Study & Evaluation Scheme

of

Master of Science
(Physics)
[Applicable for Academic Session 2017-18]
[Approved by Hon’ble VC dated August 08, 2017]

TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001
Website: www.tmu.ac.in
TEERHANKER MAHAVEER UNIVERSITY  
(established under Govt. of U. P. Act No. 30, 2008)  
Delhi Road, Bagarpur, Moradabad (U.P.)

Study & Evaluation Scheme  
Master of Science  
SUMMARY

<table>
<thead>
<tr>
<th>Programme</th>
<th>M.Sc. (Physics)</th>
</tr>
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<tbody>
<tr>
<td>Duration</td>
<td>Two-year full time (Four Semesters)</td>
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<td>Medium</td>
<td>English</td>
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<td>Minimum Required Attendance</td>
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<td>Credit</td>
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<td>Maximum Credit</td>
<td>82</td>
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<td>Minimum credit required for the degree</td>
<td>(Maximum One non-core paper can be audit per year of program)</td>
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Assessment:

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<tr>
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<td>10 Marks</td>
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<th>Evaluation of Seminar/Viva</th>
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<table>
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<tr>
<th>Duration of Examination</th>
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<tbody>
<tr>
<td>Internal</td>
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<td>3 hrs.</td>
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(To qualify the course a student is required to secure a minimum of 45% marks in aggregate in each course including the semester-end examination and the teacher’s continuous evaluation shall be essential for passing the course and earning its assigned credits. A candidate, who secures less than 45% marks in a course, shall be deemed to have failed in that course.)

**Question Paper Structure**

1. The question paper shall consist of six questions. All six are compulsory. First question shall be of short answer type (not exceeding 50 words). Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 2 marks each).
2. Remaining five questions will be one from each unit with internal choice. The student has to answer one of the two in each question. The weightage of Question No. 2 to 6 shall be 10 marks each.
3. Usually each question in the examination should be designed to have a numerical component, where part of syllabus.)
Note 1:

**Evaluation Scheme for MOOC, Short Term Courses:**

University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

Keeping this in mind the Academic Council in its 10th meeting on February 13, 2016, approved the University proposal and allowed a maximum of two credits to be allocated for MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through edX, Coursera, IIRS and NPTEL could be given a maximum credit of two with 1 credit for credit with 30-60 contact hours and 2 credits for courses having more than 60 credit hours.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

1. There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

2. The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalise a list of courses to be offered with credits defined for each course and the mode of credit consideration of the student. The complete process including the approval of the Vice Chancellor shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course the approval will be valid only for the semester on offer.

3. A student can opt for a maximum of two MOOC courses for credit during the complete duration of the course other than offered under SWAYAM.

4. College can offer upto 20% credit through courses offered by SWAYAM. However, if the college is offering courses on other MOOC platforms, the total credit offered under MOOC will not exceed 20% including those offered under SWAYAM.

5. Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Co-ordinator MOOC through the Principal of the College.
6. Where the MOOC course or Add-on on courses are only offering certificate of successful completion, and credit has been assigned to the course, the University examination division will conduct a MCQ examination for the course with 50 MCQ with 100 marks to facilitate inclusion of the courses in CPI computation.

7. College will define whether the credits are regular credits or to be considered only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

8. In case the College wants the additional course to be shown in the mark sheet as additional course completed by the students the same shall also be mentioned by the College and the student will opt for the same at the time of taking admission to the course.
## Study & Evaluation Scheme

### Semester I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Category (Core &amp; Non-core)</th>
<th>Course Code</th>
<th>Subject</th>
<th>Periods</th>
<th>Credit</th>
<th>Evaluation Scheme</th>
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<td>1</td>
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<td>MPH111</td>
<td>Mathematical Physics-I</td>
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<td>3</td>
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<td>4</td>
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<td>Physics Lab-I</td>
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**Total**

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<td>320</td>
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Semester-I

Mathematical Physics-I

Course Code: MPH111

L T P C 4 0 0 4

**Objective:** To provide a mathematical foundation of real physical problem and to develop the mathematical aptitude to apply in scientific problems.

**Course Outcomes:** After completion of the course student will able to learn the required mathematics applicable in various area of physics such as quantum mechanics, electromagnetic theory, nuclear physics etc.

**Course Contents:**

**Unit I**

**Linear vector spaces and operators:** Vector spaces and subspaces, Linear dependence and independence, Orthogonality, Basis and Dimensions, linear operators, Matrix representation, Types of matrices, Similarity transformations, Characteristic polynomial of a matrix, Eigen values and eigenvectors, Self-adjoint and Unitary transformation.

**Unit II**

**Vector analysis and curvilinear co-ordinates**- Gradient, Divergence, their geometrical interpolation and Curl operations, rotational motion, vector potential function, Vector Integration, Gauss’ and Stokes’ theorems, Curvilinear co-ordinates, tangent and normal vectors, contravariant and covariant components, line element and the metric tensor, Gradient, Curl, divergence and Laplacian in spherical polar and cylindrical polar co-ordinates.

**Unit III**

**Calculus of variations and Non-linear methods:** Concept of variation, Euler’s equation, Missing dependent variables, Applications of the Euler equation, Several independent variables, Hamilton’s principle and Lagrange’s equations, Lagrangian multipliers.

**Unit IV**

**Ordinary differential equations and Special Functions-I:** Linear ordinary differential equations, Separation of Poisson and Helmholtz equations in spherical polar and cylindrical polar coordinates, power Series methods, Series solutions – Frobenius’method, Series solutions.

**Unit V**

**Ordinary differential equations and Special Functions-II:** Series solutions of the differential equations of Bessel, Legendre, Laguerre and Hermite polynomials, Generating functions, Some recurrence relations, orthogonality properties of these functions, Brief discussion of spherical Bessel functions and spherical harmonics.

**Text Books:**

5. Introduction to Dynamics – I. Percival and D. Richards, Cambridge University Press.
Reference Books:

2. A. W. Joshi, Matrices and Tensors in Physics, New Age International.

* Latest editions of all the suggested books are recommended
Semester-I
Classical Mechanics

Course Code: MPH112  
L T P C  4 0 0 4

Objective: The objective of this course is to provide the alternate ways of solving Newtonian mechanics by using Lagrangian, Hamiltonian approach which is based on energy concept compared to forces used in Newton equations. Along with the course also provides the knowledge of special theory of relativity.

Course Outcomes:
1. The students will learn the solving the equation of motion by using lagrangian and Hamiltonian
2. The course also provides a detail understanding of central forces and Kepler’s law.
3. The course also deals the understanding of rigid body dynamics.
4. The students will get an understanding of length contraction time dilation masss energy equivalence by understanding the relativity.

Course Contents:

Unit I  (Lectures 08)
Preliminaries of classical mechanics:  
Newtonian mechanics - one and many particle systems; Conservation laws; Work energy theorem; Open system (with variable system) constraints and their classification; D’Alembert principle; Generalized coordinates.

Unit II  (Lectures 08)
Central Forces:  
Reduction to one body problem; equation of motion and first integral; one dimensional problem and classification of orbits; Kepler’s laws and planetary motion; Scattering in central force field; Transformation to laboratory frames.

Unit III  (Lectures 08)
Rigid Body and Vibrating System:  
Euler angles; Tensor of inertia; Kinetic energy of a rotating body; Symmetric top and Applications; Vibrating string; Solution wave equation; Normal vibrations; Dispersion; Coupled vibrating system.

Unit IV  (Lectures 08)
Hamiltonian Formulation:  
Legendre transformation; Hamiltonian equation of motion; cyclic coordinates; Phase space and Liouville’s theorem; Poisson bracket.

Unit V  (Lectures 08)
Special Theory of Relativity  
Text Books:
   1. N. C Rana & P S Joag, Classical Mechanics by, TMH.

Reference Books:
   2. R. G. Takawale and P.S. Puranik, Introduction to Classical Mechanics, TMH.

* Latest editions of all the suggested books are recommended
Semester-I
Quantum Mechanics-I

Course Code: MPH113

L T P C
4 0 0 4

Objective: The course provides basic understanding of quantum mechanics using Operator concept, commutator algebra.

