DEPARTMENT OF PHYSICS

MASTER OF PHYSICS

2020-22 BATCH

M. Sc Physics

PROGRAMME OUTCOMES

PO1: To enhance the student's abilities, personal qualities and transferable skills which will give them an opportunity to develop as responsible citizens.

PO2: To understand the laws, theorems and basic concepts in physics.

PO3: To use a systematic concept-based problem-solving approach that can be applied to different conditions.

PO4: To understand the physical of behavior of microscopic and macroscopic bodies.

PO5: To pursue complex, open-ended investigation in physics.

PO6: To understand the theories which describe the nature of physical phenomena and to establish them by experiments.

PO7: 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 EDUCTAION

Programme & Branch	**MSc Physics**							
Scheme of Examination (Applicable to students admitted during the academic year2020-2021 onwards)								
Semester	**Subject code**	**Title of the paper**	**Instructions Hours/week**	**Duration of exam in hours**	**Maximum marks**			**credits**
					CA	**ESE**	**Total**	
I	MPS2001	Paper I- Mathematical Physics –I	6	3	40	60	100	4
	MPS2002	Paper II - Classical Mechanics	6	3	40	60	100	4
	MPS2003	Paper III - Thermodynamics & Statistical Mechanics	6	3	40	60	100	4
	MPS2004	Paper IV – Electronics	6	3	40	60	100	4
	MPS19P1	Practical-I General Practicals	3	.....	…..	…..	……	….
	MPS19P2	Practical –II Electronics Practicals	3	.....	……	…..	…..	…..
II	MPS2005	Paper V - Mathematical Physics –II	5	3	40	60	100	4
	MPS20 06	Paper VI- Quantum Mechanics -I	5	3	40	60	100	4
	MPS2007	Paper VII- Electromagnetic Theory	5	3	40	60	100	4
	MPS2008 MPS2009	Elective – I **1.**Programming in C 2. Nuclear Physics I	4	3	40	60	100	3
	MPS17A1	Inter Disciplinary Course-Biophysics	3	3	40	60	100	5
	MPS19P1	Practical-I General Physics	4	4	40	60	100	4
	MPS19P2	Practical –II Electronics Practicals	4	4	40	60	100	4
III	MPS2011	Paper IX- Condensed Matter Physics -I	4	3	40	60	100	5
	MPS1912	Paper X - Quantum Mechanics –II	4	3	40	60	100	5
	MPS1913	Paper VIII - Atomic and Molecular Spectroscopy	4	3	40	60	100	4

	MPS1914 MPS1915	Elective II 1. Advanced Microprocessor and Microcontrollers 2.Nuclear Physics II	4	3	40	60	100	4
	MPS19S1	Special Course Research Methodology	2	3	-	-	100	3
	MNM15CS	Cyber Security	2	2	100	-	Grade	-
	PGCE	Comprehensive Exam	-	2	-	-	Grade	-
	MPS20P3	Practical-III Advanced Practicals	5	6	40	60	100	4
	MPS16 P4	Practical –IV Special Electronics	5	6	40	60	100	4
IV	MPS2010	Paper IX - Laser Physics	5	3	40	60	100	5
	MPS1916	Paper XII - Nuclear and Particle Physics	5	3	40	60	100	3
	MPS2017	Paper XIII – Condensed Matter Physics - II	5	3	40	60	100	4
	MPS16AC1 MPS16AC2	Advanced Learners' Course* 1.Communication systems 2.Advanced Experimental Techniques	-	3	-	-	100*	5*
	MPS16PROJ	Project	15	-	-	-	100	5

Total 2200 90

***Self Study**

For all the subjects 4 hours are allotted for tutorials

Bloom's Taxonomy based Assessment Pattern

CA I & II

Bloom's Category	Section	Marks	Number of Words	Total
Understand K2, Apply K3	A – 5 X 2 Marks	10	1 or 2 sentence	50
Apply K3, Analyse K4	B – 4 X 5 Marks	20	250 words	
Analyse K4, Evaluate K5, Create K6	C - 2/3 X 10 Marks	20	500 words	

End semester Examination Pattern

Bloom's Category	Section	Marks	Number of Words	Total
Understand K2, Apply K3	A-11/13 X 3 Marks	22	One or two sentences	100
Apply K3, Analyse K4	B - 5/7 X 6 Marks	36	250	
Analyse K4, Evaluate K5, Create K6	C - 4/6 X 12 Marks (1 question compulsory)	48	400	

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF

CONTINUOUS INTERNAL ASSESSMENT

Theory

	CIA I	CIA II	Model Exam	Assignment/ Class Notes	Seminar	Quiz	Class Participation	Library Usage	Attendance	Max. Marks
Core	5	5	6	4	5	4	5	3	3	40
ALC		10	15	-	-	-	-	-	-	25
Cyber Security	40	40		10		10				100

Practical

	Model Exam	**Lab Performance**	**Regularity in Record Submission**	**Attendance**	**Maximum Marks**
Core	12	20	5	3	40

RUBRICS

Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
Focus Purpose	Clear	Shows awareness	Shows little awareness	No awareness
Main idea	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
Organisation Overall	Well planned	Good overall organization	There is a sense of organization	No sense of organization
Content	Exceptionally well presented	Well presented	Content is sound	Not good
Style Details and Examples	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark	Points scored
Level of Engagement in Class	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributes to class by offering ideas and asking no questions	Student never contributes to class by offering ideas	
Listening Skills	Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.	Student listens when others talk, both in groups and in class.	Student listens when others talk in groups and in class occasionally	Student does not listen when others talk, both in groups and in class.	Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak.	
Behavior	Student almost never displays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class	
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.	

