DEPARTMENT OF PHYSICS

M.Sc. (PHYSICS)

(Students admitted during 2019-2020 Onwards)

(Under CBCS with Outcome Based Education (OBE) Pattern)

SYLLABUS

I & II SEMESTER

GOBI ARTS & SCIENCE COLLEGE

(Govt. Aided Autonomous Co-educational Institution, Affiliated to
Bharathiar University, Coimbatore, Re-accredited with 'A' Grade by NAAC (3rd cycle)
and Nationally Ranked by NIRF, MHRD, Government of India)

KARATTADIPALAYAM POST,

GOBICHETTIPALAYAM - 638453

ERODE DISTRICT.

GOBI ARTS & SCIENCE COLLEGE (AUTONOMOUS)

Vision

Social and Economic upliftment of the people of this area through value based quality Education.

Mission

Committed to serve the society with humility and trust, devoid of exploitation; to impart value based higher education, particularly to the socially and economically deprived sections of this area; to make students of this institution worthy citizens of our glorious motherland.

DEPARTMENT OF PHYSICS

Vision

Inculcate Physics among the students and become a pioneer in teaching and research towards the development of community it serves.

Mission

- To provide sound technical skills to the students by imparting basic theoretical and practical knowledge.
- To carry out interdisciplinary and innovative research in emerging areas and disciplines.
- To develop technological and infrastructural department to attain the vision.

GOBI ARTS & SCIENCE COLLEGE (AUTONOMOUS): GOBICHETTIPALAYAM

SCHEME OF EXAMINATIONS - M.Sc. (PHYSICS) (19 BATCH)

No.	Course Code	Course	Total Hours	Hrs/ Exam	Maximum Marks		Total Marks	Credits
					CIA	EOS		
		SEMESTER - I						
1	19P3PH01	CLASSICAL MECHANICS AND STATISTICAL MECHANICS	75	3	40	60	100	5.0
2	19P3PH02	MATHEMATICAL PHYSICS - I	75	3	40	60	100	5.0
3	19P3PH03	NUCLEAR AND PARTICLE PHYSICS	75	3	40	60	100	5.0
4	19P3PH04	SPECIAL ELECTRONICS (ANALOG & DIGITAL ELECTRONICS)	75	3	40	60	100	5.0
		SEMESTER - II						
5	19P3PH05	MATHEMATICAL PHYSICS - II	75	3	40	60	100	5.0
6	19P3PH06	ELECTROMAGNETIC THEORY AND ELECTRODYNAMICS	75	3	40	60	100	5.0
7	19P3PH07	MODERN OPTICS	75	3	40	60	100	5.0
8	19P3PH08	ELECTIVE - I : THIN FILM PHYSICS & NANO SCIENCE	75	3	40	60	100	5.0
9	19P3PHPA	PRACTICAL - I : GENERAL EXPERIMENTS	120	4	40	60	100	4.0
10	19P3PHPB	PRACTICAL - II : ELECTRONICS EXPERIMENTS	120	4	40	60	100	4.0
		SEMESTER – III						
11	19P3PH09	QUANTUM MECHANICS - I	90	3	40	60	100	5.0
12	19P3PH10	CONDENSED MATTER PHYSICS	75	3	40	60	100	5.0
13	19P3PH11	ATOMIC AND MOLECULAR SPECTROSCOPY	75	3	40	60	100	5.0
14		SUPPORTIVE PAPER :	90	3	40	60	100	4.0
		SEMESTER - IV						
15	19P3PH12	QUANTUM MECHANICS - II	90	3	40	60	100	5.0
16	19P3PH13	ELECTIVE - II : CRYSTAL GROWTH TECHNIQUES	90	3	40	60	100	5.0
17	19P3PHPC	PRACTICAL - III : ADVANCED EXPERIMENTS	90	6	40	60	100	4.0
18	19P3PHPD	PRACTICAL - IV : SPECIAL ELECTRONICS EXPERIMENTS	90	6	40	60	100	4.0
19	19P3PHV1	PROJECT VIVA – VOCE				100	100	5.0

TOTAL CREDITS: 90

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

I. END OF SEMESTER (EOS) EXAMINATIONS:

1. Theory: 60 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	10 × 1 = 10	MCQ	60
K2	B (Either or Pattern)	5 × 4 = 20	Short answers	
K3 & K4	C (Answer 3 out of 5)	3 × 10 = 30	Descriptive/Detailed	

2. Practical Examinations: 60 Marks

Knowledge Level	Section		Total
	Practical	Record work	
K3	50	10	60
K4			
K5			

II. CONTINUOUS INTERNAL ASSESSMENT (CIA):

1. Test – I & II: 30 Marks (Theory)

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	10 × 1 = 10	MCQ	30
K2	B (Answer 2 out of 3)	2 × 5 = 10	Short answers	
K3 & K4	C (Answer 1 out of 2)	1 × 10 = 10	Descriptive/Detailed	

2. Test –III: (Model Exam)

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	10 × 1 = 10	MCQ	60 Marks converted to 40 Marks
K2	B (Either or Pattern)	5 × 4 = 20	Short answers	
K3 & K4	C (Answer 3 out of 5)	3 × 10 = 30	Descriptive/Detailed	

3. Practical Internal Assessment: 40 Marks

Knowledge Level	Components		Calculation	Lab Performance	Total
K3, K4, K5	Test 1	30	$\frac{\text{Test 1 + Test 2}}{2}$	10	40
	Test 2	30			

Components of Continuous Internal Assessment (CIA)

Components		Calculation	CIA Total
Test 1 & Test 2	30	$30 + 40 + 30 = \frac{100 \times 40}{100} = 40$	40
Test 3	40		
Assignment+ Seminar+ Quiz / GD / Poster Presentation / Book Review	10+10+10 = 30		

/ Field Visit Report			

Programme Specific Objectives

The students will be able to do, on successful completion of programme,

1. To educate the students in the current and vibrant emerging areas of physics by following up the advanced technologies, contributing to the national industries competitive character through educational and research based activities.

2. To acquire knowledge of fundamental laws and principles in wide areas of Physics along with their applications so as to develop strong student competencies in physics and its applications in a technology rich, interactive environment.

3. To understand the challenges of a dynamically and globalized changing world by adapting their skills through continuous learning and self improvement.