Course Outcomes: The course will give the understanding of
1. Basics of Quantum mechanics such as concept of wavefunction and their condition of acceptability, uncertainty principle as well as advance concept such as operators & their formulation.
2. Introduction of matrix theory and in this context the bra and ket notation and understanding of Schrodinger, Heisenberg and interaction picture, solution of Simple harmonic oscillator by operator method.
3. The course also provides a detail analysis of angular momentum.

Course Contents:

Unit I
Introductory concepts: (Lectures 08)
Empirical basis, wave-particle duality, electron diffraction, Wave packets, Gaussian wave packet, Spreading of Gaussian wave packet, Heisenberg uncertainty principle for position and momentum, Schrodinger equation, conservation of probability, probability interpretation of wave function, expectation values, Ehrenfest theorem, measurement in quantum theory, time-independent Schrodinger equation, stationary states, momentum space representation.

Unit II
One-dimensional problems: (Lectures 08)
Free-particle solution, momentum eigen functions, box normalization, particle in square well potential, transmission through a potential barrier, simple harmonic oscillator.

Unit III
General formalism of quantum theory: operator methods- (Lectures 08)
Hilbert space and observables, linear operators and observables, Dirac notation, degeneracy and simultaneous observables, generalized uncertainty principle for two non-commuting observables, Unitary dynamics, projection operators and measurements, time-dependence of observables: Schrodinger, Heisenberg and interaction pictures, Simple harmonic oscillator by operator method.

Unit IV
Angular momentum-I- (Lectures 08)
Orbital angular momentum commutation relations, Eigen values and eigen functions, Central potential, separation of variables in the Schrodinger equation, the radial equation. The Hydrogen atom.

Unit V
Angular momentum-II (Lectures 08)
General operator algebra of angular momentum operators J_x, J_y, J_z. Ladder operators, Eigen values and eigenkets of J^2 and J_z, Matrix representations of angular momentum operators, Pauli matrices, Addition of angular momentum, Clebsch-Gordan coefficients, computation of Clebsch-Gordan coefficients in simple cases (j_1 = j_2=1/2).
Text Books:

Reference Books:
1. Liboff, Introductory Quantum Mechanics, Pearson Education Ltd.
2. R.P. Feynman, Feynman Lectures on Physics, Narosa.

* Latest editions of all the suggested books are recommended
Semester-I

Research Methodology

Course Code: MAT115

Objective:

- Students should understand a general definition of research design
- Students should know why educational research is undertaken, and the audiences that profit from research studies
- Students should be able to identify the overall process of designing a research study from its inception to its report

Course Outcomes: At the end of this course, the students should be able to:

- understand some basic concepts of research and its methodologies
- identify appropriate research topics
- select and define appropriate research problem and parameters
- prepare a project proposal (to undertake a project)
- organize and conduct research (advanced project) in a more appropriate manner
- write a research report and thesis

Course Contents:

UNIT I (Lectures 08)


UNIT II (Lectures 08)

Measurement of scaling techniques: Measurement scales, sources of error in measurement, technique of developing measurement tools, Meaning of scaling, its classification, important scaling techniques. Methods of collection, Sampling Techniques

UNIT III (Lectures 08)

Introduction to statistics: Meaning, Definition, Characteristics, importance of the study of statistics. Tabulation of Data: Basic principles of graphical representation, Types of diagrams histograms, frequency polygons, smooth frequency polygons, cumulative frequency curve. Measures of central Tendency: Mean, Median Mode, Measures of Dispersion: Range, mean deviation and standard deviation.

UNIT IV (Lectures 08)

Testing of Hypotheses, Level of significance, Degree of freedom, Student t-test, F-test, Chi Square-test, Anova-one way & two way; Correlation & regression: Significance, Types of Correlation, Linear Regression
UNIT V  
(Lectures 08)

Interpretation and report writing: Meaning, Techniques of interpretation, significance of report writing, steps in writing, layout of the research report, types of report and precautions for writing research report. Use of SPSS in Data Analysis.

Text Books:

1. Dr. J. A Khan: Biostatistics & Research Methodology, APH Publishing.

* Latest editions of all the suggested books are recommended
Semester-I
Physics Lab-I

Course Code: MPH161

Objective: The Objective of this lab is to provide to technique to measure some physical parameter as well use of CRO.

Course Outcomes: After completion of this lab Student will able to-

1. Measure the susceptibility, fibre attenuation, Stefan’s constant, Resistivity.

2. Able to use CRO for tracing the characteristic curve, Band gap energy of a thermister, elastic constants, Curie temperature etc.

List of Experiments:

Note: Minimum 10 experiments should be performed

4. Find the Susceptibility of given paramagnetic substances (FeCl₃) by Quincke’s Method.
6. Study of the elastic constants of glass by Cornu’s interference methods – Elliptical and Hyperbolic Fringes
7. To trace I-V characteristic curves of diodes and transistors on a CRO, and learn their uses in electronic circuits
8. Determination of solar constant of a solar cell.
9. To study the Fibre attenuation of a given optical fiber.
10. Study of Band gap energy of a Thermister.
11. Determination of Stefan’s constant.

Reference Books:
2. B.K. Jones, Electronics for Experimentation and Research, Prentice-Hall.

* Latest editions of all the suggested books are recommended
Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

<table>
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External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
Objective: The objective of this course is to develop the skill to measure various physical parameter.

Course Outcomes: After completion of this lab Student will able to-
1. Determine dielectric constant, Cauchy constant, Study of Electron spin using ESR.
2. Able to draw BH curve on CRO, IV characteristic of solar cell.
3. Able to verify Hall effect, Faraday effect.

List of Experiments:
Note: Minimum 10 experiments should be performed
1. To study the B-H curve for a given sample using CRO.
2. To measure the dielectric constant of unknown liquid.
3. To study Hall’s effect and to determine Hall coefficient.
4. To study electrical resistivity of Semiconductors by four probe method.
5. Study of E.S.R. of DPPH.
7. Determination of the Plank’s Constant by Photo cell
9. To study the I-V characteristics of the used solar cell and find its spectral response.
10. To calibrate the prism/grating spectrometer with mercury vapour lamps and hence to find the Cauchy's constant.
11. To study the frequency variation in R-C phase shift Oscillator or Colpitt’s Oscillator or Hartley Oscillator.

Reference Books:
2. B.K. Jones, Electronics for Experimentation and Research, Prentice-Hall.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
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External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
Semester I
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC111

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

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<th>S No</th>
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<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
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Responsible for marks:
Mentor
Cultural Events Coordinator & Department Club Coordinator
Sports Coordinator

M.Sc. (Physics) Syllabus Applicable w.e.f. Academic Session 2017-18 Page 20
Semester-II

Mathematical Physics-II

Course Code: MPH211  
L  T  P  C  4  0  0  4

Objective: To provide a mathematical foundation of real physical problem and to develop the mathematical aptitude to apply in scientific problems.

Course Outcomes: After completion of the course student will able to learn the required mathematics applicable in various area of physics such as quantum mechanics, electromagnetic theory, nuclear physics etc.

Course Contents:

Unit I (Lecture 08)
Fourier Series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Even and odd functions and their Fourier expansions, Parseval’s theorem,

Unit II (Lecture 08)
Integral transforms:
Fourier transform: Fourier Integral and Fourier transform, Fourier complex transformation, Fourier sine and cosine transformations and application to simple heat transfer equation, Fourier transform of Dirac Delta function.

Unit III (Lecture 08)
Complex analysis I: Functions of a complex variable, Analytic functions, Cauchy-Riemann relations, Conjugate and harmonic nature of the real and imaginary parts of an analytic function, Cauchy's theorem, Cauchy’s integral formula,

Unit IV (Lecture 08)
Complex analysis II: Taylor and Laurent expansions, analytic continuation, classification of singularities, residue theorem, Evaluation of definite integrals

Unit-V (Lecture 08)
Group theory
Basic definitions, Group, a Multiplication table, Subgroups, Field, Ring and its properties, Permutation Groups.