MAPPING OF POs WITH COs

COURSE	PROGRAMME OUTCOMES						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2001							
CO1	S	S	S	S	M	S	M
CO2	S	S	S	S	S	M	S
CO3	S	S	S	S	S	M	M
CO4	S	S	S	M	S	M	M
CO5	S	S	S	S	S	S	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - **MPS2002**							
CO1	S	S	M	M	M	L	L
CO2	S	M	S	M	M	L	L
CO3	S	M	M	L	M	L	L
CO4	S	M	M	M	M	S	L
CO5	S	M	M	S	M	M	L
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2003							
CO1	S	S	S	S	S	M	S
CO2	S	S	S	M	S	S	S
CO3	S	S	S	L	S	S	L
CO4	S	S	M	S	S	S	L
CO5	S	S	S	S	S	L	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2004							
CO1	S	S	S	L	L	M	L
CO2	S	S	M	S	M	M	M
CO3	S	S	S	M	L	M	M
CO4	S	S	S	M	L	M	M
CO5	S	S	S	M	S	S	M
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2005							
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
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2006							
CO1	S	S	L	L	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
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2007							
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
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2008							
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
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2009							
CO1	S	S	M	L	L	L	L
CO2	S	L	S	M	M	M	M
CO3	S	L	S	S	S	L	M
CO4	S	S	S	S	M	L	M
CO5	S	M	S	M	S	S	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS19P1							

CO1	S	M	M	S	M	M	M
CO2	S	M	S	M	M	S	S
CO3	S	S	M	M	S	M	M
CO4	S	M	M	M	M	M	M
CO5	S	M	M	M	M	S	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS19P2							
CO1	S	M	M	S	M	M	M
CO2	S	M	S	M	S	M	S
CO3	S	S	M	M	M	M	S
CO4	S	M	M	M	M	M	M
CO5	S	M	M	M	M	M	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2011							
CO1	S	S	S	M	S	L	M
CO2	S	S	S	M	M	M	M
CO3	S	L	S	M	S	L	M
CO4	S	S	S	M	M	L	M
CO5	S	M	S	M	S	L	M
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS1912							
CO1	S	S	L	L	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
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**

COURSE - MPS1913							
CO1	S	S	S	S	M	S	L
CO2	S	S	S	S	S	M	M
CO3	S	S	S	M	S	S	M
CO4	S	S	S	L	S	S	M
CO5	S	S	M	S	S	S	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS1914							
CO1	S	M	S	M	S	S	L
CO2	S	S	M	S	M	M	M
CO3	S	S	M	M	S	M	M
CO4	S	S	M	S	M	S	M
CO5	S	S	S	S	S	M	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS19S1							
CO1	L	S	M	M	S	L	L
CO2	L	S	S	M	M	L	M
CO3	L	S	S	M	S	L	M
CO4	L	S	M	M	M	L	M
CO5	L	M	S	M	S	L	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS20P3							
CO1	S	S	M	S	M	M	L
CO2	S	M	S	M	M	S	M
CO3	S	S	M	M	S	M	M
CO4	S	M	M	S	M	S	S
CO5	S	S	M	M	M	S	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS16P4							
CO1	S	S	M	S	M	S	L
CO2	S	M	S	M	M	S	M
CO3	S	S	M	M	S	M	M
CO4	S	M	S	M	S	M	S
CO5	S	M	S	M	M	S	S
COURSE	**PROGRAMME OUTCOMES**						

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COURSE - MPS2010							
CO1	S	M	M	S	S	M	M
CO2	M	S	M	M	S	M	M
CO3	M	S	M	M	S	M	M
CO4	M	S	M	M	S	M	M
CO5	S	S	S	S	S	S	M
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS1916							
CO1	S	L	M	L	M	L	L
CO2	S	S	S	M	M	M	M
CO3	S	L	S	S	S	L	M
CO4	S	S	M	S	M	L	M
CO5	S	M	S	M	S	L	S
COURSE	**PROGRAMME OUTCOMES**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
COURSE - MPS2017							
CO1	S	M	S	M	S	M	L
CO2	S	S	M	S	S	M	M
CO3	S	S	S	S	S	S	M
CO4	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S

MPS2001	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, Probability and special functions required for the description of the physical phenomena.

Prerequisite

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Understand the basic principles and carry the knowledge forward which can be applied in future research.	K2
CO2.	Enable them to improve their logical and analytical skills.	K3
CO3.	Gain well versed knowledge in the advanced mathematical methods and tools which can be used to analyse the nature of the problems in physics.	K4
CO4.	Strike a balance between formalism and applications.	K5
CO5.	Enhance the qualities of applying mathematical concepts in physics.	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Unit I – VECTORS **17 HRS**

Gauss divergence theorem & its physical interpretation - Gauss's Theorem – Stokes's theorem-Poisson's equations – curvilinear coordinates – orthogonal curvilinear coordinates – condition for orthogonality – cylindrical coordinates – 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 matrices, partitioning of matrices, special types of matrices and their properties, vectors as matrices 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. 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, 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.