4. To work effectively in bringing practical skills to excel in technical carrier and bloom in research studies.

5. The students will be able to work in team competent enough to make an entrepreneur and also to pursue research and higher education and they will practice professional ethics, communicate effectively, emerge as leaders in chosen fields and be socially responsible.

Programme Specific Outcomes (PSO)

PSO1: Students will acquire a comprehensive knowledge and sound understanding of fundamentals of Physics.

PSO2: To improve the ability of written and oral communication skills in communicating physics related topics.

PSO3: Students will be capable to acquire a range of general skills, to solve problems, to communicate with society effectively.

PSO4: Apply conceptual perceptive of physics in other disciplines such as Engineering, Mathematics, Chemistry and Computer science.

PSO5: Express the ability to do advanced lab experiments that apply the principles learned in the class room.

Programme Code:	M.Sc.	Programme Title:	Physics	
Course Code:	19P3PH01	Course Title:	Batch:	2019
Total Hours:	75	Classical Mechanics and Statistical Mechanics	Semester:	I
			Credits:	5.0

Course Objective

The course aims

- Study to use the equation of motion for complicated mechanical systems using Lagrangian and Hamiltonian formulation.
- Know to use conservation of energy and linear angular momentum to solve dynamic problems.
- Study to use Ensembles, Classical and Quantum Statistics.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	CO1	Can understand basic mechanical concepts related to discreate and continuous mechanical systems and its applications
K2	CO2	Understand, evalute and describe the special motion of a rigid body and motion of a mechanical system by using Hamiltonian dynamics
K3	CO3	Can give an account of the relevant quantities used to describe macroscopic systems, thermodynamic potentials and Ensembles
K4	CO4	Able to describe the importance and consequence of statistical mechanics and application on Maxwell – Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Lagrangian Dynamics:** Basic concepts of constraints and Generalized Co-ordinates- Principle of Virtual work- D'Alembert's principle -Lagrangian equation from D'Alembert's principle - Generalized potential (Gyroscopic forces) - Applications of Lagrangian formulation :Atwood Machine - Lagrangian equation for LC circuit- Hamilton's principle and Lagrange's equation- Gauge invariance of Lagrangian- Symmetry properties of space, time and conservation laws. **Hamiltonian Dynamics:** Generalized momentum and cyclic coordinates- conservation theorems- Hamilton's function H and conservation of energy- Hamilton's equations- Applications of Hamiltonian formulation: Harmonic oscillator- charge particle moving in an electromagnetic field.	**15**
II	**Two body central force problem:** Reduction of two body central force problem to the equivalent one body problem- Equations of motion under central force and first integrals- Differential equation of an orbit- Inverse square law of force- Kepler's laws of planetary motion and their deduction- Virial theorem. **Variational Principles:** Deduction of Hamilton's principle from D'Alembert's principle- Deduction of Hamilton's equation from modified Hamilton's principle (or variational principle) - Principle of least action – ***Other forms of principle of least***	**15**

	action*.	
III	**Brackets:** Poisson's brackets - Lagrange brackets- Relation between Lagrange and Poisson brackets - Angular Momentum and Poisson bracket. **Small Oscillations:** General theory of small oscillations - Secular equation and Eigen value equation -Solution of Eigen value equation - Small oscillations in Normal coordinates - Vibrations of a linear triatomic molecule. **Dynamics of a Rigid Body:** Body and Space reference systems - Euler's angles - Angular momentum and Inertia tensor - Principal Axes - Principal moments of Inertia - Rotational kinetic energy of a Rigid body - Euler's equation of motion for a rigid body (Newtonian Approach).	**15**
IV	**Ensembles:** Concepts of ensembles- types of ensembles-Micro canonical ensembles: ideal gas in Micro canonical ensembles - Canonical ensemble- ideal gas in canonical ensemble-grand canonical ensemble-ideal gas in grand canonical ensembles. **Classical Statistics:** Phase space - volume in phase space - volume occupied by a quantum state - number of cells in a given energy range of Harmonic oscillator-numbers of phase cells in the given energy range - constraints and accessible states - Boltzmann entropy relation.	**15**
V	**Maxwell - Boltzmann Distribution:** Microstates and Macro states - Maxwell-Boltzmann distribution law - Condition for the applicability of Maxwell - Boltzmann statistics **Applications:** Total internal energy and specific heat at constant volume - Most probable, Mean and Root mean square speeds. **Quantum Statistics:** **Bose-Einstein and Fermi-Dirac Statistics:** Bose-Einstein distribution law - Derivation of Plank's law from B-E distribution- Fermi-Dirac distribution law -Fermi energy- Effect of temperature - Fermi energy for free electron in a metal - Expression for mean kinetic energy of electrons in a metal at absolute zero.	**15**

<* - *Self Study*>

Text Books:

1. Dr.J.C.Upadhyaya, *Classical Mechanics*, 1st edition, Himalaya Publishing House, Mumbai, Reprint 2006 (Unit I, Unit II, Unit III).
2. Dr.S.L.Gupta, Dr.V.Kumar, *Elementary Statistical Mechanics*, Pragati prakashan, Reprint 2007. (Unit IV).
3. Miss Kamal Singh and S.P.Singh, *Elements of Statistical Mechanics*, 3rd edition, S.Chand & Company, Reprint 1992 (Unit IV, Unit V)

Reference Books:

1. Goldtein and Pearson, *Classical Mechanics*, 3rd edition, New International Publishers, 2014.
2. Gupta,S.L.Kumar and Sharma,*Classical Mechanics*, Pragathi Prakasan, Meerut, 2012.
3. B.K.Agarwal,Melvin Eisner,*Statistical Mechanics*, 2nd Edition, New Age international (P) Ltd.

E-references:

1. https://courses.physics.ucsd.edu/2010/Fall/physics200a/LECTURES/CH06.pdf
2. https://nptel.ac.in/courses/113106040/12
3. http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/disbe.html

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	M	M
CO2	S	S	S	M	M
CO3	S	S	H	M	M
CO4	S	S	S	H	M

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

Programme Code:	M.Sc.	Programme Title:	Physics	
Course Code:	19P3PH02	Course Title:	Batch:	2019
Total Hours:	75	Mathematical Physics - I	Semester:	I
			Credits:	5.0

Course Objective

The course aims

- To understand the fundamental concepts in Vector calculus and Linear vector space.
- To lay a strong foundation in Fourier & Laplace transforms.
- To know the need and the use of numerical methods in solving Physics problems.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	CO1	Understand the concepts of gradient, divergence, curl & Lapacian operators.
K2	CO2	Can solve problems in Laplace Transforms and Fourier series of some typical waveforms.
K3	CO3	Have a good grasp of basic elements of complex analysis and will be able to use the residue theorem to compute integrals.
K4	CO4	Can obtain the solution of Legendre's and Bessel's differential equations and theory and problems on generating function, orthogonality, Rodrigue's formula, prove Recurrence relation and numerical problems.