Reference Books:

5. Linear Algebra and Group theory for Physicists – K. N. Srinivasan Rao,

* Latest editions of all the suggested books are recommended
Semester-II

Solid State Physics

Course Code: MPH212  
L T P C  
4 0 0 4

Objective: To provide a conceptual understanding of crystal structure, conductors, semiconductors, superconductors magnetic materials and physics behind them.

Course Outcomes: After completion of the course, student learn -
1. About the physics of crystal structure, crystal diffraction, Lattice vibration
2. Theory behind conductors, semiconductors and superconductivity.
3. Magnetic materials and the measurement of susceptibility.

Course Contents:

Unit I
Crystal Structure: (Lectures 08)
Bravais lattices; Crystal systems; Point groups, space groups and typical structures; Reciprocal Lattice, Planes and directions; Point, line, surface and volume defects; Ionic crystals: Born Mayer potential; Thermo-chemical Born-Haber cycle; Van der Waals binding: Rare gas crystals and binding energies; Covalent and metallic binding: characteristic features and examples.

Unit II
Crystal Diffraction and Lattice Vibrations: (Lectures 08)
X-rays; Bragg's law in direct and reciprocal lattice; Structure factor; diffraction techniques; Lattice dynamics: mono-atomic and diatomic lattices; Quantization of lattice vibrations; Phonon momentum; Inelastic scattering by phonons; Debye’s theory of lattice heat capacity; Einstein’s model and Debye’s model of specific heat; thermal expansion; Thermal conductivity.

Unit III
Theory of Conductors and Semiconductors: (Lectures 08)
Free electron theory of metals; Electron Heat Capacity; Bloch functions; Formation of energy bands; Kronig -Penny Model; Brillouin zone; Effective mass; Concept of Holes; Fermi surface; Drude model of electrical and thermal conductivity.
Semiconductors: Carrier statistics in intrinsic and extrinsic crystals; Electrical conductivity; Hall Effect Electronic specific heat.

Unit IV
Superconductivity: (Lectures 08)
Concept of superconductivity; Meissner effect; Type I and type II superconductors; London equations; Penetration depth; Coherence length; Super-conductivity ground state; BCS theory; Flux quantization in a ring; Electron tunneling; DC & AC Josephson Effect; Macroscopic quantum interference; SQUID; Introduction to high temperature superconductors.

Unit V
Magnetic Materials: (Lectures 08)
Magnetic materials: Types, Quantum theories of dia- and para- magnetism; Susceptibility measurement: Guoy Balance, Quincke’s method; Hysteresis; Domain theory – Ferri, Ferro and antiferromagnetic order; Curie temperature and Neel Temperature.
Text Books:


Reference Books:


* Latest editions of all the suggested books are recommended
Semester-II
Atomic & Molecular Physics

Course Code: MPH213  
L T P C  
4 0 0 4

Objective: To provide the basic concept and principles of Physics of atom as well as spectroscopy.

Course Outcomes: After studying students-

1. The spectroscopic terms used to define the spectrum of atoms as well as physics behind their origin such as spin orbit interaction LS and JJ coupling.
2. To learn the principals and application of various spectroscopy such as - ESR, NMR, UV, IR, Raman and Electronic.

Course Contents:

Unit I  
(Lectures 08) 
Atomic Spectra: 
Quantum states of Electron in atoms; Hydrogen atom spectrum; Electron spin; Spin Orbit interaction; Lande interval rule; Two electron systems; LS – JJ coupling Schemes; Fine structure; Spectroscopic terms and selection rules; Hyperfine structure; Isotopic shift; Width of spectral lines; Exchange symmetry of wave function; Pauli's exclusion principle; Spectrum of Helium and Alkali atom.

Unit II  
(Lectures 08) 
Atoms in External Fields and Resonance Spectroscopy: 
Zeeman and Paschen Back Effect of one and two electron systems; Stark effect; X-ray – Auger transitions; Compton Effect; NMR – Basic principles; Classical and Quantum mechanical description; Magnetic dipole coupling; Chemical shift; Knight shift; ESR – Basic principles; Nuclear interaction and Hyperfine Structure; g-factor; Zero field splitting.

Unit III  
(Lectures 08) 
Microwave Spectroscopy and IR Spectroscopy: 
Rotational spectra of diatomic molecules; Rigid rotator - Effect of isotropic substitution; Non-rigid rotator – Rotation spectra of polyatomic molecules; Linear, symmetric top and asymmetric top molecules; Experimental Techniques; Diatomic vibrating rotator; Linear, Symmetric top molecule; Analysis by infrared techniques.

Unit IV  
(Lectures 08) 
Raman Spectroscopy: 
Raman Effect; Quantum theory of Raman effect; Electronic, rotational, vibrational and Raman spectra of diatomic molecules; Raman spectra of polyatomic molecules; Raman Spectrometer; Hyper Raman effect; Experimental techniques.

Unit V  
(Lectures 08) 
Electronic Spectroscopy: 
Electronic spectra of diatomic molecules; Frank-Condon principle; Dissociation energy and dissociation products; Rotational fine structure of electronic vibration transitions; Fortrat Diagram; Pre-dissociation.
Text Books:

Reference Books:
   2. G. Aruldhas, Molecular Structure and Spectroscopy, Prentice Hall of India Ltd.

* Latest editions of all the suggested books are recommended
Semester-II
Quantum Mechanics-II
Course Code: MPH214  

Objective: The course provides the advance formulation of Quantum mechanics using matrix theory to understand the phenomena of Fine structure of atoms Zeeman effect, Scattering Theory, states of atoms and the method used to solve them such as variation approach, Perturbation theory WKB approximation Partial Wave analysis. Apart from that the course provide the Relativistic Formulation Of quantum mechanics.

Course Outcomes:
- The course provides an understanding of the methods such as variationally approach, perturbation theory WKB approximation, scattering theory, Partial wave analysis to understand many electron systems which cannot solved by the Schrödinger equations.
- The course also deals the relativistic quantum mechanics by using Dirac theory.

Course Contents:
Unit I  (Lectures 08)
Approximation methods for stationary problems-I
Time independent perturbation theory: Time independent perturbation theory for a non-degenerate energy level, time independent perturbation theory for a degenerate energy level, Applications: (1) one dimensional harmonic oscillator subjected to a perturbing potential in x, x² and x³ (2) the fine structure of the hydrogen atom (3) Zeeman effect.

Unit II  (Lectures 08)
Approximation methods for stationary problems:
Variationally Method: Bound states (Ritz Method), Expectation value of the energy. Applications: (1) ground state of Helium (2) van de Waals interaction. WKB approximation: the—classical region, connection formulae, tunneling.

Unit III  (Lectures 08)
Time dependent perturbation theory-I:
Statement of the problem, approximate solution of the Schrodinger equation, constant perturbation, harmonic perturbation, transition to a continuum, the Fermi golden rule. Scattering theory: The scattering experiment, relationship of the scattering cross section to the wave function, scattering amplitude and scattering cross-section, born approximation, scattering by a spherically symmetric potential, cross-section for scattering in a screened coulomb potential, validity of Born’s approximation.

Unit IV  (Lectures 08)
Time dependent perturbation theory-II: Method of partial waves: Expansion of a plane wave in terms of partial waves, scattering by a central potential, optical theorem.
Unit-V

**Relativistic quantum mechanics:** Klein-Gordan equation for a free relativistic particle, Plane wave solutions, probability density and probability current density. Dirac Hamiltonian for a free relativistic particle, properties of alpha and beta matrices, probability density and probability current, positive and negative energy solutions, intrinsic spin of the Dirac particle, Negative energy sea, gamma matrices.

**Reference Books:**


* Latest editions of all the suggested books are recommended*
Semester-II

Physics Lab-III

Course Code: MPH261

Objective: The Objective of this lab to provide student a hand on to measure and verify various physical parameter and effect.

Course Outcomes: After completion of the lab student will learn-
1. Basic idea of Michelson interferometer widely used apparatus in research and industry.
2. Student able to measure resistivity, Susceptibility, electronic charge etc.

