.be/jRqkhRgooxA>
3. <https://youtu.be/PK4yFaGHSFc>
4. https://youtu.be/A9_ythcyuGo
5. <https://youtu.be/gJcN2VDBJxI>
6. <https://youtu.be/ByY3-EpryPM>
7. <https://youtu.be/MU4eOJw2sBQ>
8. <https://youtu.be/OLczG3zUULQ>
9. <https://youtu.be/13VXGX2yR3k>
10. <https://youtu.be/QeT73pfvWrQ>
11. <https://youtu.be/YyBGiZZSsIY>
12. <https://youtu.be/kCE-BvHuFHU>
13. <https://youtu.be/sM-VI3alvAI>
14. <https://youtu.be/4eet-rjAHic>
15. <https://youtu.be/p0AOPJcnoBg>

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers

1. Dr. M. Lavanya
2. Mrs. S. Subanya

MPS2216	NUCLEAR AND PARTICLE PHYSICS	Category	L	T	P	Credits
			73	2	-	4

Preamble

The objective of introducing this paper is to provide an in-depth knowledge of nuclear structure, nuclear models, nuclear reactions and different elementary particles.

Prerequisite

4. Basic idea on nuclear models, elementary particles

Course Outcomes

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

CLO. Number	CLO Statement	Knowledge Level
CLO1.	Understand the concepts in nuclear and particle physics	K2
CLO2.	Applying conservation principles to determine the type of reaction taking place and the possible product outcome	K3
CLO3.	Analyze the properties of stable nucleus and explore different types of nuclear models	K4
CLO4.	Expand and evaluate the theoretical predictions for nuclear reactions.	K5
CLO5.	Acquire quantum mechanical reasoning in classification of particles in subatomic level.	K6

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	L	M	L	M	L	M
CLO2	S	S	S	M	M	M	M
CLO3	S	L	S	S	S	L	M
CLO4	S	S	M	S	M	L	M
CLO5	S	M	S	M	S	L	M

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Nuclear Disintegration Studies

14 Hrs

Alpha Decay: Properties of Alpha particles¹ - velocity and energy of alpha particles- Geiger Nuttall Law – Gamow’s theory of alpha decay.

Beta Decay: Properties of Beta particles¹-Fermi theory of beta decay- **Curie plot**³- Forms of

interaction and selection rules-electron capture

Gamma Transitions: absorption of Gamma rays by matter²- interaction of Gamma rays with matter – the measurement of Gamma ray energies- Dumond bent crystal spectrometer- internal conversion.

Unit II: Elements of Nuclear Structure and Systematics

14 Hrs

Theories of Nuclear composition (Proton electron theory) –**Mass Spectroscopy**⁴- **Bainbridge and Jordan mass spectrograph**⁵ – Nier's mass spectrometer – Deuteron – magnetic and quadrupole moment of deuteron – ground state of deuteron – excited state of deuteron – the **meson theory of nuclear forces – Yukawa potential**⁶.

Unit III: Properties of Stable Nucleus and Nuclei Models

14 Hrs

Semi-empirical mass formula – Nuclear models- **liquid drop model, Semi empirical mass formula**⁷, **Shell models**^{8,9} – Magic numbers – Single particle method- **Collective model**⁸- magnetic moments and shell model- prediction of angular moments of nuclear grounds state.

Unit IV: Nuclear Reaction Studies

14 Hrs

Conservation laws for nuclear reactions- Nuclear Energy – Reaction dynamics- Q equation- **BreitWigner one level dispersion formula**¹⁰- Photonuclear reaction – fission process – cross sections – **Bohr Wheeler theory**¹¹.

Unit V: Elementary Particles

15 Hrs

Classification of elementary particles¹² – Fundamental interaction – Electromagnetic, strong , weak and gravitational interactions – Parameters of elementary particles – Conservation laws – **CPT theorem – Okubo mass formula for SU (3) symmetry**¹³ – Quarks theory- Unification theory-**Standard Model**¹⁴ - Higgs Bosons (Elementary ideas).

