ANNEXURE 18B05

V.V. VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

CHOICE BASED CREDIT SYSTEM
REGULATIONS AND SYLLABUS
(with effect from Academic Year 2018 - 2019)

V.V. Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 19 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 3 Ph.D. Programmes. All these programmes, except Ph.D. Programmes, have been framed as per the guidelines given by UGC under Choice Based Credit System (CBCS).

The Departments of Commerce, English and History upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The students' performance will be evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

Arts & Humanities	:	History (E.M. & T.M.), English, Tamil
Physical & Life Sciences	:	Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology, Computer Applications.
Commerce & Management	:	Commerce, Commerce with Computer Applications, Commerce with Professional Accounting Business Administration

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Biochemistry, Food Processing & Quality Control, Chemistry, Zoology, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	:	Commerce, Business Administration (MBA*)
		* AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM (PG)

1. Core Courses
2. Discipline Specific Elective Courses (DSEC)
3. Non Major Elective Course (NMEC)

List of Non Major Elective Courses (NMEC) Offered

PG PROGRAMMES

Name of the Course	Semester	Department
History of Freedom Movement in India (A.D. 1885 – 1947)	III	History
Functional and Communicative English	III	English
jkpOk; gpwJiwfSk;	III	Tamil
Taxation Concepts and Assessment	III	Commerce
Entrepreneurship	III	Business Administration
Mathematics For Competitive Examinations	III	Mathematics
Digital Electronics	III	Physics
Industrial Chemistry	III	Chemistry
Apiculture	III	Zoology
Nutrition and Health	III	Home Science – Nutrition and Dietetics
Clinical biochemistry (Basics)	III	Biochemistry
Introduction to Internet and HTML	III	Computer Science
Fundamentals of Information Technology	III	Information Technology
Principles of Information Technology	III	Computer Applications

ELIGIBILITY FOR ADMISSION

The candidate should have passed in B.Sc. Physics, Applied Physics, Electronics, Electronics and Communication degree of any recognized University.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of two academic years (four semesters).

MEDIUM OF INSTRUCTION

English

EVALUATION SCHEME

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	40	60	100
Practical / Project	40	60	100

Core Courses, Discipline Specific Elective Courses and Non Major Elective Course

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation		Marks
Periodic Test	:	25
Seminar	:	10
Assignment	:	5
Total	**:**	**40**

Three Periodic Tests - Average of the best two will be considered
Two Assignments - Best of the two will be considered

Practical

Mode of Evaluation		Marks
Periodic Test	:	30
Record	:	5
Performance	:	5
Total	**:**	**40**

Three Periodic Tests - Average of the best two will be considered

Question Pattern for Periodic Tests **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Max. Marks
A Q.No.(1 - 5)	Multiple Choice	5	5	1	5
B Q.No.(6 - 10)	Internal Choice Either or Type	5	5	5	25
C Q.No.(11 - 13)	Open Choice	3	2	10	20
				Total	**50**

Marks obtained to be calculated for 25 Marks

EXTERNAL EXAMINATION
Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each question	Total Marks
A Q.No.(1 - 5)	Multiple Choice (Atleast one question from each unit)	**5**	5	1	5
B Q.No.(6 - 10)	Internal Choice Either Or Type	5	5	5	25
C Q.No.(11-15)	Open Choice (one from each unit)	5	3	10	30
Total					**60**

ON LINE ASSESSMENT (SET/NET Preparation – General Paper)

Online Test with Multiple Choice Question Pattern for 100 marks will be conducted in III Semester.

ELIGIBILITY FOR THE DEGREE

1. The candidate will not be eligible for degree without completing the prescribed Courses of study, lab work etc., and a minimum of 50% Pass marks in all the Courses.
2. Attendance, progress and conduct certification from the Head of the Institution will be required for the students to write the examination.
   - No Pass minimum for Internal Assessment.
   - Pass minimum for External Examination is 27 marks out of 60 marks for Core Courses, Discipline Specific Elective Courses and Non Major Elective Course.

ATTENDANCE

The following rules are applicable to the students of all UG, PG and M.Phil. Programmes with effect from 2018-2019.

a) The students with an attendance of 85% and above are permitted to appear for the Summative Examinations without any condition.
b) The students with 78% - 84 % of attendance are permitted to appear for the Summative Examinations by paying a fine of ₹500/-
c) The students with 66% - 77% of attendance can appear for the Summative Examinations only after getting special permission from the Principal. Special permission shall be granted by the Principal only on medical grounds and those students should also pay a fine of ₹1000/- along with the application form for exemption. If permission is not granted, they have to appear for the Summative Examinations in the next Semester by paying a fine of ₹1000/-
d) The students who have less than 65% of attendance cannot appear for the Summative Examinations and have to repeat the whole semester .
e) For Part V Courses, the students require 75% of attendance to get the required credit.
f) For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

MASTER OF PHYSICS

Programme Code – 7014

PROGRAMME OUTCOMES

- Empower self-disciplined, self-monitored and self-esteemed thinking.
- Practice intellectual conception of information, analytical observation, intelligent perception, systematic evaluation and active execution.
- Enhance virtual and non-virtual communication, technical and technological bondage with the society.
- Spread scientific temperament to the Nation, while dealing with the various issues of the society.
- Volunteer in the civic life with values, morality, responsibility and justice.
- Preserve nature in its original form amidst all the natural and artificial calamities.
- Develop the self-sustained and infinite learning to meet the challenges of the contemporary socio-technological scenario.