K1 - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Vector Calculus and Linear Vector Space:** Line, Surface and Volume integrals - Important Vector Identities - Gauss divergence theorem- proof - Stoke's Theorem- proof - Green theorem - proof - Green theorem in a plane - Classification of Vector fields. Orthogonl Curvilinear co-ordinates - Gradient, Divergence, Curl, Laplacian in curvilinear co-ordinates - Differential operators in Spherical Polar Co-ordinates & Cylindrical Co-ordinates. Linear Vector Space - Linear independence of Vectors & Dimensions -Basis and Expansion Theorem - Inner product and unitary spaces - Orthonormal sets -Schmidt Orthogonalisation method.	**15**
II	**Laplace Transforms and Fourier Series**: Definition of Laplace transform - properties of Laplace transforms -Linearity property -Translation property - Inverse Laplace Transformation -properties of inverse Laplace Transform - Solving simple second order differential equation. Fourier series - Dirichlet's theorem - change of interval - complex form - Fourier series the interval (O, T), uses of Fourier series.	**15**
III	**Complex Variable Theory**: Functions of a complex variable single and multivalued functions- The Cauchy - Riemann differential equation- analytical -line integrals of complex function-Cauchy's integral theorem and integral formula - derivatives of an	**15**

	analytic function - Taylor's variable - Laurent's series - Residue and Cauchy's residue theorem - application to the equation of definite integral – Definite integrals of trignometric functions of cos θ and sin θ - Conformal transformation – Geometrical representation- Transformation -Theorems.	
IV	**Special Functions and their Properties:** Legendre's polynomials and functions - Differential equations and solutions - Rodrigue's - Generating functions - Orthogonality - Relation between Legendre polynomial and their derivatives - recurrence relations - Bessel's functions - Differential equation and solution - generating functions - recurrence relations.	**15**
V	**Curve Fitting & Numerical Methods:** The method of least squares- curve fitting - straight line, non–linear equations - Bisection and Newton- Raphson method of finding roots of the equations - solution of simultaneous linear equation by Guass elimination method - Guass Jordan method - solution of ordinary differential equation by Euler method and Runge -Kutta second and fourth order method - Evaluation of integral by means of Simpson's one third rule - ***Trapezoidal rule*.**	**15**

<***- Self Study***>

Text Books:

1. Satya Prakash, *Mathematical Physics*, edition, Sultan chand & Sons, Reprint 2005. (Unit I, Unit II, Unit III, Unit IV)
2. H.K.Dass, Dr.Rama verma, *Mathematical Physics*, 7th revised edition, S Chand & Company Ltd, 2014. (Unit II, Unit III)
3. P.Kandasamy, K.Thilagavathy, K.Gunavathy, *Numerical methods*, 3rd revised edition, S. Chand & Company Ltd, 2014. (Unit V)

Reference Books:

1. B.D.Gupta, *Mathematical Physics*, 4th edition, Vikas Publishing house (P) Ltd, Reprint 2013.
2. B.S.Rajput - *Mathematical Physics*, 28th edition,Pragati Prakashan, Meerut,Reprint 2016.
3. K.F.Riley and M.P. Hobson, *Essential Mathematical methods for Physical sciences*, Cambridge University Press, 2011.

E-references:

1. https://nptel.ac.in>courses
2. https://ece.uwaterloo.ca/~dwharder/NumericalAnalysis/10RootFinding/bisection/exampes.html
3. http://mathworld.wolfram.com/LaplaceTransform.html

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	S	S
CO2	S	H	S	S	S
CO3	S	S	S	S	H
CO4	S	H	S	S	S

S - Strong; **H -** High; **M -** Medium; **L –** Low

Programme Code:	M.Sc.	Programme Title:	Physics	
Course Code:	19P3PH03	Course Title:	Batch:	2019
Total Hours:	75	Nuclear and Particle Physics	Semester:	I
			Credits:	5.0

Course Objective

The course aims

- To understand the concept of nuclear binding energy and calculate the binding energy for different nuclei.
- To distinguish between the different types of radioactive decays and compute the daughter nuclei for these decays.
- To appreciate nuclear interactions and interaction with matter**.**

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	CO1	Understand the basic concepts of atomic nucleus, properties and mass detecting spectrograph.
K2	CO2	Acquired knowledge about different forms of radioactivity and their decay process by relativistic calculations.
K3	CO3	Able to explain the types of nuclear models and kinematics of various nuclear reactions.
K4	CO4	Learn about fission and fusion fragments with their energies.
K5	CO5	Can get thorough knowledge about various elementary particles and their properties.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**General properties of Atomic Nucleus:** Distribution of Nuclear charge - Scattering of α particles (Rutherford's Scattering formula and its Experimental verification) - Nuclear size and its determination: life time of α emitters, Anomalous scattering of α particles, Scattering of neutrons - nuclear reaction by charged particles - Mass spectroscopy: Bainbridge & Jordan Mass spectrograph - Nier's Mass Spectrometer - Theories of Nuclear composition (Proton - electron, proton - neutron) - Binding energy (Nuclear Stability) - Semi empirical mass formula - Quantum numbers for Individual nucleons - Quantum properties of Nuclear states.	**15**
II	**Radio Activity:** **Alpha decay:** Properties of α particles - velocity and energy of α particles - Gamow's theory of α decay - Geiger Nuttal law - α ray energies and fine structure of α rays. **Beta decay:** Properties of β particles - General features of β decay spectrum - Pauli's hypothesis - Fermi's theory of β decay (neutrino's theory of β decay) - forms of interaction & selection rules - K capture. **Gamma decay:** Properties of γ particles - The absorption of gamma rays by matter - interaction of Gamma rays with matter - measurement of Gamma ray energies -	**15**

