BHARATHIAR UNIVERSITY, COIMBATORE-641 046

B.Sc. PHYSICS WITH NANO TECHNOLOGY & COMPULSORY DIPLOMA IN INSTRUMENTATION

SCHEME OF EXAMINATIONS (CBCS PATTERN)

(For the students admitted during the academic year 2008-2009 and onwards)

<table>
<thead>
<tr>
<th>Part</th>
<th>Study Components</th>
<th>Course Title</th>
<th>Ins. hrs / week</th>
<th>Exam</th>
<th>Credit</th>
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<tr>
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<tr>
<td>III</td>
<td>Allied A - Mathematical Paper I *  (or)</td>
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| Semester II | | | |
| I   | Language-II      | 6            | 3       | 25  | 75    | 100    | 3 |
| II  | English-II       | 6            | 3       | 25  | 75    | 100    | 3 |
| III | Core III – Electricity and Magnetism | 6 | 3 | 25 | 75 | 100 | 4 |
| III | Major Practical I | 3 | 3 | 40 | 60 | 100 | 3 |
| III | Allied A - Mathematical Paper II *  (or) | 7 | 3 | 25 | 75 | 100 | 5 |
|     | Chemistry Theory II ** | 4 | 3 | 20 | 55 | 75 | 4 |
| III | Allied Practical** | 3 | 3 | 20 | 30 | 50 | 2 |
| IV  | Value Education - Human Rights # | 2 | 3 | - | 50 | 50 | 2 |

| Semester III | | | |
| I   | Language-III     | 6            | 3       | 25  | 75    | 100    | 3 |
| II  | English-III      | 6            | 3       | 25  | 75    | 100    | 3 |
| III | Core IV – Optics | 4 | 3 | 25 | 75 | 100 | 4 |
| III | Major Practical II | 2 | - | - | - | - | - |
| III | Allied B - Mathematical Paper I *  (or) | 7 | 3 | 25 | 75 | 100 | 5 |
|     | Chemistry Theory I ** | 4 | 3 | 20 | 55 | 75 | 4 |
| III | Allied Practical** | 3 | - | - | - | - | - |
| IV  | Skill Based Subject I (Diploma) Instrumentation I | 3 | 3 | 25 | 75 | 100 | 3 |
| IV  | Tamil @ / Advanced Tamil#  (OR) | 2 | 3 | 75 | 75 | 2 |
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### Semester V

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<td>III Core VII – Applied Electronics</td>
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<td>III Core VIII – Solid State Physics</td>
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<td>III Core IX – Principles of Digital Electronics &amp; Micro Processors</td>
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<td>III Major Practical IV - Digital and Micro Processor</td>
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### Semester VI

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<td>III Core X – Quantum Mechanics and Relativity</td>
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<td>III Core XI - Principles of Programming concepts and C Programming</td>
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<td>Major Practical V - C and C++</td>
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* For subjects without practical  ** For subjects with Practical  
@ No University Examinations. Only Continuous Internal Assessment (CIA)  
# No Continuous Internal Assessment (CIA). Only University Examinations.

### List of Elective papers (Colleges can choose any one of the paper as electives)

<table>
<thead>
<tr>
<th>Elective – I</th>
<th>A</th>
<th>Nano Mechanics</th>
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<tr>
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<th>A</th>
<th>Fundamentals of Nano Materials and its Characterization</th>
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<th>A</th>
<th>Nanoscale Materials &amp; Devices</th>
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$ - yet to be submitted
SEMESTER – I

CORE PAPER I \hspace{1em} HEAT AND THERMO DYNAMICS

No. of Credit Hours : 3 per week

Subject Description :
This paper presents the principle of heat and Thermodynamics.

Goal:
To enable the students in order to learn the basic principles and concepts of Heat and Thermodynamics

Objectives
The aims is to provide the students
➢ To understand the principles of calorimetry
➢ understand the basic principle and laws of thermodynamics
➢ understand the concepts of entropy

UNIT I \hspace{1em} (9 hrs)

UNIT II \hspace{1em} (9 hrs)

UNIT III \hspace{1em} (9 hrs)

UNIT IV \hspace{1em} (9 hrs)
UNIT V  
**Concept of entropy:** Change in entropy in reversibility and irreversibility process entropy of an ideal gas – temperature entropy diagram – increase of entropy in any irreversible process – Thermo dynamics functions – Maxwell’s thermodynamics relations and applications – Joule – Kelvin effect (theory)- Clausius and Clapeyron equation.