PROGRAMME SPECIFIC OUTCOMES

- In-depth and detailed functional knowledge of the fundamental theoretical concepts of Physics
- contribution to the betterment of society through knowledge in Physics
- obtain insight into the interface between the history of Physics and natural science and modern technology
- acquire experimental skills required to solve scientific and technological problems

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MASTER OF PHYSICS

Programme Structure - Allotment of Hours and Credits
For those who join in the Academic Year 2018-2019

Components	**Semester**				**Total Number of Hours/Credits**
	I	**II**	**III**	**IV**	
Core Course	6 (4)	6 (4)	6 (4)	6 (5)	**24 (17)**
Core Course	6 (5)	6 (5)	6 (5)	6 (5)	**24 (20)**
Core Course	6 (5)	6 (5)	6 (5)	6 (5)	**24 (20)**
Core Practical	6 (3)	6 (3)	6 (3)	-	**18 (9)**
DSEC	6 (5)	6 (5)	-	6 (5)	**18 (15)**
NMEC	-	-	5 (4)		**5 (4)**
Online Course (SET/NET Preparation - General Paper)	-	-	1 (1)		**1 (1)**
Project	-	-	-	6 (4)	**6 (4)**
Total	**30 (22)**	**30 (22)**	**30 (22)**	**30 (24)**	**120 (90)**

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MASTER OF PHYSICS
Programme Code – 7014

PROGRAMME CONTENT

SEMESTER I

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-1	Mathematical Physics – I	18PPHC11	6	4	3	40	60	100
2	Core Course-2	Classical Mechanics	18PPHC12	6	5	3	40	60	100
3	Core Course-3	Advanced Electronics	18PPHC13	6	5	3	40	60	100
4	Core Practical-1	Electronics and General Physics lab-I	18PPHC11P	6	3	6	40	60	100
5	DSEC-1	DSEC - Numerical Methods & Programming in C++ / Microprocessors	18PPHE11/ 18PPHE12	6	5	3	40	60	100
			Total	**30**	**22**				**500**

DSEC - Discipline Specific Elective Course

M.Sc. Physics - SEMESTER II

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-4	Mathematical Physics – II	18PPHC21	6	4	3	40	60	100
2	Core Course-5	Statistical Mechanics	18PPHC22	6	5	3	40	60	100
3	Core Course-6	Quantum Mechanics - I	18PPHC23	6	5	3	40	60	100
4	Core Practical-2	Electronics and General Physics lab-II	18PPHC21P	6	3	6	40	60	100
5	DSEC-2	Nuclear and Particle Physics / Applied Optics and Laser Physics	18PPHE21/ 18PPHE22	6	5	3	40	60	100
			Total	**30**	**22**				**500**

DSEC- Discipline Specific Elective Course

M.Sc. Physics - SEMESTER III

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-7	Solid State Physics - I	18PPHC31	6	4	3	40	60	100
2	Core Course-8	Electromagnetic Theory	18PPHC32	6	5	3	40	60	100
3	Core Course-9	Quantum Mechanics - II	18PPHC33	6	5	3	40	60	100
4	Core Practical-3	Electronics and General Physics lab-III	18PPHC31P	6	3	6	40	60	100
5	NMEC	NME – Digital Electronics	18PPHN31	5	4	3	40	60	100
6	Online Course	SET/NET Preparation - General	18POLS31	1	1	-	100		100
			Total	**30**	**22**				**600**

NMEC: Non Major Elective Course

M.Sc.Physics - SEMESTER IV

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-10	Solid State Physics – II	18PPHC41	6	5	3	40	60	100
2	Core Course-11	Molecular Spectroscopy	18PPHC42	6	5	3	40	60	100
3	Core Course-12	Applied Physics	18PPHC43	6	5	3	40	60	100
4	Core Course-13	Project Viva - voce	18PPHC41PR	6	4	6	40	60	100
5	DSEC -3	DSEC – Nano Physics / Bio Physics	18PPHE41/ 18PPHE42	6	5	3	40	60	100
			Total	**30**	**24**				**500**

DSEC: Discipline Specific Elective Course

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M.Sc. Physics
(2018-2019 onwards)

Semester I	**MATHEMATICAL PHYSICS-I**	Hours/Week: 6	
Core Course-1		Credits: 4	
Course Code **18PPHC11**		Internal 40	External 60

COURSE OUTCOMES

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

- have confidence in solving mathematical problems in Physics by mathematical techniques.
- impart basic knowledge in Vectors.
- understand and apply the concepts of Matrices.
- solve linear equations with Cramer's Rule.
- solve Linear Differential Equations using Power-Series Methods.
- be familiar with the most important special functions including Legendre Polynomial and Bessel functions.

UNIT I

Vectors: The Gradient - Line & Surface integrals - Problems - The Divergence and Gauss's theorem - Curl of a Vector field and Stoke's theorem - Successive application of the operator - Orthogonal Curvilinear Co-ordinates - Application to hydrodynamics: Equation of heat flow in solids. (18 Hours)

UNIT II

Matrices: Basic algebraic operations - Special matrices (I & II) - Determinants - Partitioning of matrices - Systems of linear equations- particular cases - Systems of linear equations general - Eigen value problems (I & II). (18Hours)

UNIT III

Special Functions I: Legendre Differential Equation and Legendre functions - Generating function of legendre polynomial - Rodrigue's formula for the Legendre Polynomials - Orthogonal properties of Legendre's polynomials - Recurrence formulae for $P_n(X)$ - Laplace's integrals - Trignometric series for $P_n(X)$. (18 Hours)

UNIT IV

Special Functions II: Bessel's Differential Equation - Bessel's Function of first kind - Recurrence Formulae for $J_n(x)$ - Generating Function for $J_n(x)$ - Jacobi Series - Bessel's Integrals - Orthonormality of Bessel's Functions - Modified Bessel Function.

(18 Hours)

UNIT V

Special Functions III: Hermite Differential Equation and Hermite Polynomials - Generating function of Hermite Polynomials - Recurrence formulae for Hermite Polynomials - Rodrigue's formula for Hermite Polynomials - Orthogonality of Hermite Polynomials.

(18 Hours)

TEXT BOOKS

1. Sathya Prakash (2006), *Mathematical Physics,* Sultan Chand & Sons, New Delhi.
   UNIT I – CHAPTER 1- 1.1 to 1.10, 1.15, 1.19 (B)
   UNIT III – CHAPTER 7 - 7.11 to 7.17
   UNIT IV – CHAPTER 7 - 7.21, 7.25 to 7.30
   UNIT V – CHAPTER 7 - 7.33 to 7.37
2. Joshi.A.W (1995), *Matrices and Tensors in Physics* (Third Edition), New Age International Publishers Ltd.,
   UNIT II – CHAPTER 1- 2.1 to 2.12, 3.1 to 3.4, 3.8, 4, 5.1 to 5.7, 6.1, 6.2 to 7.1, 7.2, 7.4, 7.5, 8.1 to 8.3, 9.1 to 9.3, 10.1.