	Dumond bent crystal spectrometer method - Internal conversion.	
III	**Nuclear Models:** Nuclear models - ***The liquid drop model – Semi empirical mass formula**** - The shell model - magic numbers - Collective model. **Nuclear Reaction:** Kinds of Nuclear reactions - Conservation laws - Nuclear reaction Kinematics - Nuclear cross section - cross section of a Nuclear reaction - continuum theory of Nuclear reactions - resonance: Breit - Wigner dispersion formula - different stages of Nuclear reaction - statistical theory of Nuclear reactions - Kinematics of stripping & pickup reactions.	**15**
IV	**Nuclear Fission:** Types of fission – Energy release in fission – Nature of fission fragments – Energy distribution between fission fragments – Neutran emission in fission process – Bohr & Wheeler's theory of nuclear fission and its Limitation – Charge distribution of fission products – Nuclear chain reaction. **Nuclear Fusion:** Source of Stellar energy – Fusion reactions – Energy balance and Lawson creterian – Cross sections of fusion reactions – reaction rates – critical temperature – Laser fusion process.	**15**
V	**Particle Physics :** Particle physics - classification of elementary particles - Fundamental interactions - Properties of Elementary particles - Bosons - Leptons- Mesons - π Mesons - K Mesons - C.P. Violation in neutral K-Meson decay - Baryons - Detection of Antiproton - The eight fold way - Quarks.	**15**

<* - *Self Study*>

Text Books:

1. D.C.Tayal, *Nuclear Physics*, 5th edition, Himalaya Publishing House, 2008. (Unit I, II, III)
2. M.L.Pandya & R.P.S.Yadav, *Elements of Nuclear Physics* - Kedar Nath Ram Nath & Co, 7th edition, reprint 2003. (Unit III, V)
3. S.L. Kakani & Shubhra Kakani, *Nuclear and particle Physics*, 1st edition, Viva books (P) Ltd, 2008. (Unit IV)

Reference Books:

1. Bernard L.Cohen, *Concept of nuclear Physics* – Tata McGraw Hill Publishing (P) Ltd, Reprint 2013.
2. Irving Kaplan, *Nuclear Physics* – Narosa Publishing House (P) Ltd, Reprint 2002.
3. N.N. Srivastava, *Basic Nuclear Physics* - Prgathi prakashan Publishing, Meerut, 2006.
4. R.R. Roy & B.P. Nigam, *Nuclear Physics theory and experiment* – New age international (P) Ltd, Reprint 2011.
5. R.C. Sharma, *Nuclear Physics* – K. Nath & co Educational publishing, 5th edition, 2000.

E-references:

1. https://nptel.ac.in/courses/115104043/+&cd=7&hl=en&ct=clnk&gl=in
2. https://www.youtube.com/watch?v=vPJidbP_oLM
3. https://www.youtube.com/watch?v=RXo-MrYR4bc

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	S	M	M
CO2	S	S	H	H	M
CO3	S	S	M	H	M
CO4	S	S	M	H	M
CO5	S	H	S	H	M

S - Strong; **H -** High; **M -** Medium; **L –** Low

Programme Code:	M.Sc.	Programme Title:	Physics	
Course Code:	19P3PH04	Course Title:	Batch:	2019
Total Hours:	75	Special Electronics (Analog & Digital Electronics)	Semester:	I
			Credits:	5.0

Course Objective

The course aims

- To gain the knowledge of applications of transistor at low & high frequencies.
- To be familiar with Characteristics of Feedback amplifiers, Oscillators and MOSFET.
- To have strong foundation in designing digital circuits.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	CO1	Understand the response of transistors at low and high frequencies and determination of hybrid parameters.
K2	CO2	Get the knowledge about characteristics of feedback amplifiers, oscillators, MOSFET, Thyristors and their operations.
K3	CO3	Acquire information about Operational Amplifier (OP – AMP) and its applications.
K4	CO4	Attain knowledge on Data processing and Data Acquisition systems.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Transistor at Low Frequencies:** The hybrid parameters - Determination of h-parameters - h-parameter equivalent circuit - performance of a linear circuit in h-parameters - the h-parameters of a transistor - Nomenclature for transistor h-parameters- transistor circuit performance in h-parameters- Experimental determination of h- parameters- Limitations of h-parameters. **Transistor at High Frequencies**: The Hybrid - pi (**π**) common - emitter Transistor model - Hybrid (**π**) conductances hybrid (**π**) capacitances - validity of hybrid (**π**) model - variation of hybrid (**π**) parameters - CE short circuit current gain- single stage CE Transistor Amplifier Response.	**15**
II	**Feedback Amplifier:** Feedback concept - general characteristics of negative - feedback amplifiers - input and output resistance - method of analysis of a feedback amplifier - voltage - series feedback - current - series feedback - current - shunt feedback - voltage - shunt feedback. **Oscillators:** **Sinusoidal Oscillators:** Introduction-Comparison between oscillator and amplifier – Classification of Oscillators–Applications of sinusoidal oscillators-Nature of sinusoidal oscillations-oscillatory circuit-frequency of oscillatory circuit-frequency stability of an oscillator-The Barkhausen criterion-Hartley Oscillator- Colpitt's oscillator –Clapp oscillator-Crystal oscillator-Quartz crystal-Characteristics, Equivalent circuit, Q factor and frequency stability of a quartz crystal- Crystal Oscillator circuit.	**15**

	Non-Sinusoidal Oscillators: Schmitt Trigger - Square wave and triangular wave generators.	
III	**MOSFET and Thyristors:** MOSFET- Depletion type and Enhancement type MOSFET- Working, Characteristics and circuit symbol of Depletion type and Enhancement type MOSFET- SCR-Operation-Equivalent circuit-Turning ON and OFF of SCR- V-I Characteristics – TRIAC-Operation-V-I characteristics- Applications of TRIAC-***DIAC-V-I Characteristics*.*** **Operational Amplifier and its Applications:** Op amp Basics - Active filters - solving linear simultaneous equation - solving linear differential equations -Log amplifier - Antilog amplifier - Voltage to current - current to voltage converter - Instrumentation Amplifier.	**15**
IV	**Data Processing and Data Acquisition:** Multiplexer and Demultiplexer - Decoder- Encoder- Sample and Hold system - Binary Weighted Resistor D/A converter - R-2R Resistive ladder D/A converter - Counter type A/D Converter - Successive approximation A/D Converter - Dual slope ADC- Parallel comparator A/D converter- 555 IC Timer -555 IC as Schmitt Trigger.	**15**
V	**Counters:** Asynchronous counter operation - Mod 4 counters - synchronous counter operation - Mod 3, Mod 5Counters - Up / down synchronous counters - cascaded counters. **Registers**: Basis shift register functions - serial in / serial out shift registers- serial in / parallel out shift registers - Bidirectional shift registers - shift register counters. **Memory and storage:** Random access memories - Read only Memories - Programmable ROMs (PROMs and EPROMs) - Flash Memories - Memory Expansion.	**15**