**Text Book**
Thermal Physics, R. Murugesan, I Edi, 2002
Heat & Thermodynamics, Brijlal & N. Subramaniam

**Reference Books**
1. Heat and Thermodynamics – Sears & Semansky
3. Heat and Thermodynamics – Agarwal, Singhal, Sathyaprakash
4. Thermal Physics – H.C. Saxena and Agarwal

SEMESTER – I
**CORE PAPER II      MECHANICS, PROPERTIES OF MATTER AND SOUND**

No. of Credit Hours: 3 per week

**Subject Description:**
This paper presents the principle of motion of rigid bodies, liquids and knowledge sound energy.

**Goal:**
To enable the students in order to learn the basic principles, theory and concepts of matters, sound and mechanics.

**Objectives**
To gain knowledge by the students in order to
- learn motion of bodies and sound waves
- acquire basic knowledge of mechanics, properties of matter and gravitation
- know how to apply the conservation of rotational motion

**UNIT I **
**Conservation Law** – Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy – Motion of a particle in a vertical circle – friction – Laws of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination in greater then the angle of friction.
UNIT II          (9 hrs)
Motion of rigid body

UNIT III         (9 hrs)
Gravitation: Kepler’s Law of Planetary motion – Laws of gravitation – Boy’s method for G – Gravitational potential – Gravitational field at a point due to spherical shell – Variation of ‘g’ with latitude altitude and depth.

UNIT IV          (9 hrs)
Surface Tension: Definition and dimension of surface Tension – Excess of Pressure over curved surface – Variation of S.T. with temperature Jaeser’s Experiment.

UNIT V         (9 hrs)

Text Books
1. Properties of Matter – Brijlal. and N. Subramaniam  - S Chand & Co
2. Text Book of Sound – Brijlal. and N. Subramaniam  - S Chand & Co

Reference Books
2. University Physics – Sears Semansky and Ground
3. Text books of Sound - Ghosh
SEMESTER – II
CORE PAPER III  ELECTRICITY AND MAGNETISM

No. of Credit Hours: 6 per week

Subject Description:
This paper presents the basic principle of charged body, when they are in rest and also under motion. This paper gives the knowledge regarding the electrical energy and magnetic energy.

Goal:
To enable the students in order to learn the basic principles theory and concepts of electricity and magnetism.

Objective
To gain knowledge about the electrical energies in order to
- learn motion of charges
- acquire basic knowledge of magnetic properties
- know about the alternating current and its circuits
- get a depth of knowledge in electricity and magnetism

UNIT I  \( (18 \text{ hrs}) \)
Gauss theorem and its applications
Normal electric induction L Gauss theorem, application of guass theorem; electric intensity at a point immediately adjacent to a charged conductor; energy stored in unit volume of an electric field.

Capacitance and Capacitors
Spherical capacitor: Cylindrical capacitor, Force of attraction between charged plates of a capacitor l change in the capacitance – capacity of a parallel plate capacitor; effect of introducing a dielectric slab between the plates – Guard ring condenser polarization in dielectric materials.

UNIT II  \( (18 \text{ hrs}) \)
Magnetic Properties of materials
Electron theory of magnetism; dia, para, ferromagnetism; magnetic field B; magnetization M; magnetic field intensity H; magnetic susceptibility and magnetic permeability; magnetic materials and magnetization; magnetic hysteresis area of the hysteresis loop; determination of susceptibility : Guoy’s method – magnetic circuits - comparison of magnetic with electrical circuits.

UNIT III  \( (18 \text{ hrs}) \)
Thermo Electricity : Seebeck effect: Laws of thermo e.m.f; Peltier effect; Peltier Co-efficient, determination of Peltier co-efficient a junction; thermo dynamical consideration of Peltier effect; Thomson effect; Thomson Co-efficient; e.m.f generated in a thermocouple taking both Peltier effect and Thomson effect in the metals; Thermo electric power; Application of thermodynamics to Thermocouple ; Thermoelectric diagrams and their uses.
UNIT IV

Helmholtz equation of varying current
Growth and decay of current in an inductive – resistive circuit charging and discharging of a capacitor through a resistance; charging and diacharging of capacitor through an inductance – oscillatory circuits- Force on a current carrying conductor; Theory of Ballistic Galvanometer.

UNIT V

Dynamics of charged particles
Charged particles in a uniform and constant electric field; Charged particles in an alternating electric field; Charging particles in a uniform and constant magnetic field; magnetic focusing ; charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular direction.