REFERENCE BOOKS

1. Gupta.B.D (2009), *Mathematical Physics*, Third Edition, Vikas Publishing House.
2. Pipes and Harvill (1970), *Applied mathematical for Engineers and Physicists*, III Edition,McGraw Hill International Book Company.
3. Weber and Arfken (2005), *Essential Mathematical methods for Physicists*, Elsevier India pvt. Ltd, New Delhi.

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M.Sc. Physics
(2018-2019 onwards)

Semester I	**CLASSICAL MECHANICS**	Hours/Week: 6	
Core Course-2		Credits: 5	
Course Code **18PPHC12**		Internal 40	External 60

COURSE OUTCOMES

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

- assimilate Lagrangian and Hamiltonian formulations.
- represent the equation of motion for the mechanical system using Lagrangian and Hamiltonian formulations.
- gain knowledge in canonical transformations.
- understand the significance of Hamilton-Jacobi equation, and the advantages of using action-angle variables.
- demonstrate the concept of Newtonian gravitational fields and central forces and their effects.
- internalise the mechanics of small oscillations.

UNIT I

Lagrangian and Hamiltonian Methods: Generalised Coordinates - Lagrangian equations of motion - Hamiltons variational principle - Deduction of Lagrangian equations of motions from Hamilton's principle - Deduction of Lagrangian equations by differential method - D'Alembert's principle - Procedure to eliminate consideration of ignorable co-ordinates - The Routhain function - Hamiltonian - Hamiltonian canonical equations of

motion - Physical significance of the Hamiltonian - Advantages of Hamiltonian approach - Deduction of canonical equations from Variational principle - Applications - The principle of least action. (18 Hours)

UNIT II

Canonical Transformations: Canonical Transformations - Advantages of Canonical Transformations - Examples of canonical transformations - Condition for transformation to be canonical - Infinitesimal contact transformation - Poisson brackets: Definition - Invariance of Poisson bracket with respect to Canonical Transformation - Equation of motion in Poisson bracket form - Lagrange's brackets - Relation between Lagrange & Poisson brackets - Liouville's theorem. (18 Hours)

UNIT III

Hamilton-Jacobi Theory: Hamilton-Jacobi method - Solution of harmonic oscillator problem by Hamilton-Jacobi method - Particle falling freely - Hamilton-Jacobi equation for Hamilton's characteristic function - Kepler's problem solution by H.J method - The case of a projectile - Damped harmonic oscillator - Action & Angle variable - Solution of Harmonic oscillator problem by action angle variable method. (18 Hours)

UNIT IV

Motion under a central force two body problem: - Equivalent one body problem - Reduced mass concept - General features of central force motion - Equivalent one dimensional problem: General features of the orbits - Stability of orbits and conditions for closure - Motion under inverse square force: kepler's problem - Virial theorem.

(18 Hours)

UNIT V

Mechanics of Small Oscillations: Stable and Unstable equilibrium - Two coupled Oscillators - Formulation of the problem: Lagrange's equations of motion for small oscillations - Properties of T, V & ω - Normal Co-ordinates and Normal frequencies of vibration - Linear triatomic molecule. (18 Hours)

TEXT BOOK

Gupta Kumar Sharma (2008), *Classical Mechanics*, Twenty Fourth Edition, Pragati Prakashan, Meerut.

UNIT I – CHAPTER 1- 1.6

CHAPTER 2 - 2.3, 2.4, 2.5, 2.12

CHAPTER 3 - 3.3 to 3.7, 3.9, 3.10

UNIT II – CHAPTER 3 - 3.11 to 3.13, 3.21 - 3.23, 3.28 - 3.30

UNIT III – CHAPTER 3 - 3.14 to 3.17, 3.19, 3.20

UNIT IV – CHAPTER 4 - 4.1 to 4.6

UNIT V – CHAPTER 8 - 8.1 to 8.5, 8.6 D

REFERENCE BOOKS

1. Goldstein (1980), *Classical Mechanics*, II edition, Narosa Publishing House.
2. Gupta.B.D, Sathya Prakash (2003), *Classical Mechanics*, Kedarnath Ramnath, Meerut.
3. Takwale.R.G, Puranik.P.S (1993), *Introduction to Classical Mechanics*, Tata McGraw-Hill Publishing Company Limited, New Delhi.

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M.Sc. Physics
(2018-2019 onwards)

Semester I	**ADVANCED ELECTRONICS**	Hours/Week: 6	
Core Course-3		Credits: 5	
Course Code **18PPHC13**		Internal 40	External 60

COURSE OUTCOMES

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

- study the basic amplifier, power amplifier circuits and its performance.
- understand the effect of feed back in amplifiers and their applications.
- acquire knowledge on op-amp and its applications.
- gain knowledge on modulation and demodulation systems.
- understand the microcontroller architecture and gain a knowledge about interfacing concept.
- develop the programming skills in microcontroller.

UNIT I

Feedback Amplifiers: Classification of amplifiers - The feedback concept - General characteristics of negative feedback amplifiers - Effect of negative feedback upon output and input resistances - Voltage-series feedback - Current-series feedback - Current shunt feedback - Voltage shunt feedback.

Multistage Amplifiers: Different coupling schemes used in amplifiers - RC Coupled amplifiers - operation at low, middle, high gain frequency response - Transformer coupled amplifier - Equivalent circuit at low, medium and high frequencies. (18 Hours)

UNIT II

Operational Amplifier: Integrated Circuits - Types of Integrated Circuits - Development of Integrated Circuits - Power supplies for Integrated circuits - The ideal Op-amp - Equivalent Circuit of an Op-amp - Ideal Voltage Transfer Curve - Open loop Op- amp Configurations - Voltage Series Feedback Amplifier - Voltage-Shunt Feedback Amplifier - Differential Amplifiers. (18 Hours)

UNIT III

Applications of Operational Amplifier: Op-amp DC and AC Amplifiers - Summing, Scaling, and Averaging Amplifiers - Instrumentation Amplifier - Current to Voltage Converter - The Integrator - The Differentiator - Active Filters - All Pass Filters - Phase Shift Oscillators - Wien Bridge Oscillator - Square wave Generator - Saw tooth Wave Generator - Voltage Controlled Oscillator - Schmitt Trigger - Voltage to Frequency and Frequency to Voltage Converters - Analog to Digital and Digital to Analog Converters.