<* - Self Study>

Text Books:

1. Jacob Milliman & Christas C. Halkias, *Integrated Electronics,* Tata McGraw Hill Publications, 1983 (Unit I).
2. V.K.Mehta & Rohit Mehta, *Principles of Electronics,* S.Chand & Company, NewDelhi, 2015 (Unit I).
3. Dr.R.S.Sedha, *A Text Book of Applied Electronics,* S.Chand & Company, NewDelhi, 2017 (Unit II & III).
4. V.Vijayendran, *Introduction to Integrated Electronics*, 1st edition, S.Viswanathan (Printers & Publishers) Pvt.Ltd, Chennai, 2011(Unit IV & Unit V)

Reference Books:

1. B.L.Theraja, *Basic Electronics,* S.Chand & Company, NewDelhi, 2009.
2. Donald P.Leach, Albert Paul Malvino and Goutam Saha, *Digital Principles and applications,* 2nd edition, McGraw Hill Education Private Limited, NewDelhi, 2011.
3. Thomas L.Floyd, *Digital Fundamentals*, 8th edition, Pearson Education, 2003.

E-references:

1. https://www.tutorialspoint.com/sinusoidal_oscillators/sinusoidal_oscillators_tutorial.pdf
2. https://nptel.ac.in/courses/117103063/17
3. https://www.geeksforgeeks.org/counters-in-digital-logic/

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	H	S	S
CO2	S	S	M	H	S
CO3	S	H	S	S	S
CO4	H	S	H	S	S

S - Strong; **H -** High; **M -** Medium; **L –** Low

Programme Code:	M.Sc.	Programme Title:	Physics	
Course Code:	19P3PH05	Course Title:	Batch:	2019
Total Hours:	75	Mathematical Physics - II	Semester:	II
			Credits:	5.0

Course Objective

The course aims

- To acquire mathematical knowledge and apply it to various physical problems.
- To practice Mathematical methods for Physics through Matrices, tensors.
- To develop problem solving ability related to physical problems.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	CO1	Able to define types of matrices and can calculate inverse, orthogonality, Eigen values and vectors and theorems.
K2	CO2	Can get basic idea, theory and problems in algebra of tensors and types of tensors can simplify physical laws using coordinate transformations.
K3	CO3	Able to solve ordinary second order differential equations important in physical sciences.
K4	CO4	Solution of Hermite and Laguerre differential equation and theory and problems on generating function, Orthogonality and prove Recurrence relations. Can do problems on Beta and Gamma functions.
K5	CO5	Can explain the fundamental concepts of group theory and representation of groups.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Matrices:** Various types of Matrices (Review only) - Consistency of linear system of Equations and their solutions-Solution of Simultaneous Equations -Types of Linear Equations -Homogeneous Equations -Cramer's Rule - Characteristic roots or Eigen values- Cayley - Hamilton theorem - Characteristic Vectors or Eigen Vectors - properties of Eigen Vectors - Orthogonal Vectors - Diagonalisation of a Matrix - Theorem on Diagonalisation of a Matrix - Hermition, Skew Hermition and Unitary Matrices.	15
II	**Tensors:** N-dimensional space - Subscripts & superscripts- Co-ordinate Transformation - Indicial & Summation conventions - Dummy & Real indices- Kronecker Delta symbol - Scalars - Contravariant Vectors & Covariant Vectors - Tensors of Higher ranks - Algebric operations of Tensors - Symmetric & Antisymmetric Tensors - Invariant Tensors - Levi civita symbol - applications to physical problems.	15
III	**Differential Equations:** Linear Differential equations of second order with constant co-efficients - Introduction - Complementary function - Particular integral - Method of finding the Complementary function - Rules to find Particular integrals - Linear Partial Differential Equations – Rules for finding Complementary function and Particular integral - Applications of Partial Differential Equations: Method of Seperation of Variables - Examples: Equation of Vibrating string - One Dimensional Heat flow -	15

	Laplace Equation*.	
IV	**Hermite, Laguerres Function, Gamma, Beta functions:** Hermite's Equation - Generating function - Orthogonal Property - Recurrence Relation -Laguerre's function - Generating function - Orthogonal Property - Recurrence Relation - Gamma function - Transformation of Gamma function - Beta function - Evaluation of Beta function - A property of Beta function - Transformation of Beta function - Relation between Beta & Gamma functions - Problems involving Gamma & Beta Functions.	**15**
V	**Group Theory:** Concept of a Group- Abelian Group - The cyclic Group - The Group multiplication table - Rearrangement theorem - Isomorphism and Homomorphism - Permutation Groups - Cayley's Theorem - The Group of symmetry of equilateral Triangle - Group of symmetry of a square - Representation of Groups - Reducible and irreducible Representations - Schur's Lemma I and II - Orthogonality Theorem.	**15**

<* - *Self Study*>

Text Books:

1. Satya Prakash, *Mathematical Physics*, edition, Sultan chand & Sons, Reprint 2005. (Unit II,Unit IV, Unit V)
2. H.K.Dass, Dr.Rama verma, *Mathematical Physics*, 7th revised edition, S Chand & company Ltd, 2014. (Unit I, Unit III)

Reference Books:

1. B.D.Gupta, *Mathematical Physics*, 4th edition,Vikas Publishing house (P) Ltd, Reprint 2013.
2. B.S. Rajput - *Mathematical Physics*, 28th edition, Pragati Prakashan, Meerut, Reprint 2016.
3. A.W. Joshi, *Matrices and Tensors in Physics*, 3rd edition, New Age international (P) Ltd, 2005.
4. K.F. Riley and M.P. Hobson, Essential Mathematical methods for Physical sciences, Cambridge University Press, 2011.
5. P.K. Patra, R.K. Thapa, *Group Theory and its Applications*, Narosa Publishing House (P) Ltd.