Books for Study
1. Electricity and Magnetism – Brijlala and Subramaniam
2. Electricity and Magnetism – R. Murugesan

Books for Reference
1. Electricity and Magnetism – D.N. Vasudeva
2. Electricity and Magnetism – Nagarathanam and Lakshminarayanan
3. Fundamental of Electricity and Magnetism
   – B.D.Duggal and C.L. Chhabra

CORE PRACTICAL I

Credit Hours : 3 hours per week

ANY FOURTEEN EXPERIMENTS ONLY
(EXAMINATION AT THE END OF SECOND SEMESTER)

1. Compound Pendulum.
2. Comparison of Viscosities – Capillary Flow Method
3. Young’s Modulus – Non- Uniform bending – Pin and Microscope
4. Young’s Modulus – Uniform bending – Optic lever
5. Rigidity modulus – Static Torsion – Scale and Telescope
6. Sonometer – Frequency of A.C.
7. Spectrometer – Refractive index of Solid Prism
8. Resonance Column – Velocity of Sound
9. Moment of magnet – Tan C Position
10. Characteristics of a Junction Diode
11. Spectrometer – (i.d) Curve
12. Air Wedge – Thickness of Wire  
13. Field along the axis of a coil – Moment of a Magnet  
14. Potentiometer – Specific Resistance of a wire  
15. Potentiometer – Low range Ammeter Calibration  
16. Young’s Modulus – Cantilever – Depression – Scale and Telescope  
17. Young’s Modulus – Cantilever – Dynamic Method  
18. Viscosity by Capillary flow method  
19. Melde’s Strings – Frequency of Vibrator.

SEMESTER - III
CORE PAPER IV   OPTICS

No. of Credit Hours : 4 hours per week
Subject Description
To study the optical instrument objects in images propagation of light, nature and behaviour of light, vibration of light laser and as application

Goal and objectives
To provide a good foundation in optics  
To provide a knowledge of the behaviour of light  
To inspire interest for the knowledge of concepts

UNIT 1 - Geometrical Optics (12 hrs)
Aberrations-- Spherical aberrations in lens—coma—Astigmatism-- chromatic aberration--dispersion by a prism-- Cauchy’s dispersion formula-- dispersive power, achromatism in prism--dispersion without deviation-- chromatic aberrations in a lens-- circle of least confusion, achromatic lens--condition for achromatism of two thin lenses separated by a finite distances.

Physical Optics
UNIT 2 Interference (12 hrs)

UNIT 3 Diffraction (12 hrs)

UNIT 4 Polarization (12 hrs)
Double Refraction – Huygen’s explanation --Optic axis in the plane of incidence inclined and parallel, perpendicular to the crystal surface – Production and Detection of Plane, Circularly and
Elliptically Polarized light – Optical Activity – Fresnel’s explanation – Specific rotation – Half Shade Polarimeter.

UNIT 5  Quantum Optics  (12 hrs)

Books for Study
1. A Text book of Optics Brijlal & Subramaniam
2. Modern Physic R Murugesan

Books for Reference
3. Optics and Spectroscopy R Murugesan
4. Optoelectronics Thiyagarajan

SEMESTER – III

DIPLOMA PAPER I  INSTRUMENTATION I

Subject Description
To study the instrument with its principle and observe the method their functioning

Goal and objectives
✓ To provide a good foundation in measurements
✓ To provide a knowledge of the behaviour of instruments
✓ To inspire interest for the knowledge of concepts regarding measurements

UNIT 1  (9 hrs)
Basic Concept of Measurement
Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration

Transducers

UNIT 2  (9 hrs)
Performance Characteristics of an Instrumentation system
UNIT 3
Pressure Measurement
Mechanical Pressure measurement devices – Bourdon tube Pressure gauge – The Bridgeman gauge – Dead weight tester – Low Pressure measurement – The Mc lead gauge – Pirani thermal conducting gauge- The Knudsen gauge.

Unit 4
Flow Measurement

Unit 5
Measurement of Temperature

Book for Study
Unit 1 & 2: Instrumentation Devices and Systems – C S Rangan, G R Sharma, V S V Mani TMH.
Unit 3 & 4: Experimental Methods for Engineers – Jacy P Hofman, TMH.
Unit 5: Experimental methods for experiments by Jack P Holman

SEMESTER – IV

CORE PAPER V ATOMIC PHYSICS AND NUCLEAR PHYSICS

No. of credit hours : 4 hours per week

Subject Description
Analysis of Atom, modeled in various aspects, spectral lines subjected to magnetic fields, light inducing electron emission, X-rays and the nuclear concepts of the atom.