List of Experiments:
Note: Minimum 10 experiments should be performed

1. To determine the wavelength, separation of wavelengths of sodium light and to determine the thickness of thin mica sheet using Michelson interferometer.
2. To determine the resistivity of Ge at various temperatures by four-Probe method.
3. Study of Susceptibility of paramagnetic material by Gouy’s method.
4. Study of skin depth in Al using electromagnetic radiation.
5. Study of plateau characteristics using GM Counter.
6. Calculate the wavelength of the lamp using Fabry - Perot Etalon.
7. Study of Thermonic Emission.
8. Study of the existence of atomic energy levels using Franck – Hertz Experiment.
10. Determination of ‘e’ by Millikan oil drop’s method.
11. To determine the molecular field in a dielectric and verify Clausius – Mossotti equation.
12. Study of absorption spectra of Iodine molecule and to determine its dissociation energy using spectrometer.

Practical & Text/Reference Books:
1. G.Aruldas, Molecular structure and Spectroscopy, Prentice-hall of India Pvt. Ltd.
2. S.P. Pillai (3 rd Edition), Solid State Physics, New age International Publisher.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

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M.Sc. (Physics) Syllabus Applicable w.e.f. Academic Session 2017-18
External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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Objective: The Objective of this lab is to provide a hand on to verify some laws such as Beer Lambert, malus law as well as measure various physical parameter.

Course Outcomes: After completion of this lab student will able to
1. Verify the Beer lamberts law used in Spectroscopy
2. Analysis of Schmitt-Trigger as a discriminator, study of amplifier etc.

List of Experiments:
Note: Minimum 10 experiments should be performed

1. Verification of Malus’s law.
2. Verification of Beer-Lambert law.
3. Fabry-Perot interferometer experiments
4. Thermal conductivity of a poor conductor
5. Thermostimulated luminescence of F-centre in Alkali halide.
6. Analysis of Schmitt-Trigger as a discriminator.
7. Study of Linear Pulse amplifier.
8. Study of Preamplifier circuit.
11. Measurement and analysis of atmospheric pressure and isobars
12. Determining solar rotation period from given data of sunspot motion.

Practical & Text/Reference Books:

1. G. Aruldas, Molecular structure and Spectroscopy, Prentice-hall of India Pvt. Ltd.
2. S.P. Pillai, Solid State Physics, New age International Publisher.
3. D.R. Behekar, Dr. S. T. Seman, V.M. Gokhale, P. G. Kale, Practical Physics, (Kitab Mahal Publication)

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:
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---|---|---
EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | EXTERNAL EVALUATION (50 MARKS)

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | TOTAL EXTERNAL (50 MARKS) |
Semester II
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC211

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

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<th>Head</th>
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<th>Mentor</th>
<th>Cultural Events Coordinator</th>
<th>Department Club Coordinator</th>
<th>Sports Coordinator</th>
<th>Mentor</th>
<th>Director or Principal</th>
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M.Sc. (Physics) Syllabus Applicable w.e.f. Academic Session 2017-18
Semester-III

Electromagnetic Theory

Course Code: MPH311

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Objective: To identify, formulate and solve fields using Gauss’s law, Method of images, Ampere’s law, Maxwell’s equations. To learn advance electromagnetic theory used for accelerators and other scientific research

Course Outcomes:
1. The course provides the Understanding of Gauss’s law, Method of Images, Poisson equations to identify and Solve electric fields
2. Understanding Ampere, law to solve the magnetic fields and Maxwell equations which is foundation of electromagnetic wave.
3. The course provides the understanding of propagation of EM wave through bounded and unbounded media

Course Contents:

Unit I (Lectures 08)
Electrostatics:
Differential equation for electric field; Gauss’s law; Poisson and Laplace equations; examples of image method; Solutions of Laplace equation in cylindrical and spherical coordinates by orthogonal functions; Dielectrics, polarization of a medium, electrostatic energy; Boundary value problems.

Unit II (Lectures 08)
Magneto-statics:
Magnetic Induction, Biot-Savart law, Ampere’s law and applications; Magnetic flux; Magnetization; Magnetic intensity, energy density; Linear and nonlinear media.

Unit III (Lectures 08)
Maxwell’s Equations:
Displacement current; Maxwell’s equations; Boundary conditions on the fields at interfaces; Vector and scalar potentials; Electromagnetic energy and momentum; Conservation laws; Inhomogeneous wave equation and Green’s function solution.

Unit IV (Lectures 08)
Electromagnetic Waves:
Electromagnetic wave equation; Solution and propagation of monochromatic waves in non-conducting media; Polarization and energy density; Reflection and transmission at oblique incidence; Waves in conducting media; Wave guides, TE, TM and TEM waves in rectangular wave guide.

Unit V (Lectures 08)
Radiation:
Field and radiation in dipole; Radiation by moving charges; Lienard-Wiechert potentials; Total power radiated by an accelerated charge; Lorentz formula; Basics of antennas and their applications.
Text Books:


Reference Books:


* Latest editions of all the suggested books are recommended
Semester-III

Thermodynamics & Statistical Physics

Course Code: MPH312

Objective:
2. Explanation of the properties of macroscopic systems using the knowledge of properties of individual molecules.
3. Providing rigorous definitions of thermodynamic quantities and the derivations of laws of thermodynamics.

Course Outcomes: The students will be able
1. To study the macroscopic and microscopic phenomenon.
2. To study the importance and applications of thermodynamic laws
3. To study about the statistical basis of temperature.
4. Get an understanding of Maxwell distribution, Bose Einstein and Fermi-Dirac distribution and their application in understanding the gases Paramagnetism and physics of stars.

Course Contents:

Unit I
Elementary Probability Theory:
Binomial; Poisson and Gaussian distributions; Central limit theorem.

Unit II
Ensembles: Review of Thermodynamics-
Extensive and intensive variables; Laws of thermodynamics; Legendre transformations and thermodynamic potentials; Maxwell relations; Applications of thermodynamics to (a) ideal gas; (b) magnetic material and (c) dielectric material.

Unit III
Formalism of Equilibrium: Statistical Mechanics:
Concept of phase space; Liouville’s theorem; Basic postulates of statistical mechanics; Ensembles: microcanonical, canonical, grand canonical and isobaric; Connection to thermodynamics; Fluctuations; Applications of various ensembles; equation of state for a non-ideal gas; Van der Waals’ equation of state; Meyer cluster expansion; virial coefficients.

Unit IV
Fermi-Dirac Statistics:
Fermi-Dirac, Ideal Fermi gas, properties of simple metals, Pauli paramagnetism, electronic specific heat, and white dwarf stars.

Unit V
Bose-Einstein Statistics
Ideal Bose gas; Debye theory of specific heat, properties of black-body radiation, Bose-Einstein condensation, experiments on atomic BEC, BEC in a harmonic potential.
Text Books:

1. F. Reif, Fundamentals of Statistical and Thermal Physics, Tata McGraw-Hill.

Reference Books:

2. Lokanathan and Gambhir, Statistical and Thermal Physics, Prentice Hall of India Ltd.

* Latest editions of all the suggested books are recommended
Objective: The course provides the basic understanding of material and physics behind them.

Course Outcomes: After completion of the course the student will learn, Mechanical properties of the material Phase diagrams, crystal structure, Dielectric properties of solids, as well as Magnetic concept behind the materials.

Course Contents:

Unit I  (Lectures 08)
Mechanical properties of materials, Stress and strain behaviour, Elastic properties of materials, Plastic deformation, tensile properties, compressive and shear deformation, hardness, creep, fracture, fatigue.

Unit II  (Lectures 08)

Unit III  (Lectures 08)
Corrosion mechanism, electrochemical considerations, corrosion rates, environmental effects, corrosion resistant materials, Materials superconducting at liquid Helium temperatures, High-Tc metal oxides, Organic materials, Fullerenes, Preparation and characterization of superconducting materials, Crystal Structure,

Unit IV  (Lectures 08)
Dielectric properties of solids, Ferroelectricity, Optical constants, Optical absorption, Optoelectronic effects. Optical materials for UV, visible and IR regions, Photosensitive materials for photography, and photo fabrication

Unit V  (Lectures 08)
Magneto crystalline anisotropy, Magneto static energy, Domain walls and their properties, Domain structure, Magnetostriction, applications of magnetostriction, Wiedemann effect, Inverse Wiedemann effect, Barkhausen effect, Magnetization process, Soft and Hard Magnetic materials, Ferrites: structure and use.