Text Book

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Pandya and Yadav	Nuclear and Partic Physics	B S Agarwaal	2010	3 rd Edition
2	Tayal D.C	Nuclear Physics	Umesh Prakashan, Gujarat	2011	reprint
3	Arthur Beiser	Concepts of Modern Physics	McGraw hill Book Company	2012	3 rd edition
4	David Griffiths	Introduction to elementary particles	Prentice Hall	1999	2 nd edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1.	Bernard L. Cohen	Concepts of Nuclear Physics	Tata McGraw Hill	1978	1 st edition
2	Kenneth S. Krane	Introductory Nuclear Physics	John Wiley & Sons	1988	2 nd Edition
3	Sharma	Nuclear Physics	K. Nath & Co-Meerut 1600	1992	2 nd Edition
4	F. Reif	Statistical Physics	McGraw – Hill, Special Indian Edition	2008	2 nd Edition

References For E-Content

<https://www.youtube.com/watch?v=c9WfZJYUWv0>
<https://www.youtube.com/watch?v=u0L3vG9XSyw>
<https://www.youtube.com/watch?v=yjJr5WUDVzk>
<https://www.youtube.com/watch?v=SQucmCTpdgg>
https://www.youtube.com/watch?v=FFoMoif_2bg
https://www.youtube.com/watch?v=_iUJdeRYw5M
https://www.youtube.com/watch?v=IYe_vWk0GN0
<https://www.youtube.com/watch?v=2Tb5DSFPwkU>
<https://www.youtube.com/watch?v=2cb5xsKvvWk>
<https://www.youtube.com/watch?v=vcnbcPDBEKs>
<https://www.youtube.com/watch?v=CDR-U-e6bR4>
https://www.youtube.com/watch?v=RyF1IZ2_0Ho

Pedagogy:

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers:

Mrs.S.Subanya

MPS2217	CONDENSED MATTER PHYSICS- II	Category	L	T	P	Credits
			73	2	-	4

Preamble

This course deals with the crystal growth techniques, Super conductivity, electrical and magnetic properties of materials.

Prerequisite

Basic Knowledge on crystal structure and introductory quantum mechanics and classical mechanics

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts in nuclear and particle physics	K2
CLO2	Applying conservation principles to determine the type of reaction taking place and the possible product outcome	K3
CLO3	Analyze the properties of stable nucleus and explore different types of nuclear models	K4
CLO4	Expand and evaluate the theoretical predictions for nuclear reactions.	K5
CLO5	Acquire quantum mechanical reasoning in classification of particles in subatomic level.	K6

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	S	M	S	M	S	M	M
CLO2	S	S	M	S	S	M	M
CLO3	S	S	S	S	S	S	M
CLO4	S	S	S	S	S	S	M
CLO5	S	S	S	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Crystal growth phenomena

14

Hrs Introduction-nucleation-Theories of nucleation-Classical theory of nucleation- -Gibbs

Thomson equation-Energy of formation of a nucleus-spherical nucleus-cylindrical nucleus-heterogeneous nucleation- crystal growth from melt-Bridgeman technique- Container selection-Crystal pulling-*Czochralski technique*-zone melting technique-low temperature solution growth-crystal growth system-vapour growth-physical vapor deposition-chemical vapor deposition-**The technology of epitaxy-liquid phase epitaxy-vapour phase epitaxy**¹.

Unit II: Super Conductivity

15Hrs

Mechanism of super conductivity-Effect of magnetic fields – AC Resistivity-Critical currents-Meissner effect-Thermal properties--Energy gap-Isotope effect-The penetration depth - Type I and Type II superconductors- London equation-superconductors in AC fields-**thermodynamic of superconductors**²- A survey of BCS theory- BCS theory of superconductivity –Quantum tunnelling- Josephson superconductor tunnelling – DC Josephson effect – AC Josephson effect - Macroscopic Quantum interference

Unit III: Dielectrics and Ferroelectrics

14 Hrs

Maxwells equation – Polarization –Macroscopic Electric field : depolarization electric field – Local electric field in an atom – Lorentz field –field of dipoles inside a cavity – dielectric constant and polarizability: Electric polarizability – structural phase transition – **Ferro electric crystals**³ – classification of ferroelectrics crystal – Displacive Transition :soft optical phonon – London theory of the phase transition: soft optical phonon – London theory of the phase transition – second order transition – first order transition – **antiferro electricity and ferro electric domains** –**Piezo electricity**⁴ – ferro elasticity.

UNIT IV: Diamagnetism and Paramagnetism

14 Hrs

Langevin diamagnetism equation –**quantum theory of diamagnetism of mono nuclear systems**⁵ – Paramagnetism – quantum theory of paramagnetism: rare earth ions – Hund rule – Iron group ions – Crystal field splitting – Quenching of the orbital angular momentum – spectroscopic splitting factor - Van Vleck temperature – independent Paramagnetism cooling by isotropic demagnetization – Paramagnetic susceptibility of conduction electron.