E-references:

1. https://nptel.ac.in>courses
2. https://math.mit.edu/~gs/linearalgebra/ila0601.pdf
3. http://mathworld.wolfram.com/HermitePolynomial.html

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	S	S	M
CO2	S	S	S	S	S
CO3	S	H	H	S	H
CO4	S	S	H	S	H
CO5	S	S	S	S	H

S - Strong; **H -** High; **M -** Medium; **L –** Low

Programme Code:	M.Sc.	Programme Title:	Physics	
Course Code:	19P3PH06	Course Title:	Batch:	2019
Total Hours:	75	Electromagnetic Theory and Electrodynamics	Semester:	II
			Credits:	5.0

Course Objective

The course aims

- To gain an insight into the physical nature of elastic & magnetic phenomena.
- To understand the relationship between electric & magnetic fields and propagation of Electromagnetic fields.
- To acquire knowledge in relativistic Thermodynamics through Tensors.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	CO1	Recall on the basic about Magnetostatics and Electrostatics.
K2	CO2	Have an understanding of Maxwell's equations in different forms and apply them to workout problems.
K3	CO3	Analyse problems involving various media with boundary conditions and laws of reflection and refraction in em waves.
K4	CO4	Acquire knowledge about fields of moving charges and Radiating system.
K5	CO5	Can get an idea about four vectors tensors and transformation equations.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Electrostatics and Magnetostatics:** Potential and field due to an electric dipole - dielectric polarization - external field of a dielectric medium - Gauss's theorem in a dielectric - the electric displacement vector, D - linear dielectrics - relations connecting electric susceptibility - and dielectric constants. Electrostatic energy and energy density- Biot - Savart's law statement -Applications: Magnetic field due to a Long straight wire, Circular coil, Solenoid - Ampere's circuital law - Applications: Magnetic field due to a Long straight wire, Solenoid, Toroid - Divergence and curl of B - Magnetic scalar potential (derivation of expression only) - Equivalence of a small current loop and a magnetic dipole - ***Magnetic vector potential (derivation of expression only)*.***	**15**
II	**Field Equation and Conservation laws:** Equation of continuity - Displacement currents - The Maxwell's equation derivation - Physical significance - Poynting vector - Momentum in electromagnetic field - Electromagnetic potentials - Maxwell's equation in electro magnetic potentials - Concept of gauge - Lorentz gauge - Coulomb gauge - radiation produced by a low velocity accelerated charged particle (Larmour formula).	**15**
III	**Propagation of electromagnetic waves:** Electro Magnetic waves in free space pointing vector of free space (energy flow) - electromagnetic waves in matter - isotropic	**15**

	dielectric - anisotropic dielectric - in conducting media - pointing vector in conducting media – propagation in ionized gases. **Interaction of Electromagnetic waves with matter on Macroscopic scale & Microscopic scale:** Boundary conditions at interfaces - reflection and refraction - Frenel's law - Brewster's law and degree of polarization - total internal reflection and critical angle - Scattering and Scattering parameters - Scattering by a free electron (Thomson Scattering) - Scattering by a bound electron (Rayleigh Scattering).	
IV	**The fields of Moving charges and Radiations:** Retarded potentials - Lienard - Wiechert potentials - field of a point charge in uniform rectilinear motion - Radiation from an accelerated charged particle at low velocity - Radiation from an accelerated charged particle at high velocity. **Radiating system:** Oscillating electric dipole - Radiation from an oscillating dipole - Radiation from small current element.	**15**
V	**Relativistic Electrodynamics:** Four Vectors and Tensors - Transformation equation for charge density δ and current density J - Transformation equation for A and φ - The Electromagnetic field Tensor - Transformation equations for field vector E and B - covariance of Maxwell equations in 4 - vector from - covariance and Maxwell equations in 4 tensor form - covariance and transformation law of Lorentz force.	**15**

<* - *Self Study*>

Text Books:

1. Satya Prakash, *Electromagnetic theory and Electrodynamics*, Kedar Nath,Ram Nath & Co. 2019 (Unit I, Unit II).

2. Chopra & Agawal,*Electromagnetic theory* 6th edition,K Nath & Co, meerut 2017, (Unit III, Unit IV, Unit V).

Reference Books:

1. David J. Griffiths, *Introduction to Electrodynamics*, 3rd edition,
2. Saroj K.Dash, Smruti R.Khunta, *Fundamentals of Electro magnetic theory*, 2nd edition, PHI Learning (P) Ltd, 2011.
3. S.N.Ghosh, *Electro magnetic theory & wave propogation*, 2nd edition, Narosa Publishing house Reprint 2008.
4. Uma mukherji, *Electromagnetic field theory and wave propogation* , Narosa publishing house 2008.

E-references:

1. https://nptel.ac.in/courses/115101005/downloads/lectures-doc/Lecture-35.pdf
2. http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/coursenotes/modules/guide13.pdf

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	S	M
CO2	S	S	S	H	S
CO3	S	H	S	S	M
CO4	S	S	H	S	S
CO5	H	H	S	S	S

S - Strong; **H -** High; **M -** Medium; **L –** Low

Programme Code:	M.Sc.	**Programme Title:**	Physics	
Course Code:	19P3PH07	**Course Title:**	**Batch:**	2019
Total Hours:	75	Modern Optics	**Semester:**	II
			Credits:	5.0

Course Objective

The course aims

- To know the phenomena of propogation and nature of light, coherence and interference.
- To explore the basic principles involved in magneto optic, electro optic and Nonlinear optical effects.
- To understand the concept of optical fibers and attain relevant information about its fabrication.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	**CO1**	Obtain fundamental knowledge about propogation and nature of light, coherence and interference.
K2	**CO2**	Understand about Magneto optic, Electro optic and Non linear optic effects.
K3	**CO3**	Attain appropriate information about fabrication of optical fibers by various processes and the types of optical couplers.
K4	**CO4**	Have excellent understanding about diverse fiber optic sensors and their application in medical field.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Propogation and Nature of Light:** Electrical constants and speed of light – Plane harmonic waves: Phase Velocity- Group Velocity - The Doppler effect- Energy Flow: The pointing Vector - Linear Polarization – Circular and elliptic polarization - Matrix Representation of Polarization: Jones Calculus - Reflection and Refraction at a plane Boundary - Amplitudes of reflected and Refracted waves - Brewster angle.	**15**
II	**Coherence and Interference:** Theory of Partial Coherence: Visibility of fringes - Coherent Time and Coherent Length – Spectral resolution of a finite wave train: coherence and line width- Spatial Coherence – Intensity interferometry - Fourier Transform Spectroscopy - Interference with multiple beam - Theory of Multilayer films.	**15**
III	**Magneto optic and Electro optic effects:** Optical activity – Susceptibility tensor of an optically active medium – Faraday rotation on solids – Kerr electro optic effect – The Cotton Mouton effect – The Pockels effect. **Nonlinear Optics:** Harmonic generation – Second harmonic generation – phase matching – Third harmonic generation – Optical Mixing – Parametric generation of light – Self focusing of light.	**15**