(18 Hours)

UNIT IV

Modulation of Signals:

Amplitude modulation: Amplitude modulation - Amplitude Modulated Transmitters - AM receivers - Single sideband modulation: Principles - SSB generation - SSB reception - Signal to noise ratio for SSB.

Angle modulation: Frequency modulation - sinusoidal FM- Frequency spectrum for sinusoidal FM - Phase modulation - Equivalence between PM and FM.

Pulse modulation: PAM - PCM. (18 Hours)

UNIT V

Intel 8051 Microcontroller: Features of 8051 - Pin configuration of 8051 Architecture of 8051 - Addressing Mode of 8051 - Instruction set of 8051 - simple programs (Addition, Subtraction, Multiplication, Division)

8051 Interfacing Functions: Interfacing of 8051 - LCD, LED, ADC and DAC Application. (18 Hours)

TEXT BOOKS

1. Jacob Millman, Halkias Christos.C (1967), *Integrated Electronics*, McGraw Hill International Editions.

   UNIT I: CHAPTER 13 - 13.1 to 13.6
2. Salivahanan.S, Sureshkumar.N, Vallavaraj.A (1999), *Electronic Devices and Circuits*, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

   UNIT I: Chapter 10 - 10.1, 10.2, 10.5 (Relevant Sections), 10.6 (Relevant Sections)
3. Ramakant A.Gayakwad (1993), *Op-Amps and Linear Integrated Circuits*, 5th edition, Pearson Publication.

   UNIT II – CHAPTER 1 - 1.6 to 1.9, 1.13

   CHAPTER 2 - 2.3 to 2.6

   CHAPTER 3 - 3.3 to 3.5

   UNIT III – CHAPTER 6 - 6.2, 6.5, 6.6, 6.8, 6.10, 6.12, 6.13

   CHAPTER 7 - 7.2, 7.10, 7.12, 7.13, 7.15, 7.17, 7.18

   CHAPTER 8 - 8.4, 8.10, 8.11
4. Roddy.D & Coolen.J (2006), *Electronic Communications*, 4th Edition, Prentice Hall of India.

   UNIT IV – CHAPTER 8 - 8.1 to 8.5, 8.12 to 8.14

   CHAPTER 9 - 9.1, 9.2 to 9.5, 9.7

   CHAPTER 10 - 10.1 to 10.5, 10.8, 10.9

   CHAPTER 11 - 11.1 to 11.3
5. Godse.A.P & Godse.D.A (2009), *Microprocessor and Microcontroller*, Technical Publications, Pune.

   UNIT V – CHAPTER 15:15.2 to 15.4

   CHAPTER 16 - 16.2 to 16.10

   CHAPTER 18 - 18.2.3, 18.6, 18.7

REFERENCE BOOKS

1. Roy Choudhary.D (2010) Linear *Integrated Circuits*, 4th edition New age International Publishers.
2. Senthilkumaran.N (2010), *Microprocessor* & *Microcontrollers*, Oxford University Press.
3. Sedha.R.S (2008), *A Text book of Applied Electronics*, S.Chand & Company Limited.

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M.Sc. Physics
(2018-2019 onwards)

Semester I	**ELECTRONICS & GENERAL PHYSICS LAB – I**	Hours/Week: 6	
Core Practical-1		Credits: 3	
Course Code **18PPHC11P**		Internal 40	External 60

CORE PRACTICAL

1. Hyperbolic fringes
2. Emitter Follower
3. Wave Shaping Circuits using IC 741
4. Wave form Generators using IC 741
5. Active Filter Circuits – Low, High and Band Pass Filters
6. Edser–Butler Fringes
7. Determination of Capacitance using Wein's Bridge

C++ Program

8. Solution of an equation by Newton – Raphson method
9. Evaluation of definite integrals using Trapezoidal rule & Simpson's rule
10. Solution of first order differential equation by Runge – Kutta IV order method

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M.Sc. Physics

(2018-2019 onwards)

Semester I	**NUMERICAL METHODS AND PROGRAMMING IN C++**	Hours/Week: 6	
DSEC-1		Credits: 5	
Course Code **18PPHE11**		Internal 40	External 60

COURSE OUTCOMES

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

- solve the simultaneous equations using numerical techniques.
- be able to formulate and apply numerical techniques for curve fitting.
- solve the differential equations and integral equations numerically.
- be familiar with numerical solutions of ordinary differential equations.
- study about the control and branching statements in C++.
- write the programs in C++ for various methods.

UNIT I

Solution of simultaneous Algebraic Equations: The Gauss Elimination method - Pivoting - Ill conditioned equations - refinement of the solution obtained by Gauss Elimination - The Gauss Seidal iterative method.

Least Squares Approximation of Functions: Linear regression - Polynomial regression - Fitting exponential and trigonometric functions. (18 Hours)

UNIT II

Differentiation and Integration: Formulae for numerical differentiation - Numerical integration - Simpson's rule - Trapezoidal rule.

Numerical Solutions for Differential equations: Euler's methods - Runge Kutta methods - Runge Kutta Fourth order formulae - Predictor Corrector method - Higher order differential equations. (18 Hours)

UNIT III

Programming in C++: Data types, operators and statements: Identifiers and Keywords - Constants - C++ operators - Type conversion - Summary of C++ operators - Declaration of variables - Statements - Simple C++ programs - Features of iostream.h - Manipulation functions - Input and Output (I/O) stream flags. (18 Hours)

UNIT IV

Control Statements: Conditional expressions – if statement - if-else statement - Switch statement - Loop statements - for loop - while loop - do-while loop- Breaking control statement - break statement - continue statement- goto statement. (18 Hours)

UNIT V

Function and Program statements: Defining a function - Return statement - Types of functions - Actual and formal arguments - Local and global variables - Default arguments - Recursive functions. (18 Hours)

TEXT BOOKS

1. Rajaraman.V (2005), *Computer Oriented Numerical Methods*, 3rd Edition, PHI, New Delhi.
   UNIT I – CHAPTER 4 - 4.1 to 4.6
   CHAPTER 6 - 6.1, 6.2, 6.4, 6.5
   UNIT II – CHAPTER 8 - 8.2 to 8.4, 8.8
   CHAPTER 9 - 9.2, 9.4 to 9.6, 9.7
2. Ravichandran.D (2002), *Programming in C++*, 18th Reprint, Tata Mc Graw – Hill Publishing Company Ltd, New Delhi.
   UNIT III – CHAPTER 1 - 1.1 to 1.5
   CHAPTER 2 - 2.1 to 2.6
   UNIT IV – CHAPTER 3 - 3.1 to 3.4
   UNIT V – CHAPTER 4 - 4.1 to 4.7, 4.10

REFERENCE BOOKS

1. Venkataraman.M.K (1999), *Numerical Methods in Science and Engineering*, The National Publishing Company.
2. Balagurusamy.E (2006), *OOP with C++*, Tata Mc Graw – Hill Publishing Company Ltd, New Delhi.
3. Yeshwant Kanetkar (1999), *Let us C++*, BPB Publications, New Delhi.