Goals and Objectives
✓ To provide a detailed study of atom
✓ To learn the impact of magnetic fields on spectra
✓ To learn the behaviour of nucleolus in various states
✓ To provide a knowledge of the application of observed theories

Unit 1 Magneto Optical Properties of Spectrum (12 Hrs)
Unit 2  Photoelectric Effect  (12 Hrs)
Introduction – Richardson and Compton experiment – Relation between Photoelectric current and retarding potentials – Relation between Velocity of Photo electrons and the frequency of light – Laws of Photoelectric emission – Failure of electromagnetic theory – Einstein’s Photo electric equation – Experimental verification – Millikan’s Experiments – Photo electric cells – Photo emission cell – Photo Voltaic cell – Photo conductive cell – Applications of Photo electric cell.

Unit 3  X-ray Spectra  (12 Hrs)

Unit 4 – Radioactivity  (12 hrs)

Unit 5 - Nuclear Fission and Fusion Reactions  (12 hrs)

Book for Study:
1. Modern Physics          R Murugesan (S. Chand & Company)

Books for Reference
1. Modern Physics           Sehgal Chopra Sehgal
2. Source book on Atomic Energy Galsstons (S)
3. Atomic Physics           Rajam
4. Introduction to Atomic Spectra White (HE)
5. Nuclear Physics          D C Tayal
6. Concept of Modern Physics Arthur Beiser
7. Introduction to Modern Physics F K Richtmyer Etal
SEMESTER – IV
DIPLOMA PAPER II  INSTRUMENTATION II

No. of Credit Hours : 3 Hours

Subject Description
To study the instrument with its principle and observe the method their functioning

Goal and objectives
✓ To provide a good foundation in measurements
✓ To provide a knowledge of the behaviour of instruments
✓ To inspire interest for the knowledge of concepts regarding measurements

UNIT 1
Temperature Measurement by Radiation:
(9 Hrs)

Thermal and transport property Measurement.

UNIT 2
Force, Torque and Strain Measurements
(9 Hrs)

UNIT 3
Vibration
(9 Hrs)

UNIT 4
Thermal and Nuclear Radiation Measurements
(9 Hrs)

UNIT 5
Air Pollution Sampling and Measurements
(9 Hrs)
Books for Study:
Unit 1, 2, 4 to 5: Experimental methods for Experiments by Jack P Holman
Unit 3: Instrumentation Devices and Systems – C S Rangan, G R Sharma, V S V Mani TMH.

CORE PRACTICAL – II
(Examination at the end of Fourth Semester)
Any Fourteen (14) Experiments only

1. Rigidity Modulus – Torsional Pendulum – With & Without symmetrical masses
2. Quincke’s method – Surface Tension and Angle of Contact of Mercury
3. Specific heat capacity – Newton’s law of cooling – Spherical calorimeter
4. Spectrometer – Hollow prism – Refractive index of the Prism
5. Determination of $M_H$ and $B_H$
6. Zener diode - Characteristics
7. Spectrometer – (i – i’) curve
8. Newton’s rings – Refractive index of a lens
9. Reduction factors of a Tangent Galvanometer - BG
10. Comparison of Mutual Inductance - BG
11. Spectrometer – Grating – Minimum deviation & Normal Incidence
12. Young’s Modulus – Koenig’s Method – Non Uniform bending
14. Spectrometer – Cauchy’s constant
15. Spectrometer – Dispersive Power
16. Spectrometer – Narrow Angled Prism
17. Carey Foster’s Bridge – Temperature Coefficient
18. Potentiometer – Reduction factor of T.G in Primary
19. Potentiometer – EMF of a thermocouple
20. B.G - Absolute Capacity

SEMESTER – V
CORE PAPER VI  MATHEMATICAL PHYSICS

No. of credit hours : 5 per week

Subject Description :
This paper presents the fundamental of classical mechanics special functions and matrices which will be used for studies solving problems during research work.

Goal:
To enable the students to acquire the problem solving ability and to apply the equations for the situation of different physical problems.
Objectives

- To acquire knowledge and apply it to various physical problems
- Various physical problems
- To apply the develop the problem solving ability.
- To motivate the students to apply matrices or solving problems in spectroscopy, nuclear physics etc.,
- To apply vectors to non-linear dynamics

UNIT 1 (15 Hrs)
Classical Mechanics - I

UNIT 2 (15 Hrs)
Classical Mechanics – II

UNIT 3 (15 Hrs)
Special Functions

UNIT 4 (15 Hrs)
Matrices

UNIT 5 (15 Hrs)
Vector Calculus

Books for Study and Reference
1. Mathematical Physics B D Gupta
2. Mathematical Physics Rajput
3. Classical Mechanics
   Gupta Kumar & Sharma

4. Mathematical Physics
   K N Pillai

5. Mathematical Physics
   Sathiya Prakash

6. Mathematical Physics
   H K Dass

7. Mathematical Physics
   Gupta Kumar & Sharma

SEMESTER – V
CORE PAPER VII  APPLIED ELECTRONICS

No. of credit hours : 4 hours per week

Subject Description:
This paper presents the fundamentals of electronics and its theory which will be used for studies solving problems during research work.