Unit V – SPECIAL FUNCTIONS **18 HRS**

Series solution ,solution of Linear differential equation of first order, 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.

Text Book

1. Sathya Prakash, Mathematical Physics with Classical mechanics,Sultan Chand & Sons,6thEdition.

Reference Books

1. ChattopadhayP.K, Mathematical physics, New Age International-New Delhi, 2nd Edition.
2. Dass.H.K, Mathematical Physics, S. Chand and Company Pvt. Ltd, 6th Edition.
3. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley India Private Limited, 8thEdition.
4. Gupta, Mathematical Physics, Vikas Publishing House Pvt. Ltd, 2006, 3rd Edition.
5. Joshi A.W., Matrices and Tensors in Physics, Wiley Eastern Ltd,1975,2nd Edition.
6. Pipes & Harvill, Applied Mathematics for Engineers and Physicists,McGraw Hill international Book company, 3rd Edition.
7. Hans. J Weber and George. B.Arfken, Mathematical methods for Physicists, Academic Press 6th Edition.

Pedagogy

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

Course Designers:

1.Mrs.S.Subanya

MPS2002	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

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	develop familiarity with the physical concepts and facilitate with the mathematical methods of classical mechanics	K2
CO2	develop skills in formulating and solving physics problems	K3
CO3	emphasize the analysing solution and explore its consequences in particular as a means of verification	K4
CO4	expand and evaluate the students physical intuition and thinking process through the understanding of the theory and application of this knowledge to the solution of practical problem	K5
CO5	acquire knowledge of real time problems in macroscopic view and applying it to the microscopic level	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	M	M	L	L
CO2	S	M	S	M	M	L	L
CO3	S	M	M	L	M	L	L
CO4	S	M	M	M	M	S	L
CO5	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-Single particle in space-Atwood's machine-bead sliding on a rotating wire, linear harmonic oscillator- simple pendulum.

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 - 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- the motion in time in the Kepler problem- The Laplace-Runge-Lenz vector-Scattering in a central force field-transformation of the scattering problem to laboratory coordinates.

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-Forced vibration and the effect of dissipative forces.

Unit V: Hamilton's Formulation **18 hrs**

Legendre transformations and the Hamilton canonical equations of motion –Cyclic coordinates - Routh's procedure- Hamiltonian formulation of relativistic mechanics-Derivation of Hamilton's equations from a variational principle- The principle of least action.

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

Text Book

1. Herbert Goldstein, Classical Mechanics, Narosa Publishing House, New Delhi- 2001,2nd Edition.

2. Gupta, Kumar & Sharma, Classical Mechanics, Pragati Prakashan, 2012, 26th reprint.

3. R G Takwale & P S Puranik, - Classical Mechanics, Tata Mc Graw Hill Education Pvt. Ltd, Revised Edition (2010), 2nd Edition.

Reference Books

1. Rana & Joag, Classical Mechanics, TMH, 28th reprint 2010,6th edition.

2. Douglas Gregory, Classical Mechanics, Cambridge Unversity press, 2008, 1stedition.

Predagogy

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

Course Designers:

1.Dr.C.Sharmila

2. Mrs.S.Yuvarani.

MPS2003	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

- B.Sc. Physics
- B.Sc. Applied Physics

Course Outcomes

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

CO Number	CO Statement	Knowldge Level
CO1	Learn relationship between equilibrium distributions and kinetic processes leading to equilibrium	K2
CO2	Apply classical and quantum distributions in circumstances varying from standard examples to real statistical problems	K3
CO3	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
CO4	Examine appropriate limiting behaviours in various statistical systems and to develop statistical description of system	K5
CO5	Construct a partition function for a system in thermal equilibrium and use it to obtain thermodynamic quantities of interest.	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Unit – I: Thermodynamics **18 hrs**

Thermodynamic variables - extensive and intensive variables- Zeroth law of thermodynamics - equivalence of heat and work - first law of thermodynamics - Significance of

the first law of thermodynamics - thermodynamic processes - reversible process – irreversible process - state variables and process variables - definition of entropy - second law of thermodynamics - entropy changes in irreversible processes - Maxwell's Thermodynamical relations - thermodynamic potentials – Enthalpy, 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 states - 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 - canonical ensemble - 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 iii) Harmonic Oscillator 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 - Einstein's theory of heat capacity - Debye's theory of heat capacity - Bose – Einstein statistics - black body radiation- photon gas - Planck's law - Bose-Einstein Condensation - lambda transition – Liquid helium – Super fluidity

Unit-V: Quantum Statistical Mechanics - II **17 hrs**

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

Text Books

1. Gupta & Kumar, Elementary Statistical Mechanics, Pragati Prakashan, 2011, 24th edition
2. Kerson Huang, Introduction to Statistical Physics, Indian Edition Taylor & Francis
3. B.B. Laud, Fundamentals of Statistical Mechanics, New age International Publishers, 2011, First Edition.

Reference Books

1. K. Huang, Statistical Mechanics, John Wiley & Sons, 2009, Second Edition.
2. L. D. Landau and E. M. Lifshitz, Statistical Physics, Pergamon Press, 2011, Third Edition.
3. R.K.Pathria & Paul D. Beale, Statistical Mechanics, Elsevier- Butterworth Heinemann, 3rd Edition.
4. F.Reif, Statistical Physics, McGraw – Hill, Special Indian Edition, 2008.
5. Satya Prakash, Statistical Mechanics, Kedar Nath Ram Nath Publications Meerut, 2011.