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VIRUDHUNAGAR - 626 001

M.Sc. Physics

(2018-2019 onwards)

Semester I	**MICROPROCESSORS**	Hours/Week: 6	
DSEC-1		Credits: 5	
Course Code **18PPHE12**		Internal 40	External 60

COURSE OUTCOMES

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

- understand microprocessor architecture.
- impart the knowledge about the instruction set.
- develop the programming skills.
- apply the fundamentals of assembly level programming of microprocessor.
- know a detailed software & hardware structure of the microprocessor.
- illustrate how the peripherals are interfaced with microprocessor.

UNIT I

Architecture: A detailed look at the 8085 MPU and its architecture - 8085 programming - Instruction classification - Instruction format - How to write, assemble and execute a simple program - Introduction to 8085 instructions - Data transfer operations - Arithmetic operations - Logic operations - Branch operations - Writing assembly language program - Debugging a program. (18 Hours)

UNIT II

Programming techniques: Programming techniques with additional instructions - Looping, counting and indexing - Additional data transfer and 16 bit arithmetic instructions - Arithmetic operations related to memory - Logic operations; Rotate and compare - Dynamic debugging. (18 Hours)

UNIT III

Counters and time delays: Counters and time delays - Illustrative programs - Hexadecimal Counters - Zero to nine counters - Generating pulse wave form - Debugging counters and time delay programs

Stack and subroutines: Stack - Subroutine - Conditional call and Return instructions - Advanced and subroutine concepts. (18 Hours)

UNIT IV

Applications: Code conversion, BCD arithmetic and 16 bit data operations - BCD to binary conversion - Binary to BCD conversion - BCD to seven segment LED code conversion - BCD addition - BCD subtraction - Introduction to advanced instructions and applications - Multiplication - Subtraction with carry- Interrupts - The 8085 interrupts - 8085 vectored interrupts - Restart as software instructions. (18 Hours)

UNIT V

Interfacing data converters: Digital to analog converters - Analog to digital Converters - 8255A programmable peripheral interface. (18 Hours)

TEXT BOOK

Ramesh S Gaonkar (1997) M*icroprocessor-Architecture, Programming and application with 8085*, III Edition, Penram International Publishing, India.

UNIT I – CHAPTER 3 - 3.1 to 3.5

CHAPTER 5 - 5.1 to 5.5

CHAPTER 6 - 6.1 to 6.6

UNIT II – CHAPTER 7 - 7.1 to 7. 6

UNIT III – CHAPTER 8 - 8.1 to 8.5

CHAPTER 9 - 9.1 to 9.4

UNIT IV – CHAPTER 10 - 10.1 to 10.9

CHAPTER 12 - 12.1 to 12.3

UNIT V – CHAPTER 13 - 13.1to13.2

CHAPTER 15 - 15.1

REFERENCE BOOKS

1. Ram.B (2005), *Fundamentals of Microprocessor and Microcomputers*, Dhanpat Rai Publications.
2. Godse .A.P and Godse.D.A (2005), *Microprocessors*, Technical Publications, Pune.
3. Mathur. A.P (1989), *Introduction to Microprocessors, III* Edition, Tata McGraw Hill Company, New Delhi.

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M.Sc. Physics
(2018-2019 onwards)

Semester II	**MATHEMATICAL PHYSICS-II**	Hours/Week: 6	
Core Course-4		Credits: 4	
Course Code **18PPHC21**		Internal 40	External 60

COURSE OUTCOMES

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

- apprehend the concepts of Fourier series and Fourier Transform.
- use complex variables in solving problems.
- apprehend the basic elements of complex analysis, including the important integral theorems.
- apply tensors in relevant problems
- have knowledge on basic ideas about group theory.
- solve problems using probabilistic methods and ideas

UNIT I

Tensors: n-dimensional Space - Superscript and Subscript - Co-ordinate transformation - Indicial and summation conventions - Dummy and Real indices – Kronecker delta symbol - Scalars, Contravariant and Co-variant Vectors - Tensors of Higher ranks - Algebraic operation of tensors - Symmetric and Anti symmetric tensors - Fundamental tensors - Raising and lowering of indices; Associated tensors - Co-variant differentiation of vectors. (18 Hours)

UNIT II

Complex Variables: Functions of a complex variable - The Derivative and the Cauchy - Riemann Differential equations - Line Integrals of complex functions - Cauchy's integral theorem - Cauchy's integral formula.