Text Book:

Reference Book:

* Latest editions of all the suggested books are recommended
Semester-III

Physics & Technology of Semiconductor Devices

Course Code: MPH314
Course Contents: L T P C
4 0 0 4

Objective: The course provides the understanding of various semiconductor materials, carrier transports inside a semiconductor, various junction devices.

Course Outcomes:
1. To study about semiconductor materials and its properties
2. To study the carrier transport mechanism in semiconductors
3. To study junction devices such as p-n diodes, MOSFET, BJT
4. To study about IC fabrication process
5. Various methods of preparation such as Lithography, Etching, Micro-machining

Course Contents:
Unit I (Lectures 08)
Semiconductor Materials:
Energy Bands; Intrinsic carrier concentration; Donors and Acceptors; Direct and Indirect band semiconductors; Elemental (Si) and Compound semiconductors (GaAs); Alloy semiconductor and their important properties; Doping of Si (Group III(n) and Group V (p) compounds) and GaAs (group II(p), IV (n-p) and VI (n compounds)).

Unit II (Lectures 08)
Carrier Transport in Semiconductors:
Drift velocity; Carrier Diffusion; Carrier Injection; Generation; Recombination Processes; Direct and Indirect Bandgap Semiconductors; Minority Carrier Life Time; drift and diffusion; Determination of conductivity (a) four-probe and (b) Van der Paw techniques; Hall coefficient; minority carrier lifetime

Unit III (Lectures 08)
Junction Devices:
Junction Devices: (i) p-n junction – energy Band diagrams for homo and hetero junctions; Current flow mechanism in p-n junction, (ii) Metal semiconductor (Schottky Junction): Energy band diagram, current flow mechanisms in forward and reverse bias. (iii) Metal-Oxide-Semiconductor (MOS) diodes; Energy band diagram, depletion and inversion layer; High and low frequency Capacitance Voltage (C-V) characteristics.

Unit IV (Lectures 08)
Bipolar Junction Transistor (BJT):
Charge transport and current in a BJT; Current transfer ratio; Terminal currents; Generalized biasing; Charge control analysis; BJT switching; Turn-on and Turnoff transients; Base narrowing; Frequency limitations of a transistor; FET, MOSFET: Principle of Operation and I-V Characteristics of FET; MESFET; MOSFET; MOS Capacitor; Threshold voltage in MOSFET.

Unit V (Lectures 08)
Polysilicon Preparation of Crystal:
Single crystal growth; Defects in epitaxial; Lithography; Etching and Micro-machining of Silicon; Fabrication of Integrated Circuits; Film Deposition Methods: Chemical vapour deposition (CVD), MOCVD.
Text Books:


Reference Books:


* Latest editions of all the suggested books are recommended
Semester-III
Nano-Science and Technology

Course Code: MPH315

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4 0 0 4

Objective: This module develops an understanding the students –
1. To different types of nano-materials, methods of making them, various analysis techniques with reference to nano-materials;
2. Their applications in the field of medical and electronics.

Course Outcomes: The student will be able-
1. To demonstrate an advanced level knowledge of nanoscience and its application to engineering and measurements of nanomaterial properties.
2. To show skills necessary to produce and characterize nanomaterials.

Course Contents:

Unit I (Lectures 08)
Introduction to Nanoparticles:
Introduction; Historical perspective of nanoparticle; Classification of nanomaterials - Nanorods, Nanoparticle; Nanomaterial preparation - Plasma Arching, Chemical Vapor Deposition, Sol Gel electrode position, Ball Milling technique.

Unit II (Lectures 08)
Characterization Tools:
Electron Microscopy Techniques – SEM, TEM; X ray methods; Optical Methods Fluorescence Microscopy; Atomic Force Microscopy; STM.

Unit III (Lectures 08)
Nano magnetism:
Mesoscopic magnetism; Magnetic measurements: Miniature Hall Detectors; Integrated DC SQUID Microsusceptometry; Magnetic recording technology; Biological Magnets.

Unit IV (Lectures 08)
Nanoelectronics and Integrated Systems:
Basics of nanoelectronics; Single Electron Transistor; Quantum Computation; Tools of micronanofabrication; Nanolithography; Quantum electronic devices; MEMS and NEMS; Dynamics of NEMS; Limits of integrated electronics.

Unit V (Lectures 08)
Applications:
Micromechanical systems; Robots; Ageless materials; Nano mechanics; Nano electronics; Optoelectronic devices; LED; Colorants and pigments; Nano biotechnology - DNA chips, DNA array devices, Drag delivery systems.

Text Books:

Reference Books:

1. N John Dinardo, Nanoscale Characterisation of Surfaces & Interfaces, Weinheim Cambridge, Wiley-VCH.

* Latest editions of all the suggested books are recommended
Semester-III

Industrial Safety & Health Hazards

Course Code: MSC011

Objective: The course content focuses on the Industrial safety programs and toxicology, Industrial laws, regulations, fire and explosion, preventive methods, relief and its sizing methods. The course helps to analyse industrial hazards and its risk assessment.

Course Outcomes: By the end of the course the students will be able to analyze the effect of release of toxic substances, understand the industrial laws, regulations and source models which helps them to apply the methods of prevention of fire and explosions. This course also helps to understand the methods of hazard identification and preventive measures.

Course Contents:

UNIT I


UNIT II

Occupational Health and Toxicology: Concept and spectrum of health - functional Units and activities of occupational health services, notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax, lead-nickel, chromium and manganese toxicity, gas poisoning (such as CO, ammonia, coal and dust etc) their effects and prevention – cardio pulmonary resuscitation, audiometric tests, eye tests, vital function tests.

UNIT III


UNIT IV


UNIT V

Reference Books:

1. L.M Deshmukh Industrial safety management.
2. Ralph king and John magid industrial hazard and safety.

*Latest editions of all the suggested books are recommended*
Objective: The Objective of this Course is to provide an idea of various physical process and phenomena which are applicable in bioscience.

Course Outcomes: After Completion of this course student will learn the physical process such as bonding in atom and molecules, spectroscopic techniques, isotopes and radioactivity, radiation and biophysics which are used in understanding the bioscience.

Course Contents:

Unit – I: (Lectures 08)

Unit – II: (Lectures 08)

Unit – III: (Lectures 08)

Unit – IV: (Lectures 08)
Isotopes and radioactivity: Radioactive decay laws, production of radioisotopes (radio nuclides), allocation of radioactive traces, isotopic tracer method. Assay using radioactive substances, Labelling and detection methods using fluorescent molecules (a few examples).

Unit – V: (Lectures 08)
Radiation biophysics: Radiation sources, Interaction of radiation with matter (general discussion), energy transfer process, measurement of radiation, Dosimetry, Biological effects of radiation, effect of radiation on living systems, radiation protection and radiation therapy.

Reference Books:

5. Biophysics- Cotterill.

* Latest editions of all the suggested books are recommended
Semester III
Statistical Techniques in Data Mining

Course Code: MSC013

L T P C
4 0 0 4

Unit I (Lectures 08)
Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Unit II (Lectures 08) Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Unit III (Lectures 08) Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

Unit IV (Lectures 08)
Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis - Mining Streams, Time Series and Sequence

Unit V (Lectures 08) Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

Text Books:

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.
Reference Books:

5. Data Mining Introductory and advanced topics – Margaret H Dunham, Pearson education.

* Latest editions of all the suggested books are recommended
Semester III

Database Management System

Course Code: MSC014/ECS411/511/611

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**Objective:** Introducing the fundamental concepts necessary for designing, using, and implementing database systems and applications. The goal of this course is for students to become well-grounded in basic concepts necessary for understanding DB and their users, DBMS concepts, architecture, the concepts of the Entity Relationship (ER) model, the data abstraction and semantic modeling concepts leading to EER data model, describe the basic relational model, its integrity constraints and update operations, and the operation of relational algebra, describe relational schema design, and it covers the normalization and functional dependency algorithm.

**Course Outcomes:**

1. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
2. Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
3. Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
4. Be familiar with the basic issues of transaction processing and concurrency control.