IV	**Fiber Fabrication:** Classification of fiber fabrication techniques – External chemical vapor deposition (External CVD) – Axial vapor deposition (AVD) – Internal chemical vapor deposition – Multielement Glasses – Phasil system. **Optical Couplers:** Types of optical couplers – Directional coupler using four grin rod collimating lenses attached to the fiber – Other directional couplers – Star couplers – T couplers.	**15**
V	**Fiber Optic Sensors:** Fiber optic sensors – Intensity modulated sensors – Microbend strain intensity modulated sensor – Liquid level type hybrid sensor – Internal effect intensity modulated sensor – Phase sensor – Diffraction grating sensors – Sensors using single mode fiber – Interferrometric sensors - Interferrometric pressure sensor - Interferrometric temperature sensor – distributed fiber optic sensors – polarization problem in Interferrometric sensors using single mode fiber – Medical applications of fiber sensor – Fabry perot fiber optic sensor – ***Military and aerospace applications of fiber*.***	**15**

<* - Self Study>

Text Books:

1. Grant R.Fowles, Holt, Rinehart and Winston, *Introduction to Modern Optics*, Dover Publications, Inc., New York, 1975 (Unit I, Unit II, Unit III).
2. B.B.Laud, *Laser and Nonlinear Optics*, 2nd edition, New age international, 2008 (Unit III).
3. Subir kumar sarkar, *Optical Fibers and fiber optic communication systems*,S Chand and Co., 2010 (Unit IV, Unit V).

Reference Books:

1. A.B.Gupta, *Modern Optics,* 3rd edition, Arunabha Sen Books & Allied (P) Ltd, Kolkata, 2012.
2. N.Subrahmanyam Brijlal and M.N.Avadhanulu, *A Text Book of Optics*, S.Chand Publishers, 2006.
3. G.D.Barugh, *Essential of Laser and Nonlinear Optics*, Pragati Prakasan Meerut, 2000.
4. John M.Senoir, *Optical Fiber Communications,* 3rd edition, Pearson Education Limited, 2010.

E-references:

1. https://wiki.metropolia.fi/display/Physics/Coherence+and+Interference
2. https://nptel.ac.in/courses/115101008/17
3. https://onlinecourses.nptel.ac.in/noc18_ee28/preview

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	H	S
CO2	S	S	M	H	S
CO3	H	S	M	S	H
CO4	S	H	S	S	S

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

Programme Code:	M.Sc.	**Programme Title:**	Physics	
Course Code:	19P3PH08	**Course Title:**	**Batch:**	2019
Total Hours:	75	Elective - I: Thin Film Physics & Nano Science	**Semester:**	II
			Credits:	5.0

Course Objective

The course aims

- To understand fundamental aspects of thin film hardness, toughness, adhesion and functionality.
- Insight into the materials, fabrication and other experimental techniques that can be used on the nanoscale as well as their limitations.
- To promote the development of nanotechnology products and processes that help to solve health and environmental problems.

Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
K1	**CO1**	Gain knowledge about nature and preparation of thin film and thickness measuring methods.
K2	**CO2**	Understanding the stages of thin films and crystal growth, Defects.
K3	**CO3**	Get a clear view about Bottom – up and Top – down techniques, nanomaterials and nanotubes.
K4	**CO4**	Know about nanowires, preparation techniques and application of nanomaterials.
K5	**CO5**	Have the awareness of morphology and a application of thin film and nanotechnology.

K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate

SYLLABUS		
Unit	**Content**	**No. of Hours**
I	**Preparation of Thin film:** Nature of thin film - Deposition Technology - Distribution of Deposit - Thermal Deposition in Vacuo - **Resistance heating :** Thermal Evaporation - Flash Evaporation - **Chemical Vapour Deposition (CVD):** Thermal Decomposition or Pyrolysis - Vapour phase reaction - Vapour Transporation method - Disproportionation method - **Mass methods:** Microbalance Technique- Crystal oscillator- **Optical method:** Photometric - Ellipsometry - Interferometry - Substrate cleaning.	**15**
II	Film growth - Incorporation of defects, Impurities etc, in film - Deposition parameters and grain size - Epitaxy - Thin film structure - Substrate effect - Epitaxial deposit - Phase transition - Dissociation - Film thickness effect - **Crystal Growth process :** Nucleation stage- Epitaxial stage- Intermediate stage ***-Final stage****.	**15**
III	Basic idea of Nanotechnology -Techinques used in Nanotechnology – Bottom – up techniques – **Top – down – Techinques:** Electron beam lithography (EBL) – Dip pen nano lithography (DPN) – Nano imprint lithography (NIL) – UV imprint and EUV	**15**

	lithography. Nanomaterials - Properties of Nanomaterials - carbon nanomaterials- Graphite- Carbon nanocones- Fullerenes - Introduction of Nanotubes: types of nanotubes - properties of carbon nanotubes – Industrial application for Carbon Nanotubes.	
IV	**Nanowires:** Types of nanowires - properties of nanowires- Production of nanowires- Structure of nanowires- Use of nanowires. Quantum wells, wires and dots – Prepration of Quantum nanostrcture. **Methods of Synthesis:** RF plama – Chemical methods – Thermolysis – pulsed laser methods – Sol gel method. Methods of measuring properties: particle size determination - surface structure - potential risks of nanotechnology health & environmental impact of nanoparticles & nanomaterials.	**15**
V	**Characterization Techniques and Applications:** **Electron diffraction technique** - High energy electron diffraction - Low energy electron diffraction – Electron microscopy - Scanning electron microscopy - FE-SEM- Field ion Microscopy - Transmission Electron Microscopy - X ray photoelectron spectroscopy - Mass spectroscopy. **Applications of Thin Films:** Discrete passive component- Thermistor, Varistor, Strain Gauge Element- Microelectronics, Integrated circuits and other applications- **Applications of nanotechnology:** plastic solar cells - carbon nanotubes in solar cells - fuel cell electrodes - nanotechnology: in textile developments - smart materials - Nano computers quantum computers.	**15**