Goal:
To enable the students to acquire the knowledge of electronics and to apply the principles for the situation of different physical problems.

Objectives
To acquire knowledge and apply it to
- Various electronics instruments
- To apply the development of the electronic instruments.
- To motivate the students to apply the principles of electronics in their day – to – day life.

UNIT 1 – Amplifiers  (12 hrs)
Characteristics of an amplifier, Voltage amplifiers - Feed back amplifier- feedback and related terms - block diagram of a feedback amplifier - Transfer gain of an amplifier with feedback - Emitter follower circuit - an example of negative feedback.

UNIT 2 – Oscillators  (12 hrs)
Introduction - Types of oscillators - Fundamental principle of oscillators - Concept of feedback oscillators - Hartley oscillators - Analysis - Colpitts oscillators - Analysis - Phase shift oscillators - Analysis - Wien bridge oscillator – Analysis.

UNIT 3 – Solid state switching circuits  (12 hrs)

UNIT 4 – Wave Shaping Circuits  (12 hrs)
Differentiating circuit - Output waveforms - Integrating circuit – Output waveforms - Important applications of diodes – Clipping circuit – positive clipper – biased clipper – combinations
clipper – applications of clipper- Clamping Circuits-basic idea of a clamper-Positive clamber – Operations – negative clamper.

UNIT 5 -- Power Electronics (12 hrs)

Book for Study and Reference
1. Foundation of Electronics D Chattopadhyaya & R C Rakshji
2. Principles of Electronics V K Metha
3. Applied Electronics R S Sedha
4. Integrated Electronics Millman and Halkias
5. Electronics devices and Circuits Millman and Halkias.

SEMESTER – V
CORE PAPER VIII
SOLID STATE PHYSICS

No. of credit hours : 4 hours per week

Subject Description :
This paper presents the fundamentals of solids and its bond theory which will be used for studies solids, how they are formed.

Goal:
To enable the students to acquire the knowledge of electrons and their bonds with the external applied force as well as the interval attractive force.

Objectives
To acquire knowledge of

- Various bond theory
- And to know the method of forming different alloys, conducting materials.
- To motivate the students to apply the principles of bond theory in their research studies.

UNIT 1 (12 hrs)
Crystallography: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Crystal structure – Unit cell – Number of lattice points per unit cell- Bravise lattices – Miller indices – Elements of Symmetry – Structure of KCl and NaCl crystal – Atomic Packing – Atomic radius —Lattice constant and density- Crystal structure (sc; hcp; fcc;bcc.)
UNIT 2
(12 hrs)

UNIT 3
(12 hrs)

UNIT 4
(12 hrs)

UNIT 5
(12 hrs)

Books for Study:
1. Solid State Physics Gupta and Kumar
2. Modern Physics R Murugesan

Books for Reference:
1. Introduction to Solid State Physics Charles Kittel
2. Solid State Physics A J Dekker

SEMESTER – V
CORE PAPER IX
PRINCIPLES OF DIGITAL ELECTRONICS AND MICRO PROCESSORS

No. of credit hours : 3 hours per week

Subject Description
This paper presents basic principles of digital electronics. This paper gives deep knowledge to the students regarding number system, arithmetic building blocks, memories and data processing circuits.

Goal
To enable the students to learn the basic principles, theory and concepts of number system memories and data processing circuits counters
Objectives
To give description for the students in order to
- Learn the logic circuits
- Acquire basic knowledge of binary addition
- Understand the action and application of counters
- Get a deep knowledge of various memories used in computer circuits

UNIT 1 - Arithmetic Circuits (9 hrs)
Binary addition - Binary Subtraction – Unsigned Binary numbers - sign magnitude numbers –
2’s complement representation – 2’s complement Arithmetic – Arithmetic building blocks – The
Adder – Subtractor.
Flip – Flops:
Master Slave flip flop – Schmitt trigger.

UNIT 2 - Shift Register and Counters (9 hrs)
Types – Serial In Serial Out – Serial In Parallel Out – Parallel In Serial Out – Parallel In Parallel
Out – Ring counter – Asynchronous counter – Decoding gates – Synchronous counter – Mod 3
counter – Mod 5 counter – shift counter.

UNIT 3 - Semiconductor Memories (9 hrs)
Basic – Memory addressing – ROM’s PROM’s and EPROM’s – RAM’s – DRAM’s – Dynamic
RAM’s.