**Course Contents:**

**Unit I:** (Lectures 08)

**Introduction:** Scope and purpose of database system, view of data, relational databases, database architecture, transaction management, database system Vs filesystem, Database system concept and architecture, data definitions language, DML.

**Data Models:** The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction

**Unit II:** (Lectures 08)

**Database design and ER Model:** overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity etc, Codd’s rules, Relational Schemas, Introduction to UML, Relational database model: Logical view of data, keys, integrity rules.

Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF)

**Unit III:** (Lectures 08)

**Relational data Model and Language:** Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, Relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, Computational capabilities, constraints, Views.
**Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, and Procedures in SQL/PL SQL.

**Unit IV:**

(Lectures 08)
Usage of Oracle:
1. Installing oracle
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE
4. MYSQL: a) Writing basic SQL SELECT statements.
   b) Restricting and sorting data.
   c) Displaying data from multiple tables.
   d) Aggregating data using group function.
   e) Manipulating data.
   f) Creating and managing tables.
5. Normalization in ORACLE.
6. Creating cursor in oracle.
7. Creating procedure and functions in oracle.
8. Creating packages and triggers in oracle.

**Unit V:**

(Lectures 08)
Transaction management: ACID properties, serializability and concurrency control Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

**Text Books:**


*Latest editions of all the suggested books are recommended.*
Semester-III
Physics Lab-V

Course Code: MPH361

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Objective: This lab provides students with the demonstration of various electronic circuits and a bridge course between basic and advanced level experimental problems.

Course Outcomes:
1. Students will learn to handle various electronic circuits like differentiator, integrator, logic gates.
2. Students will also learn basic understanding to program a chip.

List of Experiments:

Note: Minimum 10 experiments should be performed

1. To design and analyze the Combinational Logic Circuit.
2. To verify Thevenin Theorem and find out Thevenin’s Equivalent circuit using DC Sources.
3. Experiments on FET and MOSFET characterization and application as an amplifier.
4. Experiment on uni-junction Transistor and its application
5. Study of OP AMP as summing and inverting amplifier.
6. Study of OP AMP as Emitter Follower.
7. Study of OP AMP as Difference Amplifier.
8. Study of OP AMP as differentiator and integrator.
9. Study of Voltage to Frequency / Frequency to voltage converter using OP-AMP.
10. Study of errors in electrical measurement and results due to loading.
11. Study of noise performance of an amplifier
13. Study of IC 555 as A stable multivibrator and Voltage Controlled Oscillator.
14. To measure temperature co-efficient using 555 timer.
15. Instrumentation Amplifier - using four IC 741.
17. Multiplication and division using 8086.

Reference Books:
1. B.K. Jones, Electronics for Experimentation and Research, Prentice-Hall.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

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**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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Semester III
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC311

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

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<th>S No</th>
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<th>Student Name</th>
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<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>Participation in sports/ co-curricular activities</th>
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<td>Cultural Events Coordinator &amp; Department Club Coordinator</td>
<td>Sports Coordinator</td>
<td>Mentor</td>
<td>Director or Principal</td>
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Semester-IV

Plasma Physics

Course Code: MPH411

Objective: The course provides the basic concept of plasma State, the particle dynamics in that state, the fluid as well as kinematic description of the plasma and waves in plasma.

Course Outcomes: After completion of the course student get-
1. An insight to plasma state of matter, the physics description and theories such as fluid as well kinematic approach to understand the dynamics of that state.
2. The student also gets an idea of the various types of waves generated in plasma state.

Course Contents:

Unit I (Lectures 08)
Introduction to the Plasma State, elementary concepts and definitions of temperature and other plasma parameters, occurrence and importance of plasma for various applications. Physics of glow discharge, electron emission, ionization breakdown of gases, Paschen's laws and different regimes of E/p in a discharge, Townsend discharge and the evolution of a discharge.

Unit II (Lectures 08)
Single particle orbit theory: Drifts of charged particles under the effect of different combinations of electric and magnetic fields. Crossed electric and magnetic fields. Homogenous electric and magnetic fields, spatially varying electric and magnetic fields, time varying electric and magnetic fields, particle motion in large amplitude waves.

Unit III (Lectures 08)
Fluid description of plasmas: distribution functions and Liouville's equation, macroscopic parameters of plasma, two and one fluid equations for plasma. Waves in fluid plasmas: dielectric constant of field free plasma, plasma oscillations, space charge waves of warm plasma, dielectric constant of a cold magnetized plasma, ion-acoustic waves, Alfven waves, Magnetosonic waves.

Unit IV (Lectures 08)
Kinetic description of plasma: microscopic equations for many body systems: Statistical equations for a many body system, Vlasov equation and its properties, drift kinetic equation and its properties.

Unit V: (Lectures 08)

Reference & Text Books:
1. Introduction to Plasma Physics, FF Chen.
4. The Plasma State, JL Shohet.
5. Introduction to Plasma Physics, M.Uman.
   * Latest editions of all the suggested books are recommended.
Semester-IV

Electronics Communications

Course Code: MPH412

Objective:
1. To know basics of modulation
2. To study various Analog modulation techniques like AM, FM, PM.
3. To study various Digital modulation techniques.
4. To study the basics of Optical communication

Course Outcomes: After completion of course, the students will be able to -
1. Explain the need for modulation.
2. Describe various analog modulation techniques like AM, FM, PM.
3. Explain Digital modulation.
4. Explain the basics of Optical communication
5. Compare and contrast the strengths and weaknesses of various communication systems.

Course Contents:
Unit I (Lectures 08)
Signal Analysis: Sinusoidal signals (Frequency and time Domain); Fourier series expansion of periodic sequence of impulses; Sampling function; Normalized power; Power Spectral density (of Digital data, sequence of random pulses); Effect of Transfer function on power spectral density; Fourier transform (example v(t) = cos wt); Convolution; Power and Energy Transfer through a network.

Unit II (Lectures 08)
Amplitude Modulation: Amplitude Modulation; Spectrum of the modulated signal; Square law Modulator; Balanced Modulator; DSBSC; SSB and vestigial sideband modulation; Limitations of Amplitude Modulation.

Unit III (Lectures 08)
Frequency Modulation: Analysis and frequency Spectrum; Generation and Detection of FM; Comparison of AM and FM. Pre-emphasis and De-emphasis; Reactance Modulator; Capture Effect; Varactor Modulator; Amplitude Limiter; FM Receiver; Foster Seeley Discriminator; Ratio Detector.

Unit IV (Lectures 08)
Digital Communication: Digital Line Waveforms: Symbols, Bits and Bauds; Functional Notation for Pulses; Line Codes and Waveforms; Pulse Modulation: Pulse Amplitude, Pulse Code, Pulse Frequency, Pulse Time, Pulse Position and Pulse Width Modulation; Differential PCM; Delta Modulation. Digital Communication Systems; Digital Carrier System; Frequency Shift Keying; Phase Shift Keying; Differential Phase Shift Keying; Digital Multiplexing.

Unit V (Lectures 08)
Fiber Optic Communication: Principle of light transmission in a fiber; effect of index profile on propagation; modes of propagation; Number of modes in a fiber; Losses in fibers; Dispersion in fiber; Source and detectors for fiber optic; Connectors and splices; Fiber optic communication systems.
Text Books:


Reference Books:


* Latest editions of all the suggested books are recommended
Semester-IV

Astro Physics

Course Code: MPH413

Objective: The course provides an understanding of the basics of astronomy, Stellar structure and properties as well as solar system.

Course Outcomes: After completion of the course student will learn the-
1. The Basic concept of Astronomy their co-ordinate system, time system, magnitude system and astronomical instruments
2. The student will learn the properties of stellar system in that context the observation feature of star, also the physics behind white dwarf, black holes, neutron star supernovae.
3. The overview of sun their structure, the properties of planets.
4. The physics of Stellar structure.