Residues: Singularities of an analytic function - Residues and their evaluation - Cauchy Residue theorem - Evaluation of definite integrals. (18 Hours)

UNIT III

Fourier series and Fourier Transform: Fourier series - Dirichlet's theorem and Dirichlet's conditions - Examples of Fourier expansions of functions - Uses of Fourier Series - Fourier Transform - Properties of Fourier Transform - Fourier Sine & Cosine transforms of derivatives - Fourier transform of functions of two or three variables - Finite Fourier transforms. (18 Hours)

UNIT IV

Probability: Definition - Sample space - Mutually exclusive events - Theorem of total probability - Compound event and theorem - Binomial theorem of probability - Measure of central tendency: Average - Binomial distribution - Poisson distribution - Normal distribution. (18 Hours)

UNIT V

Group Theory: Concept of a group - Abelian group - Generators of finite group - Cyclic group - Group multiplication table - Rearrangement theorem - Sub group - Coset - Conjugate elements and Classes - Isomorphism and Homomorphism - Group of symmetry of triangle and square - Representation of a group - Reducible and irreducible representations - The orthogonality theorem - Character Table. (18 Hours)

TEXT BOOK

1. Sathya Prakash (2011), *Mathematical Physics*, Sultan Chand & Sons, New Delhi.

UNIT I – CHAPTER 3 - 3.1 to 3.11, 3.17, 3.18, 3.23

UNIT II – CHAPTER 6 - 6.1 to 6.4, 6.7, 6.9 to 6.12, 6.14, 6.16, 6.22 to 6.25(a)

UNIT III – CHAPTER 8 - 8.1 to 8.8

CHAPTER 10 - 10.1, 10.2, 10.3, 10.5 to 10.7

UNIT IV – CHAPTER 12 - 12.1 to 12.7, 12.10, 12.19 to 12.22

UNIT V – CHAPTER 13 - 13.1to13.9, 13.13, 13.16 to 13.19, 13.21, 13.22

REFERENCE BOOKS

1. Gupta.B.D (2009), *Mathematical Physics*, Third Edition, Vikas Publishing House.
2. Dass.H.K(2004), *Mathematical Physics* ,Fourth Edition S.Chand & Company Ltd. New Delhi.
3. Pipes and Harvill *(1970) Applied mathematics for Engineers and Physicists* III Edition McGraw Hill International Book Company.
4. Cotton.A, *Chemical Applications of Group Theory*, II Edition, Eastern Ltd.

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M.Sc. Physics

(2018-2019 onwards)

Semester II	**STATISTICAL MECHANICS**	Hours/Week: 6	
Core Course-5		Credits: 5	
Course Code **18PPHC22**		Internal 40	External 60

COURSE OUTCOMES

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

- apprehend knowledge on thermodynamics and Classical statistics.
- apply the concepts and principles of black body radiation to analyze radiation phenomena in thermodynamic systems.
- appreciate the concepts of quantum statistical mechanics.
- recognize application of quantum statistics.
- correlate statistical mechanics with thermodynamics and distinguish the three distribution functions.
- study the systems of particles in which statistical equation of state of a substance and its energy equation

UNIT I

Thermodynamics & its application: Second law of thermodynamics - Entropy and second law of thermodynamics - Entropy and disorder - Thermodynamic potential and reciprocity relations - Nernst's heat theorem (Third law of thermodynamics) - Chemical Potential - Radiant energy - Black body radiation - Stefan's Boltzmann law - Wiens displacement law - Planck's radiation law - Rayleigh Jein's law. (18 Hours)

UNIT II

Classical Statistics: Phase space - Volume in Phase space - Ensembles - uses of ensembles - Density of distribution in phase space - Liouville's theorem - Micro and Macro states - Thermodynamical probability - General statistical distribution law - Most Probable distribution - Maxwell Boltzmann distribution law. (18 Hours)

UNIT III

Method of Ensembles: Microcanonical ensemble - Partition function and its correlation with thermodynamic quantities - Gibb's canonical ensemble - Thermodynamic functions for canonical ensemble - Partition function and its properties - Grandcanonical ensemble - Partition function and thermodynamic functions for grand canonical ensemble. (18 Hours)

UNIT IV

Quantum statistics: Transition from classical quantum mechanics to quantum statistical mechanics - Indistinguishability and quantum statistics - Bose- Einstein statistics - Fermi-Dirac Statistics - Maxwell Boltzmann statistics - Results and comparison of three statistics - Energy and pressure of ideal Bose-Einstein gas - Energy and Pressure of ideal Fermi-Dirac gas. (18 Hours)

UNIT V

Applications of Quantum Statistics: The monoatomic ideal gas- The distribution of molecular velocities- Experimental verification of the Maxwell - Boltzmann speed distribution - molecular beams - Ideal gas in a gravitational field - The principle of equipartition of energy - The Quantized linear oscillator - Specific heat capacity of a diatomic gas – The Einstein theory of the specific heat capacity of a solid – Debye theory of the specific heat capacity of a solid. (18 Hours)

TEXT BOOKS

1. Gupta kumar (2015), *Statistical Mechanics*, 28th Edition, Prakathi Prakasha Publishers.

UNIT I – CHAPTER A - A-1 to A-4, A-6, A-7,

CHAPTER B -B-1, B-5 to B-9

UNIT II – CHAPTER 1 - 1.1, 1.1-1, 1.3, 1.4, 1.5, 1.7

CHAPTER 2 - 2.1, 2.3, 2.4, 2.5, 2.7

UNIT III – CHAPTER 3 -3.0, 3.0-4, 3.1, 3.1-3, 3.1-4, 3.2, 3.2-1

UNIT IV – CHAPTER 5 - 5.2, 5.3

CHAPTER 6 - 6.2, 6.3, 6.4, 6.6

CHAPTER 8 - 8.0

CHAPTER 9 - 9.0

2. Sears.F.W and Salinger G.L.(1998), *Thermodynamics, kinetic theory and statistical Thermodynamics* , 3rd Edition, Narosa Publishing House.

UNIT V – CHAPTER 12 - 12.1 to 12.7

CHAPTER 13 - 13.1, 13.2

REFERENCE BOOKS

1. Satya Praksh, Agarwal.J.P (1994*), Statistical Mechanics,* 7th Edition, Kedarnath Ramnath & Co.
2. Gopal.E.S.R(1974*), Statistical Mechanics and Properties of Matter,* John Wiley and Sons
3. Suresh Chandra, Mohit Kumar Sharma,(2016), *A Textbook of Statistical Mechanics*, 2nd Edition ,CBS Publishers &Distributers Pvt Ltd.

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M.Sc. Physics

(2018-2019 onwards)

Semester II	**QUANTUM MECHANICS - I**	Hours/Week: 6	
Core Course-6		Credits: 5	
Course Code **18PPHC23**		Internal 40	External 60

COURSE OUTCOMES

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

- understand the aspects of development of quantum mechanics.
- solve Schrodinger equation for simple potentials.
- understand the operator formulation of quantum mechanics.
- apply raising and lowering operators for selected problems in quantum mechanics.
- apply perturbation theory.
- understand approximation methods and apply them to complex systems.