Pedagogy

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

Course Designers:

1. Dr. N. Priyadharsini

MPS2004	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

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of semiconductor devices.	K2
CO2	design counters	K3
CO3	apply the concepts of operational amplifier to solve differential and simultaneous equations.	K4
CO4	Solve problem related to semiconductor devices, digital and oscillator circuits.	K5
CO5	take projects in electronics relevant to industrial and R &D needs	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Semiconductor devices I: 18 hrs

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

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

Unit II: Semiconductor Devices II 17 hrs

The junction field effect transistor- the pinch off voltage (Vp)-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. 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, Basic Operational Amplifier applications-Differential DC amplifier- integrator and differentiator-Electronic analog Computation solving Simultaneous and Differential equations- log and Exponential amplifiers.

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- Inverted ladder D/A converter- A/D converters- A counter type- successive Approximation converters. IC 555 Timer and its Applications.

Unit V : Registers and Counters 17hrs

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

Text Books

1. Jacob Millman & Arvin Grabel, Microelectronics, Tata McGraw Hill Publishing Company Ltd-New Delhi**,** 1999.2nd edition
2. Jacob Millman & Christos C Halkias, Integrated Electronics, Tata McGraw Hill Publishing Company Ltd-New Delhi**,** 2005, 41st Reprint
3. Malvino Leach, Digital Principles and Applications, Tata McGraw Hill Publishing

Company Ltd-New Delhi**,** 1995, 5th Edition
4. Ramakant A.Gayakwad, Opamps and Linear Integrated Circuits, PHI Learning Pvt.Ltd,New Delhi, 2000, 4th Edition.
5. Sze .S.M, Semiconductor devices Physics and Technology, Wiley Student Edition, 2012, 2nd Edition.
6. V Vijayendran, Introduction to Integrated Electronics (Digital and Analog), Viswanathan (Printers and Publishers) Pvt.Ltd, 2011Reprint

Reference books

1. MehtaV.K & Rohit Mehta, Principles of Electronics, Tata McGraw Hill Publishing Company Limited New Delhi, 2014, 11th edition
2. Gupta & Kumar, Hand Book of Electronics, Pragati Prakashan, 2010, 32nd
3. Chatterji B.N, Digital Computer technology, Khanna Publishers, Delhi, 1986, 2nd Edition

Pedagogy

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

Course Designers:

1. Dr. S. Shanmuga Sundari

MPS2005	MATHEMATICAL PHYSICS-II	Category	L	T	P	Credits
			71	4	-	3

Preamble

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

Prerequisite

- B.Sc Physics
- B.Sc Applied science

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, 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, 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, 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 probability, sample space, mutually exclusive events, theorem of total probability, 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, 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.SathyaPrakash,Mathematical Physics with Classical mechanics Sultan Chand& Sons,6th Edition

2.B S Rajput,Mathematical physicsPragati Prakashan,21st Edition

Reference Books:

1.Dass.H.K,Mathematical Physics,S. Chand and Company Pvt. Ltd,6th Edition

2.Erwin Kreyzig,Advanced Engineering Mathematics,Wiley India Private Limited,8th Edition

3,Eugene Butkov,Mathematical Physics,Addison Wesley London 1973,1st Edition

4.GuptaMathematical Physics,Vikas Publishing House Pvt. Ltd,2006,3rd Edition

5.Joshi A.W,Elements of Group Theory for Physicists,John Wiley & Sons (Asia) Pvt. Ltd 3rd Edition

6.Weber and George. B.Arfken,Mathematical methods for Physicists,Hans. J , Academic Press,6th Edition

Pedagogy

Chalk and talk, PPT, Seminar, Group discussion

Course Designers:

1. Mrs.S.Yuvarani
2. Mrs.P.Maheswari

MPS2006	QUANTUM MECHANICS-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

- BSc Physics
- BSc Applied Science

Course Outcomes

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

CO Number	CO 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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	L	L	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

U nit I **14hrs**

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

Unit II **14hrs**

Energy Eigen value problems Particle in a box – Linear Harmonic oscillator- Tunnelling through a barrier- particle moving in a spherically symmetric potential- System of two interacting particles-Rigid rotator- Hydrogen atom

Unit III **15hrs**

Angular Momentum Orbital Angular Momentum-Spin Angular Momentum-Total Angular Momentum Operators-Commutation Relations of Total Angular Momentum with Components-Ladder operators-Commutation Relation of Jz with J+ and J- - Eigen values of J^2, Jz- Matrix representation of J2, Jz, J+ and J- - Addition of angular momenta- Clebsch Gordon Coefficients – Properties.

Unit IV **14hrs**

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

Unit V **14hrs**

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

Books for Study & Reference:

1) P.M. Mathews & K. Venkatesan, A Text Book of Quantum Mechanics, Tata McGraw Hill 2010.
2) G. Aruldhas , Quantum Mechanics , Prentice Hall of India 2006.
3) David J.Griffiths, Introduction to Quantum Mechanics, Pearson Prentice Hall 2005.
4) L.I Schiff, Quantum Mechanics, McGraw Hill 1968.
5) A. Devanathan, Quantum Mechanics, Narosa Publishing, New Delhi.
6) R.Shankar, Principles of Quantum Mechanics, Springer 2005.