Course Contents:
Unit I (Lectures 08)
Basic concepts of Astronomy: Co-ordinate system, Time System-Solar and Sidereal times, Apparent and Absolute magnitudes, Trigonometric Parallax, Atmospheric extinction, Optical telescopes and their characteristics, Modern Optical telescopes, Astronomical Instruments – Photometer, Photographic plates, Spectrographs, Charge Coupled Detector

Unit II (Lectures 08)

Unit III (Lectures 08)
Solar system: Overview of Sun, Solar Interior structure- Core, Radiative zone and Convective Zone, solar atmosphere-photosphere, Chromospheres, Properties of Interior planets and exterior planets satellites of planets, Kuiper Belt objects, Oort Cloud, Theories of formation of the solar system.

Unit IV (Lectures 08)
Stellar structure: Hydrostatic Equilibrium, Mass conservation, Luminosity gradient equation, Temperature gradient Equations, Lane – Emden equation for polytrophic stars and its physical solution, estimates of central pressure and temperature

Unit V (Lectures 08)

Reference & Text Books:
8. M. S. Longair: High Energy Astrophysics, CUP.

* Latest editions of all the suggested books are recommended
 Semester-IV

Nuclear & Particle Physics

Objective:
To provide a subjective knowledge on nucleus and its properties, nuclear models and their applications, reaction dynamics and theory of nuclear reactions, radioactive decays and elementary particles and their classifications.

Course Outcomes: After completion of the course-
1. The student gets familiarized with basic and advance theoretical knowledge of nuclear physics.
2. To develop a scientific approach and create interest in understanding the subject knowledge for a further study
3. To impart in depth the knowledge in the field to demonstrate high standard of competency and professionalism in learning and research.
4. To explore the basic principles and identify their applications in radiation measurements and methods for analysis and their effects on environment and health.

Course Contents:
Unit I (Lectures 08)
Basic Nuclear Properties and Force:
Basic nuclear properties: Size, Shape and charge distribution, Spin and parity; Binding energy, semi-empirical mass formula, liquid drop model; Nature of the nuclear force; form of nucleon-nucleon potential; Charge independence and charge-symmetry of nuclear forces; Deuteron problem.

Unit II (Lectures 08)
Nuclear Models:
The Semi empirical mass formula; Evidence of shell structure; Single-particle shell model, its validity and limitations; Rotational spectra; Magnetic moments and Schmidt lines; Iso-spins.

Unit III (Lectures 08)
Nuclear Decay:
Decay-range; Particle spectra; Gamow theory; Beta decay; Fermi decay of beta decay; Shape of the beta spectrum; Total decay rate; Angular momentum and parity selection rules; Parity violation; Detection and properties of neutrino; Application of radiation theory to multirole transitions in nuclei; Angular momentum and parity selection rules; Internal conversion; Nuclear isomerism.

Unit IV (Lectures 08)
Nuclear Reactions:
Reaction dynamics; The Q equation; Theory of Nuclear reaction; Partial wave analysis; Compound nucleus formations and break up; Resonance scattering and reactions; The Optical Model Theory of stripping reactions; The Fission process; Neutron released in the fission process.
Unit V (Lectures 08)

**Elementary Particle Physics:**
Types of interaction between elementary particles; Hadrons and leptons; Symmetry and conservation laws; Elementary ideas of CP and CPT invariance; Classification of hadrons quark model SU(2) SU(3) multiplets; Gell-Mann-Okubo mass formula for octet decuplet hadrons.

**Text Books:**

**Reference Books:**
1. Kaplan, Nuclear Physics, Narosa.
2. B.L. Cohen, Concepts of Nuclear Physics, Tata McGraw Hill.

*Latest editions of all the suggested books are recommended*
Semester-IV

Electronic Instrumentation

Course Code: MPH415

Objective: To provide a subject knowledge on errors in experimental measurements, probability distribution functions for curve fittings, vacuum system, High and low temperature generation and measurement and instrumentation of various spectroscopic techniques such as UV, Visible IR, NMR ESR NQR ENDOR etc.

Course Outcomes: After completion of the course student will learn the-

After completion of this course student get familiarize with various area of physics, errors and their formulation in measurement, vacuum low temperature generation and measurement, spectroscopy and instrumentation which will develop a scientific approach and create interest for research and science.

Course Contents:

Unit I

Errors in Measurement Systems:
Errors in observations and treatment of experimental data; Estimation of errors; Theory of errors and distribution laws; Least squares method: Curve fitting, Statistical assessment of goodness of fit.

Unit II

Vacuum Systems:
Production and measurement of high vacuum; Principles and operation of various pumps and gauges; Design of high vacuum systems; High pressure cells and measurements at high pressures.

Unit III

Temperature Measurement:
Production and measurement of low temperatures; Design of cryostats; High temperature furnaces: resistance, induction and arc furnaces; Measurement of high temperatures.

Unit IV

Radiation Detectors:
Optical monochromators; Filters and spectrophotometers for UV, Visible and Infrared; Measurement of reflectivity; Absorption and fluorescence; Radiation detectors; Pyroelectric; Ferroelectric; Thermoelectric; Photo conducting; Photoelectric and Photomultiplier; Scintillation types of detectors; Circuits; Sensitivity and Spectral response; photon counters.

Unit V

Magnetic Resonances:
NQR, ESR, NMR, ENDOR; Principles and schematic working systems; Measurement of resistivity; four probe techniques; Box car integrator.
Text Books:


Reference Books:


* Latest editions of all the suggested books are recommended
Semester-IV

MATLAB Programming

Course Code: MAT461

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Course Contents:

Unit I (Lectures 08)
MATLAB Basics: MATLAB environment, Menus and the toolbar, Basic computer programming, variables and constants, operators and simple calculations, formulas and functions, MATLAB toolboxes, use of MATLAB help, Debugging MATLAB codes.

Unit II (Lectures 08)

Unit III (Lectures 08)
Loop and Selection Statements: Functions and Scripts, break statement, continue statement, end statement, for statement, for nested loop statement, if/else if/else statement, while statement - nested while statement.

Unit IV (Lectures 08)
Plotting And I/O: Plot functions, X-Y Plotting, plotyy, surf, mesh, contour, pie chart, bar diagram, 3D plots, handle graphics and plot properties, saving and printing plots, File input/output, writing and reading spreadsheet files, Using MAT files for variables, Simple programs.

Unit V (Lectures 08)

Text Books:
1. Ross L. Spencer and Michael Ware, Introduction to MATLAB, Brigham Young University.

Reference Book:

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

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**External Evaluation (50 marks)**

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Semester-IV

Project, Seminar & Viva

Course Code: MPH492

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For students to enter into preliminary research field both in theory and experiment the concept of Project has been introduced in the final Semester. In the Project, the student will explore new developments from the books and journals, collecting literature / data and write a Dissertation based on his / her work and studies. The Project Work can also be based on experimental work in industries / research laboratories.

Selection of Topic:

1. Students will make project which should be preferably a working of third thoughts based on their subject.

2. The student will be assigned a faculty guide who will be the supervisor of the students. The faculty would be identified at the end of the III semester.

3. The assessment of performance of the students should be made at least twice in the semester. Internal assessment shall be for 50 marks. The students shall present the final project live using overhead projector PowerPoint presentation on LCD to the internal committee and the external examiner.

4. The evaluation committee shall consist of faculty members constituted by the college which would be comprised of at least three members comprising of the department Coordinator’s Class Coordinator and a nominee of the Director/Principal. The students guide would be special in invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each members of the committee.

The Marking shall be as follows.

Internal: 50 marks
By the Faculty Guide – 25 marks
By Committee appointed by the Director/Principal – 25 marks

External: 50 marks
By External examiner by the University – 50
Top Cover- The sample top cover shall be as under:

**TITLE (18 pt Times New Roman CAPS)**

**DISSERTATION/PROJECT (14)**

Submitted in Partial Fulfillment of the Requirements for the Degree of (14)

**MASTER OF SCIENCE (16)**

In (16)

**Physics (16)**

Submitted by (12)

Name

Enrollment No

Under the guidance of (12)

Name of Guide & Designation (14)

---

**Department of Physics (14)**

**Faculty of Engineering**

**Teerthanker Mahaveer University (14)**

**Moradabad-244001(14)**

**(December, 2017) (14)**
Order of Contents (14)

Orders of contents are as follows:
1. Title Page
2. Certificate
3. Candidate’s Declaration
4. Acknowledgement
5. Abstract
6. Contents with page numbers
7. List of Figures
8. List of Tables
9. List of Abbreviations
10. List of Symbols
11. Chapter 1: Introduction
    Chapter 2: Literature Review
    Chapter 3: ....
    Chapter 4: ....
    Chapter 5: Conclusion
    Appendix: Code
12. References
13. Publications
CERTIFICATE

This is to certify that dissertation/Project entitled “…………………………………………………………
…………………………” which is submitted by ……………………….. in partial fulfillment of
the requirement for the award of degree M.Sc. in Physics, Faculty of Engineering, Teerthanker
Mahaveer University, Moradabad is a record of the candidate own work carried out by him under
my/our supervision. The matter embodied in this dissertation/Project is original and has not been
submitted for the award of any other degree.