D/A and A/D Conversion:
conversion – Counter method – continuous A/D conversion

UNIT 4 - Microprocessor and Data Representation (9 hrs)
Basic concept – what is Microprocessor, 4, 8, 16, 32 – Organization of Microprocessor –
Microprocessor Programming – Instruction – Machine and Mnemonic codes – Machine and
Assembly Language Programming – High level Language programming – Timing diagram
conventions.
Organization of 8085 – Data and Address buses addressing – The I/O devices – Register in 8085
– Instruction types – Classification of Instruction – Addressing modes – Programming the 8085 –
The Programming process – machine language programming – Assembler Programming.

UNIT 5 Semi Conductor Memories (9 hrs)
Introduction – Registers – Primary memory – Mass storage, cache – off line backup – memory
chips – static and dynamic RAMs, ROMs and their versions characteristics of memories :
Memory chip capacity and organization – memory size – combining the chips together with
eexample electrical signals. Static RAM : Organisation of 6264 – Read and write cycle of 6264 –
dynamic RAMS : Organisation of 51100 x – Read and write cycle of 51100 x RAS only fresh
hidden fresh – Burst and distributed i.e., fresh – pseudo static ram and automatic refresh.
Books for Study:

Books for Reference:
1. Integrated Electronics – Millmann & Halkeias

SEMESTER – V
DIPLOMA PAPER III INSTRUMENTATION III

No. of Credit Hours : 3 Hours per week
Subject Description
To study the instrument with its principle and observe the method their functioning

Goal and objectives
✓ To provide a good foundation in measurements
✓ To provide a knowledge of the behaviour of instruments
✓ To inspire interest for the knowledge of concepts regarding measurements

UNIT 1 (9 hrs)
Data Acquisition and Conversion

UNIT 2 (9 hrs)
Input – Output Devices and Displays

UNIT 3 (9 hrs)
Basic meter movements

UNIT 4 (9 hrs)
Digital Instruments
UNIT 5 (9 hrs)
Oscilloscope

Book for Study:
Unit 1 & 2: Instrumentation Devices and Systems – C S Rangan, G R Sharma, V S V Mani TMH
Unit 3, 4 & 5: Electronic Instrumentation by H S Kalsi TMH

SEMESTER – VI
CORE PAPER X
QUANTUM MECHANICS AND RELATIVITY

No. of credit hours : 6 hours per week

Subject Description :
This paper presents the fundamentals of wave mechanics, Schrödinger’s wave equation and its applications.

Goal:
To enable the students to acquire the problem solving ability and to apply the Schrödinger’s wave equation for the situation of different physical problems.

Objectives
To acquire knowledge and apply it to
- Various physical problems
- To apply develop the problem solving ability.
- To motivate the students to apply Schrödinger’s equation or solving problems in wave mechanics, nuclear physics etc.,

UNIT 1- Wave Properties of Matter (18 hrs)

UNIT 2 - Uncertainty Principle (18 hrs)
experiment – Application – Non-existence of free electrons in the nucleus – Size and Energy in the ground state of Hydrogen atom

UNIT 3 - Schrödinger’s Wave Equation (18 hrs)

UNIT 4 - Spherical Symmetrical systems (18 hrs)

UNIT 5 – Relativity (18 hrs)

Books for Study:
1. Quantum Mechanics S.P Singh and M.K Banda
2. Modern Physics R Murugesan

Books for Reference:
1. Quantum Mechanics Schiff
2. Introduction to Modern Physics F.K Richtmyer Etal

SEMESTER – VI
CORE PAPER XI
PRINCIPLES OF PROGRAMMING CONCEPTS AND C PROGRAMMING

Subject Description
This subject deals with the programming concepts of C language

Goal
To learn about C programming with various features

Objectives
On successful completion of this subject the student should have.
 Writing programming ability on scientific and mathematical problems
 It is very useful to the students in many ways like their higher studies and research etc., because of its versatility.
UNIT I (12 hrs)

UNIT II (12 hrs)

UNIT III (12 hrs)

UNIT IV (12 hrs)

UNIT V (12 hrs)
Need for user defined functions – A multifunction program – RETURN values and their types – functions calls – category of functions – no arguments and no return values – simple programs.

Text Book
1. “Programming in ANSI C” by E. Balagurusamy, 3rd Edition

Reference Book
Programming in C by Ashok N. Kamthane First Indian Print 2004, Pearson.