UNIT I

Inadequacy of classical concepts: Black body radiation - Planck's quantum hypothesis - Specific heat of solids - The photoelectric effect - The Compton effect - The Rutherford atom Model - Bohr's postulates- Bohr's theory of the Hydrogen spectrum - Bohr's sommerfield Quantum Rules; Degeneracy - Space Quantization - Limitations of the old Quantum theory - De Broglie hypothesis - The motion of a free wave packet - Uncertainties introduced in the process of measurement - Diffraction phenomena - Interpretation of the wave particle dualism - Complementarity - The Formulation of quantum mechanics. (18 Hours)

UNIT II

Schrodinger Equation and Stationary States: A free particle in one dimension - Generalization to three dimension - The operator correspondence and the Schrodinger equation for a particle subject to forces - Normalization and Probability Interpretation - Non-normalizable wave function and box normalization - Conservation of probability - Expectation values - Ehrenfest's Theorem - Admissibility conditions on the wave functions - Stationary states: The time independent Schrodinger equation - A particle in a square well potential - Bound states in a square well ($E<0$) - The square well: Non localized states ($E>0$) Square Potential Barrier. (18 Hours)

UNIT III

General Formalism of Wave Mechanics: The fundamental postulates of wave mechanics - The adjoint of an operator and self adjointness - The Eigen value problem; degeneracy - Eigen values and eigen functions of self adjoint operators - Dirac Delta function - Observable: Completeness and Normalization of eigen functions - Closure - Physical interpretation of eigen functions, eigen values and expansion coefficients - Momentum eigen functions: Wave function in momentum space - The Uncertainty Principle - States with minimum value for Uncertainty product - Commuting Observable; Removal of Degeneracy - Evolution of system with time; Constants of motion - Non-interacting and interacting system - Systems of identical Particles. (18 Hours)

UNIT IV

Exactly Soluble Eigen Value Problem: The Schrödinger Equation and energy Eigen Values - The Energy Eigen functions, properties of Stationary states - The abstract operator method - The angular momentum operators - The eigen value equation for L_z; separation of variables admissibility conditions on solutions; eigen values - The eigen functions; spherical harmonics - physical interpretation - Parity - Angular Momentum in stationary states of systems with spherical symmetry. (18 Hours)

UNIT V

Approximation Methods for Stationary States: Equations in various orders of Perturbation theory - The non-degenerate case - The degenerate case - Removal of degeneracy - The effect of an electric field on the energy level of an atom (Stark effect) - Two electron atoms - Upper bound on ground state energy - Application to excited states - Trial function linear in variational parameters - The Hydrogen molecule - Exchange interaction - WKB Approximation - The one dimensional Schrodinger equation - The Bohr - Sommerfeld Quantum Condition - WKB solution of radial wave equation. (18 Hours)

TEXT BOOK

Mathews.P.M & Venkatesan.K (1997), *A text book of Quantum Mechanics*, Tata McGraw Hill Publishing Company Ltd.

UNIT I – CHAPTER 1 - 1.3 to 1.15, 1.17 to 1.19

UNIT II – CHAPTER 2 - 2.1 to 2.13

UNIT III – CHAPTER 3 - 3.2 to 3.16

UNIT IV – CHAPTER 4 - 4.1 to 4.12

UNIT V – CHAPTER 5 - 5.1 to 5.13

REFERENCE BOOKS

1. Aruldhas.G (2004*), Quantum Mechanics*, Prentice – Hall of India Private Limited, New Delhi.
2. Ajoy Ghatak (1996), *Introduction to Quantum Mechanics*, 5th edition, Macmillan India Ltd.
3. Gupta Kumar and Sharma (2015), *Quantum Mechanics*, Jai Prakashnath Publications.

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M.Sc. Physics

(2018-2019 onwards)

Semester II	**ELECTRONICS & GENERAL PHYSICS LAB – II**	Hours/Week: 6	
Core Practical-2		Credits: 3	
Course Code **18PPHC21P**		Internal 40	External 60

CORE PRACTICAL

1. Phase Shift Oscillator
2. Wien's Bridge Oscillator
3. Saw Tooth Generator
4. Two Stage RC Coupled Amplifier – With & Without Feedback
5. Solving Simultaneous Equations using IC 741
6. Diode Characteristics at different temperature
7. Elliptical Fringes
8. Michelson Interferometer
9. Determination of Mutual Inductance using Carey Foster's Bridge
10. Cauchy's constant

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M.Sc. Physics

(2018-2019 onwards)

Semester II	**NUCLEAR AND PARTICLE PHYSICS**	Hours/Week: 6	
DSEC-2		Credits: 5	
Course Code		Internal	External
18PPHE21		40	60

COURSE OUTCOMES

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

- understand the basic concepts of Nucleus and their properties.
- calculate Q values for alpha and beta decays.
- gain the knowledge of nuclear models.
- have knowledge on nuclear reactions.
- apply the concepts of nuclear fission and fusion.
- apprehend the ideas of particle Physics.

UNIT I

Physical tools: Interaction between Particles and Matter - A brief survey - Detectors for nuclear particles.

The Q Equation: Types of nuclear reaction - The balance of mass and energy in nuclear reactions - The Q Equation - Solution of the Q Equation - Centre of mass frame in Nuclear Physics. (18 Hours)

UNIT II

Constituents of the Nucleus and Some of Their Properties: Rutherford scattering and estimation of the nuclear size - Measurement of nucleus radius - Constituents of the nucleus and their properties - Nuclear spin - Moments and statistics.

Alpha Rays: Range of α-particles - Disintegration energy of spontaneous α-Decay - Alpha decay paradox - barrier penetration.

Beta Rays: Continuous Beta Ray spectrum - Pauli's neutrino hypothesis - The detection of neutrino -Parity Non-conservation in beta decay.

Introduction to Gamma Emission: γ - Ray Emission - Selection rules - Internal conversion - Nuclear isomerism. (18 Hours)

UNIT III

The Liquid Drop Model of Nucleus: Binding energies of nuclei: plot of B/A against A - Weizsacher's semi-empirical mass formula - Mass parabolas: prediction of stability against β-decay for members of an isobaric family - Stability limits against spontaneous fission - barrier penetration - Decay probabilities for spontaneous fission - Nucleon emission.