Signature of Supervisor(s)                      Head,
Name & Designation of Supervisor(s)                    Department of Physics
                                                    .
                                                    FOE, TMU
CANDIDATE’S DECLARATION

This is to certify that Dissertation/Project entitled “…………………” which is submitted by me in partial fulfilment of the requirement for the award of degree M.Sc. in Physics, Faculty of Engineering, Teerthanker Mahaveer University, Moradabad comprises only my original work and due acknowledgement has been made in the text to all other material used.

I, hereby, further declared that in case of legal dispute in relation to my M.Sc. dissertation/Project, I will be solely responsible for the same.

Date: 

Name of Candidate

Enrollment No.
ACKNOWLEDGEMENT

Apart from the efforts of me, the success of this dissertation/project depends largely on the encouragement and guidelines of many others. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this dissertation/project.

I would like to show my greatest appreciation to _ _ __. I can’t say thank you enough for his/her tremendous support and help. I feel motivated and encouraged every time I attend his/her meeting. Without his/her encouragement and guidance this dissertation/project would not have materialized.

The guidance and support received from _ _ _ (Name of Guide) was vital for the success of the dissertation/project. Without the wise counsel and able guidance, it would have been impossible to complete the dissertation/project in this manner I am grateful for his/her constant support and help.

I express gratitude to other faculty members of Physics Department, FoE for their intellectual support throughout the course of this work. Finally, I am indebted to all whosoever have contributed in this dissertation/project work and friendly stay at FoE.

Place: 

Name of Candidate

Date:
Contents

Certificate ................................................................. I

Candidate’s Declaration ............................................. II

Acknowledgement .................................................... III

Abstract ............................................................... IV

List of Figures .......................................................... V

List of Tables .......................................................... VI

List of Abbreviations .................................................. VII

List of Symbols ........................................................ VIII

1 Introduction .......................................................... 1

1.1 Introduction of Topic ............................................. 1

1.2 Associate Problems ............................................. 2

1.3 Overview of Potential Solution ................................. 3

1.4 Key Benefits of Potential Solution ............................ 4

1.5 Motivation .......................................................... 5

1.6 Aim / Problem Definition ....................................... 6

1.7 Objective of Thesis .............................................. 7

1.8 Thesis Structure / Organization of Thesis .................... 10

2 Literature Survey ..................................................... 11

2.1 Introduction ....................................................... 11

2.2 Literature Survey ................................................ 12

2.3 Problem Formulation ............................................ 25

3 Proposed Work / Proposed Methodology ....................... 35
## List of Figure

<table>
<thead>
<tr>
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<th>Page</th>
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### List of Abbreviations

<table>
<thead>
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<th>Description</th>
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<tbody>
<tr>
<td>RFID</td>
<td>Radio Frequency Identity</td>
</tr>
<tr>
<td>IVRS</td>
<td>Interactive Voice Response Service</td>
</tr>
<tr>
<td>ASR</td>
<td>Automatic Speaker Recognition</td>
</tr>
<tr>
<td>PSK</td>
<td>Phase Shift Keying</td>
</tr>
<tr>
<td>DFT</td>
<td>Discrete Fourier Transform</td>
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List of Symbols

<table>
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<th>Symbol</th>
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<td>N</td>
<td>Time index</td>
</tr>
<tr>
<td>Ω</td>
<td>Frequency in radian</td>
</tr>
<tr>
<td>Σ</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>x(n)</td>
<td>Signal variable</td>
</tr>
</tbody>
</table>
CHAPTER (Font size 14)

GUIDELINES

1.1 Size
Standard bond paper size A4 (297x210mm) should be used.

1.2 Page number
Page should be numbered consecutively and clearly. No page number should be indicated on title page. Certificate, candidate’s declaration and acknowledgement, pages are to be counted & from certificate to acknowledgement Greek numbers should be used. From main text to end of dissertation Indian numerals should be used. All typing should be on right hand pages only.

1.3 Margin
Top 1.0”, Bottom 1.0” Left 1.5” Right 1.0”

1.4 Line spacing
Line spacing should 1.5.

1.5 Font
Times new roman, size 12 for text, 12 (BOLD) may be used for headings & subheadings.

1.6 CD-ROM
All dissertation/project report should include soft copy on CD-ROM accompanied with dissertation/project report in pocket pasted on inside of back cover.

1.7 Text
Before producing the final copies of a dissertation /project report the candidate should ensure that all the spelling, grammar, punctuation and bibliography is complete and exact. Text should in 3rd person form. One is not supposed to use the words like I, we etc.

1.8 File Binding
The Project Report should be hard bound with Title page in Maroon color. The name of the candidate, degree (specifying the specialization) etc shall be printed in golden color on the Title page.

A candidate/group will submit two hardcopies with soft copies in CD to the department and candidate/group will also make an extra copy for themselves.
1.9 Figure

![Waveform of ECG signal](image)

Figure 1.1: Waveform of ECG signal

1.10 Table

Table 1.1: Comparison of different methods

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<tr>
<td>Method 3</td>
<td>CD</td>
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</table>

1.11 Reference

All the references should be arranged year wise. Examples are in reference page

1.11.1 First reference is for book.

1.11.2 Second reference is for article of journal.

1.11.3 Third reference is for proceeding of conference paper.

References


List of Publications

Journals


International Conferences


National Conferences

# EVALUATION SHEET

(To be filled by the GUIDE & Internal Examiners only)

**Name of Candidate:**
**Roll No:**

**Class and Section:**

Please evaluate out of Five marks each.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Details</th>
<th>Marks (5)</th>
<th>Marks (5)</th>
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<td></td>
<td>Guide</td>
<td>Int. Exam. 1</td>
<td>Int. Exam. 2</td>
</tr>
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<td>1.</td>
<td>Objective Identified &amp; Understood</td>
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<tr>
<td>2.</td>
<td>Literature Review / Background Work (Coverage, Organization, Critical Review)</td>
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<td>3.</td>
<td>Discussion/Conclusions (Clarity, Exhaustive)</td>
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<td>4.</td>
<td>Slides/Presentation Submitted (Readable, Adequate)</td>
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<td>Frequency Of Interaction (Timely Submission, Interest Shown, Depth, Attitude)</td>
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<td><strong>Average out of 50</strong></td>
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Signature:  
Date:

Signature:  
Date:

Signature:  
Date:
**EVALUATION SHEET FOR EXTERNAL EXAMINER**

(To be filled by the External Examiner only)

Name of Candidate:

Roll No:

I. For use by **External Examiner ONLY**

<table>
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<td>Discussion/Conclusions (Clarity, Exhaustive)</td>
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Signature:

Date:
EVALUATION SUMMARY SHEET
(To be filled by External Examiner)

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<th>Name and Roll No.</th>
<th>Internal Examiners (50)</th>
<th>External Examiner (50)</th>
<th>Total (100)</th>
<th>Result (Pass/Fail)</th>
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</thead>
</table>

**Note:** The summary sheet is to be completed for all students and the same shall also be compiled for all students examined by External Examiner. The Format shall be provided by the course coordinator.
Semester IV
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC411

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
<thead>
<tr>
<th>S No</th>
<th>Enroll No.</th>
<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences /Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>Participation in sports/ co-curricular activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
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</table>

Responsible for marks:

- Mentor
- Head
- Mentor
- Cultural Events Coordinator
- Department Club Coordinator
- Sports Coordinator
- Mentor
- Director or Principal