Pedagogy

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

Course Designers:

1. Dr. G. Praveena
2. Mrs. S. Yuvarani

MPS2007	ELECTROMAGNETIC THEORY	Category	L	T	P	Credits
			71	5	-	4

Preamble

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

Prerequisite

- B.Sc. Physics
- B.Sc. Applied Physics

Course Outcomes

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

CO Number	CO Statement	Knowldge Level
CO1	Summarize the fundamentals of Electrostatics and Magnetostatics	K2
CO2	Analyse the concept of Electrodynamic fields	K3
CO3	Apply the concept of electromagnetic theory in electromagnetic waves	K4
CO4	Understand the transverse behaviour of electromagnetic waves in different geometrics 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 Law, Gauss's Law and applications, potential function, field due to a continuous distribution of charge, equi-potential surfaces, Poison's equation, Laplace's equation, method of electrical images - spherical conductor when earthed, insulated conducting sphere near a point charge capacitance, electro-static 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-Long straight wire, Circular coil, Solenoid, Ampere's law for a current element -Ampere's law in differential vector form - Biot-Sarvart law, 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 o f ampere's law-Maxwell's equations –derivations – electromagnetic waves in free space – uniform plane wave propagation and its characteristics – wave equations for conducting medium – Maxwell's equation in phasor form – 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 proof – 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.

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 – 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 – Transmission line analogy for wave guides - 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

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

Pedagogy

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

Course Designers:

1. Dr. N. Priyadharsini,
2. A.P.Birundha

MPS2008	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 one of the most popular and widely used programming languages of modern days, namely 'C' language.

Prerequisite

- BSc Physics
- BSc Applied Physics
-

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 - C as a middle level language - C as a Structured Language - C as a Programming language - The form of C program - Compiling a C program - Data types – Identifiers – Variables - Scope of variables - Variable Initialization - Constants.

Unit II **11Hrs**

Operators – Assignment – Arithmetic - Increment/Decrement – Relational - logical-Bit wise-Ternary- Address and pointer operator - Size Of – Comma – Dot - Arrow operator -The [] and () operators – Expressions.

Unit III **11Hrs**

Selection statements - Iteration Statements - Jump Statements - Expression Statements - Block Statements - Functions - General form of Functions - Function Arguments – 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 - Passing structures to functions - Arrays and structures within structures.

Unit V **11Hrs**

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

Text Book

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.

Course Designers:

1. Dr.M.Lavanya

MPS19P1	PRACTICAL I - GENERAL PRACTICALS	Category	L	T	P	Credits
			-	-	4	4

Preamble

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

Prerequisite

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics of experimental physics	K2
CO2	Explore the concepts involved in the thermodynamics, heat and modern optics	K3
CO3	Acquire strong laboratory skills	K4
CO4	Enhance the skill to meet the present day requirements in industries, research fields	K5
CO5	Create the knowledge of theories involved in physics using practical experiments	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	S	M	M	M
CO2	S	M	S	M	M	S	S
CO3	S	S	M	M	S	M	M
CO4	S	M	M	M	M	M	M
CO5	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
2. Mrs.S.Yuvarani

		Category	L	T	P	Credits
MPS19P2	**PRACTICAL II-ELECTRONICS PRACTICALS**		-	-	4 per week	4

Preamble

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

Prerequisite

- B.Sc Physics
- B.Sc Applied Science
-

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts in IC's, digital devices and C programming.	K2
CO2	Apply circuit systems to construct electronic devices	K3
CO3	Evaluate the functioning of circuits	K4
CO4	Enhance the skill to meet the present day requirements in industries, research fields.,	K5
CO5	Become proficient to be directly employed or start his/her own work as Electronic circuit Designer	K6

Mapping with Programme Outcomes

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

1. Dr.G.Praveena

2. Mrs. S. Yuvarani

MPS2011	CONDENSED MATTER PHYSICS - I

Category	L	T	P	Credits
	56	4		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

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental principles and concepts of crystal physics	K2
CO2	Applying the reciprocal lattice to the crystal structure and explain how it gives rise to band structure and Brillouin zone	K3
CO3	Analyze the microscopic structure of the material and how it is mirrored in macroscopic aspect.	K4
CO4	Expand and evaluate the energy band structure of metal and semiconductors.	K5
CO5	Acquire knowledge on functional materials like superconductors and magnetic materials.	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Crystal Physics-I **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.

Unit II : Crystal Physics –II **11 hrs**

Crystal imperfections - Point defects-Vacancies-Interstitialcies[4,5]-Schottky defects and Frenkel defects-Line imperfections-Edge dislocation-Screw dislocation[6]-Burgers Vector - 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-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.

Unit III : Lattice vibrations and thermal properties **12 hrs**

The concept of the lattice mode of vibration[7]-Elastic vibrations of continuous media-Phase velocity-group velocity-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 theory[8] – Quantum theory of free electrons-Free particle- tunnel effect- 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 solids- 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[9].