SEMESTER – VI
CORE PAPER XII
OBJECT ORIENTED PROGRAMMING WITH C++

No of credit hours : 5 hours per week
Subject Description :
This subject deals with the programming concepts of object oriented programming using C++

Goal:
To learn about object oriented programming concepts with different features

Objectives
On successful completion of this subject the student should have
Writing program ability on oops concepts like encapsulation, data abstraction, Inheritance, polymorphism and overloading etc.

To implement various scientific and mathematical problems with minimum no. of lines.

UNIT I  
Software evolution – Procedure Oriented programming object oriented programming (oop) – Basic concepts benefits of OOP – Object oriented languages – Application of OOP – A simple C++ program – Structure of C++ program- Tokens – Key words- Identifiers and constants Basic data types – User defined Data Types – Derived data types – symbolic constants – Type compatibility – Declaration of variables – Dynamical Initialization of variables – Reference variables – Operators in C++ - Scope resolution operators.

UNIT II  

UNIT III  
Constructors and destructors – operator over loading and type conversions

UNIT IV  
Inheritance : Extending classes – Pointers- Polymorphism – pointers to objects – this pointer pointers to derived classes.

UNIT V  
Virtual functions – pure virtual functions – Managing console I / o operators.

Text Book

CORE PRACTICAL – III– ELECTRONICS PRACTICAL
(EXAMINATION AT THE END OF SIXTH SEMESTER)
ANY SIXTEEN (16) EXPERIMENTS ONLY

1. Bistable Multivibrator
2. R.C. Coupled Amplifier – Transistor single stage
3. Hartley Oscillator – Solid State
4. Colpitt’s Oscillator – Solid State
5. Tuned Plate Oscillator
6. Tuned Grid Oscillator
7. Astable Multivibrator
8. Series and Parallel resonance circuits
9. Differential Circuit and Integrating Circuit
10. Clipping and Clamping Circuits
11. Study of Solar Cell
12. Logic Gates – Discrete components
13.Emitter Follower
14. IC – Regulated Power Supply
15. Transistor – Regulated Power Supply
16. Dual Power Supply
17. Square wave generator using 555 IC
18. Study of LDR
19. UJT Characteristics
20. Bridge rectifier with voltage regulation
21. junction diode & Zener diode Characteristics

CORE PRACTICAL – IV DIGITAL AND MICROPROCESSOR
(EXAMINATION AT THE END OF SIXTH SEMESTER)
ANY SIXTEEN (16) EXPERIMENTS ONLY

1. Verification of Truth tables of IC gates: OR, AND, NOT, XOR, NOR and NAND.
2. NAND as universal building block- AND, OR, NOT
3. Verification of De Morgan’s theorem.
4. Boolean Algebra – problem solving
5. Study of RS Flip-Flop.
7. Decade counter using 7490.
8. Half adder.
9. Full adder
11. 4 BIT – Binary Adder & Subtractor using 7483.
12. Code converter (Binary to gray and vice versa) & Seven segment Decoder
14. Parity check logic.
15. Up/Down Counter using 74190
16. 8085 ALP for 8 bit Addition and Subtraction
17. 8085 ALP for One’s Complement, Masking off most significant 4 bits and setting bits.
18. 8085 ALP for Two’s compliment Addition and Subtraction
19. 8085 ALP for 8 Bit Multiplication and Division
20. 8085 ALP for finding the Biggest number element in the array and Sum of the elements in the Array
CORE PRACTICAL – V
C AND C++
ANY SIXTEEN (16) EXPERIMENTS ONLY

Programming in C
1. Find the number of Days elapsed between two dates.
2. Convert Integer in the range 1 to 100 in words.
3. Write a program that uses functions to compare two strings input by user. The Program should state whether the first string is less than, equal or greater than the second Strings.
4. Write a Program to compare two files printing the Character position where they equal and where they are differ.
5. Write a Program for Matrix addition
6. Write a Program for Matrix Multiplication.
7. Write a Program for Addition of Two times
8. Write a Program for find the Inverse of given Matrix
9. Write a Program for display the Multiplication table.

Programming in C++
1. To read any two number through the key board and to perform simple Arithmetic Operation ( Use Do while loop)
2. To display the name of the day in a week, depending upon the number entered through the keyboard using Switch – case statement.
3. To read the elements of the given two matrix of m X n and to perform the Matrix addition
4. Write a Program for Matrix Multiplication table.
5. Write a Program to find the Inverse of Given m X n Matrix
6. Write a Program to find the Modulus of the Given Number
7. Write a Program to compare two files printing the character position where they are equal and where they are differ.