Nuclear Energy: Neutron induced fission - Asymmetrical fission mass yield - Emission of delayed neutrons by fission fragments - Energy released in the fission of ^{235}U - Fission of lighter nuclei - Fission chain reaction. (18 Hours)

UNIT IV

The Shell Model of Nucleus: The evidence that led to the shell model - Main assumptions of the single-particle shell model - Spin-orbit coupling in nuclei, for a single particle shell model - The single-particle shell model - Square well potential - Prediction of the shell model - The collective model of a nucleus.

Nuclear Force: The ground state of the deuteron - Magnetic dipole and electric quadrupole moments of the deuteron - Square well solution for the deuteron - Central and non-central forces: The tensor forces as an example of non central forces - Exchange forces: Meson theory of nuclear force – A qualitative discussion, qualitative features of the nucleon.

(18 Hours)

UNIT V

Sub-nuclear Physics and conservation laws: Classification of elementary particles – Fundamental interactions – Conservation laws – Quantum chromo dynamics – Electro weak interaction theory - Grand Unification theories - Electromagnetic Field: Gauge invariance and Maxwell's equations - Polarization and photon spin - Angular momentum.

(18 Hours)

TEXT BOOKS

1. Patel.S.B (2009), *Nuclear Physics - An Introduction*, New Age International (P) Limited.

   UNIT I – CHAPTER 1 - 1.I.1 to 1.I.3

   CHAPTER 3 - 3.1 to 3.6

   UNIT II – CHAPTER 4 - 4.1.1 to 4.1.5, 4.2.1 to 4.2.3, 4.3.1to 4.3.3, 4.3.5, 4.3.6, 4.4.1 to 4.4.4

   UNIT III – CHAPTER 5 - 5.1 to 5.7

   CHAPTER 6 - 6.1 to 6.7

   UNIT IV – CHAPTER 7 - 7.1 to 7.3, 7.5, 7.7 to 7.9

   CHAPTER 8 - 8.1 to 8.6

2. Tayal.D.C (2010), *Nuclear Physics*, Himalaya Publishing House.

   UNIT V – CHAPTER 18 - 18.1 to 18.4, 18.24, 18.25, 18.26

3. Burcham.W.E, Jobes.M (1998), *Nuclear and Particle Physics*, An impart of Addison Wesley Longman, Inc.

   UNIT V – CHAPTER 8 - 8.12, 8.12.1, 8.12.2, 8.12.3

REFERENCE BOOKS

1. Roy.R.R and Nigam.B.P (1986), *Nuclear Physics (Theory and experiment)*, Willey Eastern Ltd.
2. Sharma.R.C(1992), *Nuclear Physics*, K.Nath & Co, 5th edition 1992.
3. Griffiths.D(1987), *Introduction to elementary particles* ,Wiley International Newyork.

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M.Sc. Physics

(2018-2019 onwards)

Semester II	**APPLIED OPTICS AND LASER PHYSICS**	Hours/Week: 6	
DSEC-2		Credits: 5	
Course Code **18PPHE22**		Internal 40	External 60

COURSE OUTCOMES

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

- understand the concepts of Gaussian Optics
- understand the Fresnel and Fraunhoffer diffraction pattern and Fourier transforming properties of lenses
- understand the Frequency analysis of imaging system
- gain knowledge on Non- linear Optics
- learn the principles and operation of a laser
- have knowledge on types of laser

UNIT I

Matrix methods in Gaussian Optics: Refraction and translation matrices - Image formation Process - Combination of image forming systems - Matrix representation in polarization - Jones calculus Anisotropic medium - Interference by reflections from non - identical interfaces - Interference by multiple reflections. (18 Hours)

UNIT II

Fourier optics: Scalar diffraction theory - Kirchoff's formulation of diffraction pattern by a plane screen - Fresnel and Fraunhoffer diffraction pattern - Fourier transformation and imaging properties of lenses - Thin lenses as a phase transformation - FT properties of lenses - Spatial filtering - Introduction to Fourier optics Frequency - Domain synthesis - The Vander Laugt. Filter - Concept of spatial and temporal coherence.

(18 Hours)

UNIT III

Frequency analysis of imaging system: Frequency response of a diffraction - Limited coherence imaging system - Coherent transfer functions - Frequency response of a diffraction limited incoherent - imaging system. (18 Hours)

UNIT IV

Non-linear optics: Harmonic generations - Second harmonic generation and Phase matching – Third Harmonic generation - Optical mixing - Parametric generation of light - Self focusing of light. (18 Hours)

UNIT V

Laser: Introduction – Condition for large stimulated emission - Conditions for light amplification - Population inversion – Pumping methods - Laser oscillation - Optical resonator theory - Gas lasers - Optically pumped Solid State lasers - Dye lasers - Semiconductor diode lasers - Q switching and mode locking. (18 Hours)

TEXT BOOKS

1. Douglas S. Goodman, *Introduction to Fourier Optics,* Polaroid, Cambridge, Masschausetts.

   UNIT I – CHAPTER 2 – 2.1 to 2.5

   UNIT II – CHAPTER 3 – 3.1 to 3.4

   CHAPTER 4 – 4.1, 4.2

   CHAPTER 7 – 7.1, 7.4, 7.5

   UNIT III – CHAPTER 6 – 6.1 to 6.3

2. Laud.B.B (2008), *Lasers and nonlinear optics*, New Age International Publishers (P) Ltd.

   UNIT IV – CHAPTER 13 – 13.1 to 13.7

3. Avadhanulu.M.N (2001), *An Introduction to Lasers Theory and Applications*, S.Chand & Company Ltd.

   UNIT V – Chapter 1– 1.12, 1.13, 1.15, 1.17, 1.23, 1.24

   Chapter 2– 2.1 to 2.5

   Chapter 4– 4.7, 4.9, 4.10

REFERENCE BOOKS

1. Ajoy Ghatak (1992), *Optics,* second edition, Tata Mc Graw Hill Publishing Company Limited New Delhi .
2. Ariel Lipson, Stephen Lipson and Henry Lipson (2010), *Optical Physics*, 4th Edition, Cambridge University Press.
3. Govind P.Agarwal (2001*), Nonlinear Fiber Optics*, 3rd Edition, Academic press.