Text Book

S. No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	Pillai.S.O	Solid State Physics	NewAge Publishers	2015	7th Edition
2	Saxena, Gupta	Solid State Physics	Pragati Prakashan	2008	12th 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	7th Edition
2	Wahab	Solid State Physics	Narosa Publishing House	2011	2nd Edition

Pedagogy

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

Course Designer

1. Dr.P.Meena

MPS1912	QUANTUM MECHANICS-II

Category	L	T	P	Credit
	56	4	-	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

- BSc Physics
- BSc Applied Science
-

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of time dependent perturbation theory and approximation methods; and the set of mathematical tools needed to formulate problems in quantum mechanics.	K2
CO2	Solve problems in 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. 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, quantization etc in the context of finding solution to the problems in molecular and elementary particle physics	K5
CO5	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 like bosons and fermions and also the electromagnetic field.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	L	L	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: 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- Adiabatic Approximation-sudden approximation.

Unit II: Scattering Theory **11 hrs**

Scattering cross section - Scattering amplitude - Laboratory and centre of mass coordinate systems – Partial waves - Phase Shifts - Scattering by Coulomb and Yukawa potential – 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- 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 and Hamiltonian equation-Quantization of the Non-relativistic Schrodinger equation-Number operators-Creation and Destruction–Anti Commutation Relations- 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 if Hydrogen like atom-Dirac's relativistic equation for a free particle-Dirac matrices-Dirac's equation in Electromagnetic Field-Negative energy states.

BOOKS FOR STUDY

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

BOOKS FOR REFERENCE

S.No	Authors	Title of the Book	Publishers	Year of Publication	Edition
1	A.K. Ghatak and S. Loganathan	Quantum Mechanics	McMillan	2011	4th edition

2	Gupta, Kumar, Sharma	Quantum Mechanics	Jai Prakash Nath & Co	2010	29th edition
3	Schiff	Quantum Mechanics	TMH	2010	2nd edition

Pedagogy

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

Course Designers:

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

MPS1913	ATOMIC AND MOLECULAR SPECTROSCOPY

Category	L	T	P	Credit
	56	4		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

- B.Sc. Physics
- B.Sc. Applied Physics
-

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Attain basic knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy	K2
CO2	Identify the specific and suitable molecular spectroscopy methods for solving given scientific problem	K3
CO3	Apply formalisms based on molecular symmetry to predict spectroscopic properties	K4
CO4	Examineand analyze spectroscopic data collected by various analytical methods discussed in the course.	K5
CO5	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

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

S- Strong; M-Medium; L-Low

Syllabus

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.

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- 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.

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.

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).

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- ESR Spectrum-Crystalline solids and free radicals in liquids-Hyperfine Structure

Mossbauer Spectroscopy: Mossbauer Effect-Recoilless Emission and Absorption-Mossbauer Spectrum-Experimental Methods-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	Aruldhas	Molecular Structure and Spectroscopy	Prentice Hall Private Ltd	2007	2nd Edition
2	Banwell	Fundamental of molecular spectroscopy	Tata Mc Graw Hill Publishing Company	2015	4th Edition
3	B.K. Sharma	Spectroscopy	Krishna's Educational Publishers	2014	23rd Edition
4	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	Straughen & S. Walker	Spectroscopy: Volumes I, II and III	Springer Publishers	1976	First Edition
3	R. Wilfred Sugumar	Molecular and Atomic Spectroscopy	MJP Publishers	2008	First Edition

PEDAGOGY

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

Course Designers:

1. Mrs. N. Priyadharsini, Assistant Professor,
2. Dr. S. Poongodi, Assistant Professor

MPS1914	Advanced Microprocessor and Microcontroller

Category	L	T	P	Credit
	56	4		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

- BSc Physics
- BSc Applied Physics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Be familiar with the basic concepts of architecture and assembly language programming of 8085 microprocessor and microcontroller	K2
CO2	Apply the mnemonics of 8085 to write microprocessor programs	K3
CO3	Analyze the interfacing concepts	K4
CO4	Write a assembly language program with 8085 & 8051	K5
CO5	Create a program with interfacing concepts	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Microprocessor Architecture and Instruction set 11hrs

8085 microprocessor architectures – 8085 pin description - Various registers – Microprocessor Communications and Bus timings – Control Signals – *Example of an 8085 based Microcomputer* – Instruction set – Data transfer group – Logical group – Branch group

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 – Square wave generator.

Unit III : 16 & 32 Bit Microprocessors **11hrs**

16 bit Microprocessors – Intel 8086 –- pin description for minimum mode- pin description for maximum mode – Internal Architecture – programming model – memory segmentation – Instruction set – Co processing –Memory interfacing –I/O interfacing – Intel 80186 and 80286 -32 bit Microprocessors – Intel 80386/80486 – Intel Pentium processor.

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.

Unit V: 8051 Microcontroller **12hrs**

Architecture – Microcontroller 8051 data memory hardware programs and– External memory – counters – serial data I/O – interrupts.