UNIT V : Ferromagnetic Order

14 Hrs

Currie point and exchange integral – temperature dependence of the saturation magnetization – saturation magnetization at absolute zero - Magnons: **Quantization of spin waves thermal excitation of magnons**⁶ – Neutron Magnetic scattering – Ferri magnetic orders: Curie temperature and susceptibility of ferrimagnetisms – iron garnets – Anti ferromagnetic order: susceptibility below the Neel temperature – anti ferromagnetic magnons – Ferromagnetic domains: an isotropic energy– transition region between domains

Text Book

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	SanthanaRaghavan, P.Ramasamy	Crystal growth processes and methods	KVR Publications	2001	3 rd edition
2	Pillai.S.O	Solid State Physics	NewAge Publishers	2015	7 th Edition
3	Charles Kittel	Introduction to solid state physics	Wiley India Pvt Ltd	2010	7 th Edition

Reference Books

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Saxena, Gupta	Solid State Physics	Pragati Prakashan	2008	12 th Edition
2	Wahab	Solid State Physics	Narosa Publishing House	2011	2 nd Edition

References For E-Content

2. <https://www.youtube.com/watch?v=1TqAXUYMFRE>
3. <https://www.youtube.com/watch?v=ayl1QfSFBHw>
4. <https://www.youtube.com/watch?v=Y11DCZRvWjM>
5. <https://www.youtube.com/watch?v=qTRFTyQ2f3w>
6. <https://www.youtube.com/watch?v=ieBvcZGQeVI>
7. https://www.youtube.com/watch?v=8_vbPNMIeEc

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

Course Designers

1. Dr. (Mrs).P.Meena
2. Dr. (Mrs).J. Balavijayalakshmi

**ADVANCED LEARNERS' COURSE -I
COMMUNICATION SYSTEMS**

Subject Code: MPS16AC1

Credits: 5

Objective:

The aim of this course is to acquire knowledge about different modulations and various communication systems.

Unit I: Amplitude Modulation

Introduction-Amplitude modulation- Amplitude modulation index-Modulation index for sinusoidal AM-Frequency spectrum for sinusoidal AM-Average power for sinusoidal AM-Effective voltage and current for sinusoidal AM – Double sideband suppressed carrier(DSBSC) modulation- Amplitude modulator circuits- Amplitude demodulator circuits. Single sideband principles- Balanced modulators- SSB generation-SSB reception- Modified SSB systems- Signal to noise ratio for SSB - Companded SSB.

Unit II:Angle Modulation

Introduction – Frequency modulation – Sinusoidal FM- Frequency spectrum for sinusoidal FM-Average power for sinusoidal FM- Modulation index for sinusoidal FM- Phase modulation- Equivalence between PM and FM – Sinusoidal PM- Digital PM- Angle modulator circuits- FM Transmitters- Angle modulation detectors.

Unit III: Pulse and Digital Modulation

Pulse amplitude modulation (PAM)- Pulse code modulation(PCM)- Pulse frequency modulation(PFM)- Pulse time modulation (PTM)- Pulse position modulation (PPM)-Pulse width modulation(PWM)
Digital communication- Introduction- Synchronization -Asynchronous transmission- Probability of Bit error in baseband transmission –Digital carrier systems.

Unit IV:Satellite and Fibre Optic Communications

Kepler's first law- Kepler's second law- Orbits- Geostationary orbits- Power systems- Altitude control- Satellite station keeping- Antenna look angles- Limits of visibility- Frequency plans and polarization- Transponders –Multiple access methods.
Fibre optic communications introduction-Light sources for fibre optics- Photodetectors- Connectors and Splices- Fibre optic communication link.

Unit V:Antennas And Microwave Tubes

Basic considerations – Wire radiators in space- Terms and definitions- Effects of ground on antennas- antenna coupling at medium frequencies- Directional high frequency antennas- Microwave antennas- Wideband and special- purpose antennas. Multicavity Klytstron- Reflex Klytstron- Magnetron- Travelling-wave tube.

Books for Study &Reference :

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Dennis Roddy & John Coolen	Electronic Communication	PHI	1977	4 th edition
2	George Kennedy	Electronic Communication systems	McGraw Hill Publications	2011	5 th Edition