SEMESTER – VI
DIPLOMA PAPER IV
INSTRUMENTATION PRACTICAL
(Any Twelve)

1. Construction and Service of Power supply - 2, 4, 6 Volts
2. Regulated power supply construction and service - 5V & 12V
3. Dual power supply construction and service - (-12)-0- (+12)
1. Regulated power supply service - 5V & 12V
2. Dual power supply service - (-12)-0- (+12)
3. Servicing - Microscope
1. Servicing Telescope
4. Servicing - Spectrometer
5. Servicing - Galvanometer,
6. Servicing - Voltmeter
7. Servicing - Ammeter.
8. Servicing --UPS
9. Servicing ---Stop clock and Stop watch  
10. Servicing ---Physical Balance  
11. Servicing.—Mixie  
12. Servicing.—Resistance box and Capacitance box  
13. Servicing --- Signal Generators  
14. Fixing and servicing a B.G.  
15. Cutting, drilling, polishing and trimming.  
16. Servicing.—Iron Box

**SEMESTERS : V**

**ELECTIVE PAPER I – A  NANOMECHANICS**

**Subject Description**

This paper presents basic principles of nano materials. This paper gives deep knowledge to the students regarding the nano particles.

**Goal**

To enable the students to learn the basic principles, theory and concepts of nano mechanics.

**Objectives**

To give description for the students in order to

- Learn the size of the particles
- Acquire basic knowledge of atomic sizes.

**UNIT I**  
Crystal lattices- two – dimensional crystals – three dimensional crystals – crystal structure with basis – periodic functions – one dimensional fourier series – two and three dimensional fourier series the reciprocal lattice – reciprocal space lattice – examples – Bloch’s theorem.

**UNIT II**  
Crystal theory of lattice – diatomic interaction potentials – boundary conditions in two and three dimension – normal models of the lattice – optical phonos – normal mode Hamiltonian – quantum operators for normal modes – connection to the classical continuum theory of solids

**UNIT III**  

**UNIT IV**  
UNIT V  

BOOKS FOR STUDY

SEMESTER : VI
ELECTIVE PAPER II - A
FUNDAMENTALS OF NANO MATERIALS AND ITS CHARACTERIZATION

Subject Description
This paper presents basic principles of nano materials. This paper gives deep knowledge to the students regarding the nano particles.

Goal
To enable the students to learn the basic principles, theory and concepts of nano mechanics.

Objectives
To give description for the students in order to
- Learn the size of the particles
- Acquire basic knowledge of atomic sizes.

Unit 1. INTRODUCTION TO NANOTECHNOLOGY (12 hrs)
Definition of Nanoscale system – Feymann theory of Nanotechnology – types of nanotechnology – Molecular Nanotechnology – Molecular and atomic size – Surface and dimensional space – opportunities at the Nanoscale.

Unit 2. NANO PROPERTIES (12 hrs)
Forces between atoms and molecules, particles and grain boundaries – Vander Waals and electrostatic forces between surface – Nano and Mesopores – size dependent variation in magnetic, electronic transport, resistivity, optical and etc – Misnomers and misconception of Nanotechnology.

Unit 3. QUANTUM CONFINEMENT (12 hrs)
Unit 4. SYNTHESIS OF NANOMATERIALS AND ITS CHARACTERIZATION  
(12 hrs)  

Unit 5. APPLICATION OF NANOMATERIALS  
(12 hrs)  

REFERENCES:  

SEMESTER : VI  
ELECTIVE PAPER III - A  
NANOSCALE MATERIALS & DEVICES  

Subject Description :  
This subject deals with the application material science.

Goal:  
To learn about the application and uses of materials in day-to-day life.

Objectives  
On successful completion of this subject the student should have  
- The knowledge of applied science in practical life.  
- To implement various scientific and mathematical problems with materials science.
Unit 1. SEMICONDUCTING NANOMATERIALS: (12 hrs)

Unit 2. MAGNETIC NANOMATERIALS (12 hrs)

Unit 3. NANO BIOTECHNOLOGY (12 hrs)
Natural nano composites – Introduction – natural nano composite materials biologically synthesized nano structures – biological device and synthetic nano composite – protein based nanostructure formation – biologically inspired nano composite nanotechnology in agriculture (fertilizers and pesticides)

Unit 4. NANO LITHOGRAPHY (12 hrs)
(i) Nano lithography techniques
(ii) Proximal probe Nanolithography
- STM – AEM – DIP pem nano lithography – resist imaging layers for proximal probes – Lang mum – Nano scratching

Unit 5. NANO ELECTRONICS (12 hrs)
Basic of Nano electronics – Features of Nano electrons- some physical fundamentals , Basic of information theory – the birth of electronics – The tool for micro and Nano fabrication – Basic of lithographic techniques for nano electronics.

Reference