Text Book

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

Reference Books

1. Kenneth J.Ayala, The8051Microcontroller, architecture,programming and applications, Delmar Learning(ISE), 2004.

Pedagogy:

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

Course Designers:

1. Mrs J. Balavijayalakshmi
2. Mrs P. Maheswari

MPS19S1	RESEARCH METHODOLOGY

Category	L	T	P	Credit
	27	3		3

Preamble

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Understand the basic principles and carry the knowledge forward which can be applied in different areas of research.	K2
CO2.	Develop skills on problem solving using various mathematical tools.	K3
CO3.	The goal of the course is to expose the students to the use of mathematics which they can apply in contemporary Physics research.	K3
CO4.	Emphasize on the analytical methods and their computational implementation using calculation software such as Matlab.	K4
CO5.	Get a clear idea on the basic numerical methods and the ways to evaluate the accuracy and effectiveness of the research findings.	K2,K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1.	L	S	M	M	S	L	L
CO2.	L	S	S	M	M	L	M
CO3.	L	S	S	M	S	L	M
CO4.	L	S	M	M	M	L	M
CO5.	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- Creating and using INLINE functions- using built in- functions and on-line help- *saving and loading data* -Script files- function files.

Unit II: Data Analysis: **5 Hrs**

Introduction - Measures of central value- mean, median, mode, geometric mean and harmonic mean, 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 - 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 – 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 **6Hrs**

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.

Text Book

1. Rudra pratap singh, Getting started with MATLAB, Pragathi prakashan, 31st, Revised edition, 2012.
2. Gupta S.P, Statistical Methods, Sultan Chand & Sons, 2012.

3. P. Kandasamy, K. Thilagavathy and K. Gunavathi, Numerical methods, S. Chand and Company Ltd, 2007.
4. Dr. M. K. Venkataraman, Numerical Methods in Science and Engineering, The National Publishing Company.

Reference Books

1. John.H.Mathews, Numerical methods for mathematics, science and engineering, Prentice.Hll of India Private Limited, 2nd Edition,1994.
2. S.Rajasekaran, Numerical methods in science and engineering, Wheeler Publishing , First reprint, 1992.
3. On Being a Scientist, A Guide to Responsible Conduct in Research: Third Edition (2009)
4. Role of the Ethics Committee: Helping To Address Value Conflicts or Uncertainties Author links open overlay panel Mark P.Aulisio, Robert M.Arnold
5. https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf
6. Research Regulatory Compliance 1st Edition (Mark Suckow, Bill Yates eBook ISBN: 9780124200654)
7. Recent research ethics policy from Government of India.

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

Course Designers:

1. Mrs. S. Subanya

2. Ms. D. Niveditha

Semester: III

Title : Cyber Security
Subject Code: MNM15CS

Objective

This course presents the principles of Cyber Security and its attack. It covers all aspects of cyberspace, botnet, cyber crime and its case studies.

Unit I

Cyberspace: Introduction- Web Threats for Organizations - Security and Privacy Implications from Cloud Computing - Social Media Marketing - Social Computing and the Associated Challenges for Organizations - Protecting People's Privacy in the Organization- Organizational Guidelines for Internet Usage- Safe Computing Guidelines and Computer Usage Policy.

Unit II

Security Threats: Malicious Software, Types of Attacks, Threats to E-commerce, e-cash, Credit/Debit Cards.

Unit III

Cyber Security: Introduction - An Essential Component of Cyber security - Forensics Best Practices for Organizations - Media and Asset Protection - Importance of Endpoint Security in Organizations

Unit IV

Cyber Attacks: Introduction - How Criminals Plan the Attacks - Social Engineering - Cyberstalking -Cybercafe and Cybercrimes - Botnets: The Fuel for Cybercrime - Attack Vector - Cloud Computing

Unit V

Case Study on Cyber Crime & Security: lntroduction on Cyber Crime - Trends in Mobility - Credit Card Frauds in Mobile and Wireless Computing Era. Illustrations, Examples and Mini-Cases - Introduction - Real-Life Examples - Mini-Cases Illustrations of Financial Frauds in Cyber Domain - Digital Signature-Related Crime Scenarios - Digital Forensics Case Illustrations - Online Scams.

MPS20P3	PRACTICAL III - ADVANCED PRACTICALS

Category	L	T	P	Credit
	-	-	71	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

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics of experimental physics	K2
CO2	Explore the concepts involved in the thermodynamics, heat and modern optics	K3
CO3	Inculcate strong laboratory skills	K4
CO4	Enhance the present day requirements in industries, research fields.,	K5
CO5	Create the knowledge of theories involved in physics using practical experiments	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

PRACTICAL III - General

(Examination at the end of Third Semester)

Any TEN Experiments

1. AlO Band - Determination of Moment of Inertia and dipole moment
2. (i) Identification of prominent lines – Fe arc

   (ii) Identification of prominent lines – Brass arc
3. Absorption spectrum-$KMnO_4$
4. Michelson's Interferometer - Determination of wavelength and thickness of the given material.
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
16. Determination of Lande 'g' factor - ESR Spectrum

Course Designer:

1. Dr.N.Priyadharsini

MPS16P4	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

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To make the student understand the basic concepts in IC's, digital devices and Microprocessor	K2
CO2	Various applications of electronic devices and circuit systems	K3
CO3	Inculcate strong laboratory skills	K4
CO4	Enhance the present day requirements in industries, research fields.	K5
CO5	To produce electronic professionals who can be directly employed or start his/her own work as Electronic circuit Designer	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

PRACTICAL IV - ELECTRONICS
(Examination at the end of Second Semester)
Any TEN 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.
20. Op amp – Integrator, differentiator ,Time marker

Course Designers:

1. Mrs.P.Maheswari
2. Miss A. Ponpoorani

MPS2010	LASER PHYSICS

Category	L	T	P	Credit
	56	4		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

- BSc Physics
- BSc Applied Physics
-

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand and explain the principles and design considerations of various lasers, modes of their operation and areas of their application.	K2
CO2	Apply skills in applying the basics of Gaussian beam and solve numericals using ABCD law.	K3
CO3	Analyse laser devices, its characteristics at a quantitative level.	K4
CO4	Evaluate problems at higher order levels.	K5
CO5	Innovate and design new types of laser beams for commercial applications.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	S	S	M	M
CO2	M	S	M	M	S	M	M
CO3	M	S	M	M	S	M	M
CO4	M	S	M	M	S	M	M
CO5	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 -Creation of a Population Inversion*- Three-Level System - Four-Level System -Threshold Gain

Coefficient for Lasing- Laser types-He-Ne Laser-CO_2 Laser- Nd:YAG Laser- Semiconductor Laser.

Unit – II **11 Hrs**

Laser Operation

Optical Resonator- Laser Modes- Axial modes- Transverse modes- 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 –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- STED microscopy

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.

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	2nd 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	1st edition
3	L. Novotny and B. Hecht	Principles of Nano optics	Cambridge University Press	2006	1st edition

Reference Books

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

Pedagogy

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

Pedagogy

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

Course Designer:

1. Dr.M.Lavanya

MPS1916	NUCLEAR AND PARTICLE PHYSICS	Category	L	T	P	Credit
			71	4		3

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

- B.Sc Physics
- B.Sc Applied Science

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts in nuclear and particle physics	K2
CO2	Applying conservation principles to determine the type of reaction taking place and the possible product outcome	K3
CO3	Analyze the properties of stable nucleus and explore different types of nuclear models	K4
CO4	Expand and evaluate the theoretical predictions for nuclear reactions.	K5
CO5	Acquire quantum mechanical reasoning in classification of particles in subatomic level.	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Unit I : Nuclear Disintegration Studies **14 Hrs**

Alpha Decay: Properties of Alpha particles - velocity and energy of alpha particles- Geiger Nuttal Law – Gamow's theory of alpha decay.

Beta Decay: Properties of Beta particles-Fermi theory of beta decay- Curie plot- Forms of interaction and selection rules-electron capture

Gamma Transitions: absorption of Gamma rays by matter- 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- Bainbridge and Jordan mass spectrograph – 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.

Unit III: Properties of Stable Nucleus and Nuclei Models **14 Hrs**

Semi-empirical mass formula – Nuclear models- liquid drop model, Semi empirical mass formula, Shell models – Magic numbers – Single particle method- Collective model- 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- Breit Wigner one level dispersion formula- Photonuclear reaction – fission process – cross sections – Bohr Wheeler theory.

Unit V: Elementary Particles **15 Hrs**

Classification of elementary particles – Fundamental interaction – Electromagnetic, strong , weak and gravitational interactions – Parameters of elementary particles – Conservation laws – CPT theorem – Okubo mass formula for SU (3) symmetry – Quarks theory- Unification theory- Standard Model - 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	3rd Edition
2	Tayal D.C	Nuclear Physics	Umesh Prakashan, Gujarat	2011	reprint
3	Arthur Beiser	Concepts of Modern Physics	McGraw hill Book Company	2012	3rd edition
4	David Griffiths	Introduction to elementary particles	Prentice Hall	1999	2nd 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	1st edition
2	Kenneth S. Krane	Introductory Nuclear Physics	John Wiley & Sons	1988	2nd Edition

3	Sharma	Nuclear Physics	K. Nath & Co-Meerut 160	1992	2nd Edition
4	F. Reif	Statistical Physics	McGraw – Hill, Special Indian Edition	2008	2nd Edition

Pedagogy:

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Course Designers:

1.Dr. C.Sharmila
2.Dr. S.Shanmugasundari

MPS2017	CONDENSED MATTER PHYSICS- II

Category	L	T	P	Credit
	71	4		4

Preamble

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

Prerequisite

Prerequisite

- BSc Physics
- BSc Applied Physics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Be familiar with the basic concepts of crystal growth techniques	K2
CO2.	Apply the concepts of crystal growth to grow crystals	K3
CO3.	Analyze the electric and magnetic properties of the materials	K4
CO4.	Evaluate the structure of crystals	K5
CO5.	Synthesis dielectric and magnetic materials	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1.	S	M	S	M	S	M	L
CO2.	S	S	M	S	S	M	M
CO3.	S	S	S	S	S	S	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 : 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.

Unit II: Super Conductivity **15 Hrs**

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- BCS theory of superconductivity Quantum tunneling-Josephson superconductor tunneling – 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 – 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 – ferro elasticity.

Unit IV : Diamagnetism and Paramagnetism **14 Hrs**

Langevin diamagnetism equation –quantum theory of diamagnetism of mono nuclear systems – 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 – 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	3rd edition
2	Pillai.S.O	Solid State Physics	NewAge Publishers	2015	7th Edition
3	Charles Kittel	Introduction to solid state physics	Wiley India Pvt Ltd	2010	7th Edition

Reference Books

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

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Course Designer:

1. Dr.P.Meena

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 Klystron- 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	4th edition

2	George Kennedy	Electronic Communication systems	McGraw Hill Publications	2011	5th Edition