<* - Self Study>

Text Books:

1. A.Goswami, *Thin film fundamentals*, New age international (P) Ltd, - New Delhi – 1996 (Unit I, II & V)
2. Manasi Karkaie, *Nanotechnology Fundamentals and Application*, I. K International Publishing House (P) Ltd, - New Delhi - 2008 (Unit III, IV & V)

Reference Books:

1. Charles P. Poole Jr. and Frank J.Owens, *Introduction to Nanotechnology*, A John Wiley & Sons, Inc, Publications - New Jersey - 2003.

E-references:

1. https://pdfs.semanticscholar.org/fac1/91c1fa2e11ff2dd5367c02b88e65fda25011.pdf
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf

Mapping with Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	H	S
CO2	H	S	M	M	H
CO3	S	S	S	S	S
CO4	H	S	H	S	S
CO5	M	S	S	S	S

S - Strong; **H -** High; **M -** Medium; **L –** Low

Programme Code:	M.Sc.	**Programme Title:**	Physics	
Course Code:	19P3PHPA	**Course Title:**	**Batch:**	2019
Total Hours:	120	Practical - I: General Experiments	**Semester:**	II
			Credits:	4.0

Course Objective

The course aims

- To learn some basic experimental techniques.
- To verify some fundamental laws of physics and to measure different physical quantities.

SYLLABUS		
Unit	**Content**	**No. of Hours**
	Any Twelve Experiments: 1. Young's Modulus - Elliptical Fringes by Cornu's Method. 2. Young's Modulus - Hyperbolic Fringes by Cornu's Method. 3. Viscosity of liquids – Mayer's Oscillating Disc. 4. Thermal Conductivity – Forbe's Method 5. Copper Arc Spectrum - Constant Deviation Spectrograph 6. Iron Arc Spectrum - Constant Deviation Spectrograph 7. Determination of the specific charge 'e/m' - Thomson's Method 8. Temperature Co-efficient and Band gap energy of a Thermistor 9. Rotational Power of liquids using Polarimeter 10. Determination of λ and d λ of Sodium Light - Fabry -Perot Interferometer 11. Determination of Plank's Constant 12. Study of Laser Beam parameters 13. Laser Diffraction at a Circular Aperture 14. Characteristics of Geiger-Muller tube 15. Determination of Solar Constant 16. Determination of Dipole moment for various Liquids 17. Determination of dielectric constant of a liquid by RF oscillator method. 18. Determination of coefficient of coupling of AC bridge method. 19. Determination of λ and μ using Fresnel Bi-prism. 20. Charge of an electron by spectrometer. 21. Determination of optical absorption co – efficient and refractive index using He – Ne Laser. 22. Groove spacing of a Compact Disc (CD) using reflection grating.	**120**

Programme Code:	M.Sc.	**Programme Title:**	Physics	
Course Code:	19P3PHPB	**Course Title:**	**Batch:**	2019
Total Hours:	120	Practical - II: Electronics Experiments	**Semester:**	II
			Credits:	4.0

Course Objective

The course aims

- To construct different electronic circuits using Op Amp.
- To study the function of FET, SCR and DIAC characteristics.
- To construct the Monostable, Astable and Linear oscillator and study its output waveforms.
- To verify the results of shift registers and counters.

SYLLABUS		
Unit	**Content**	**No. of Hours**
	Any Twelve Experiments: 1. IC Regulated Dual Power Supply construction & Characteristics. 2. Parameters of Op-Amp 3. UJT Relaxation Oscillator & Characteristics 4. Decade Counter 5. IC 7483 - Arithmetic Operations 6. Sign changer, Scale changer, Adder and Subtractor - Op-Amp 7. Active Filters - Op-Amp 8. SCR Characteristics 9. Differential Amplifier - Op-Amp 10. Wave form generators - 8038 Chip 11. Characteristics of FET 12. Wein's bridge oscillator - Op-Amp 13. Grey Code Converter 14. Schmitt Trigger - Op-Amp 15. Differentiating, Integrating, Clipping, Clamping circuits - Op-Amp 16. DIAC Characteristics 17. Solving Simultaneous Equations - Op-Amp 18. Astable & Monostable Multivibrators - IC 555 19. Parity Generator and Checking 20. Shift Register - Digital IC's 21. Phase Shift oscillator - Op-Amp	**120**

Question Paper Pattern - P.G. Courses

(Common for Major and Supportive Papers)

For EOS Examinations: 60 Marks

The Question Paper is to be divided into THREE Sections.

Section-A Carries 10 Marks, Section-B Carries 20 Marks and Section-C Carries 30 Marks.

Section-A Contains 10 Multiple Choice Questions. (10 x 1 = 10)

Two Questions from each unit. (Q. No: 1 to 10)

Section-B Contains 5 Either or Choice Questions. (5 x 4 = 20)

Each Question carries 4 Marks. Both (a) and (b) from the same unit.

Q. No.: 11 (a) or (b) to 15(a) or (b)

Section-C Contains 5 Questions, out of which 3 Questions are to be answered. (3 x 10 = 30)

Each Question carries 10 Marks. One Question from each unit. Q. No.: 16 to 20

For CIA Examinations: 40 Marks

CIA Test I and II Question Paper Pattern: (30 Marks)

Section-A: 10 Multiple Choice Questions. (10 x 1 = 10)

Section-B: Two Questions out of Three. (2 x 5 = 10)

Section-C: One Question out of Two. (1 x 10 = 10)

Components of Continuous Internal Assessment (CIA)

Components		Calculation	CIA Total
Test 1 & Test 2	30	$30 + 40 + 30 = \frac{100 \times 40}{100} = 40$	40
Test 3 (Model Exam)	40		
Assignment + Seminar + Quiz / GD / Poster Presentation / Book Review / Field Visit Report	10+10+10 = 30		