**DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE**

**(Linguistic Minority Institution)**

**[AUTONOMOUS]**

**Reaccredited at ‘A’ Grade by NAAC**

**(Effective from 2015 Batch onwards)**



**“Gokulbagh” 833, Periyar E.V.R. Salai,**

**Arumbakkam, Chennai – 600106. Ph: 2475 4349**

**REGULATIONS**

**B.SC PHYSICS WITH COMPUTER APPLICATIONS**

**1. ELIGIBILITY FOR ADMISSION**

 Candidates for admission to the first year of the Degree of Bachelor of Science courses shall be required to have passed the Higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the Syndicate of the University of Madras. Provided that candidates for admission into the specific main subject of study shall possess such other qualifying conditions as may be prescribed by the University.

**2.**  **ELIGIBILITY FOR THE AWARD OF DEGREE**

 A candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than three academic years, passed the examinations all the Six-Semesters prescribed earning 140 Credits (in Parts I, II, III, IV & V).

**3. Course of Study:**

The main subject of study for Bachelor Degree shall consist of the following:

Part 1: Foundation course exclusive for language.

Part 2: English

Part 3: Core courses / Allied subjects I and II

Part 4 : Non-major Elective and Skill based subjects

Part 5 : Extension Activities / Sports/NCC

4. **Passing Minimum:**

A candidate shall be declared to have passed in each paper/practical of the main subject of study wherever prescribed, if he/she secured not less than 40% of the marks prescribed for the examination.

**5. Classification of successful candidates:**

PART I, II, III &IV

Successful candidates passing the examination and securing the marks (i) 60% and above and (ii) 50% and above but below 60% in the aggregate shall be declared to have passed the examination in the FIRST and SECOND class respectively. All other successful candidates shall be declared to have passed the examination in the THIRD class.

Candidates who passed all the examination (Part I,II,III &IV) prescribed for the courses in the FIRST APPEARANCE ITSELF ALONE are eligible for ranking.

**6. QUESTION PAPER PATTERN CONSISTS OF 3 PARTS:**

PART A: - 20 MARKS

PART B: - 35 MARKS

PART C: - 45 MARKS

**Question Paper Pattern for B.Sc Physics with Computer Applications Degree Course**

**THEORY**

   **Maximum Ext. Marks: 100**

  **Duration: 3 hours**

PART A (50 words)

To answer 10 questions

out of 12 questions (at least two questions from each unit) 10 × 2 marks = 20 marks

out of 12 questions, questions 11 and 12 should be problems

PART B (200 words)

To answer 5 questions

out of 7 question (at least one question from each unit) 5 × 7 marks = 35 marks

out of 7 questions, one question should be problem based

PART C (500 words)

To answer 3 questions

out of 5 question (at least one question from each unit) 3 × 15 marks = 45 marks

out of 5 questions, one subdivision of a question should be a problem

 **Total 100 marks**

**PRACTICALS**

 **Maximum Ext. Marks: 60**

 **Maximum Int. Marks: 40**

  **Duration: 3 hours**

The external examiner will prepare a question paper on the spot with the help of the Question Bank supplied by the controller’s office.

**SUBJECTS OFFERED:**

|  |
| --- |
| **Distribution of Hours, Marks and Credits for B.Sc Physics with Computer Applications Degree Course** |

|  |
| --- |
| **ANNEXURE – I****Distribution of Hours, Marks and Credits for B.Sc Physics with Computer Applications Degree Course** |
| **FIRST SEMESTER** |
| **Part** | **Subject** | **Ins Hrs** | **Credit** | **Exam** | **Ext** | **Int** | **Total** |
| I | Language – Paper I | 4 | 3 | 3 hrs | 60 | 40 | 100 |
| II | English – Paper I | 4 | 3 | " | 60 | 40 | 100 |
| III | PCA Core 1 – Mechanics & Properties of Matter | 7 | 5 | " | 60 | 40 | 100 |
| Allied Paper – Maths I – Theory | 8 | 5 | " | 60 | 40 | 100 |
| PCA Core Practical I | 3 | Practical Examination at the end of Semester II |
| IV | 1 (a) Basic Tamil I/(b) Adv. Tamil (or)1 (c) Non-Major Elective | 2 | 2 | " |  |
| 60 | 40 | 100 |
| 2. Skill based elective I | 2 | 2 | " | 60 | 40 | 100 |
|   | **TOTAL** | **30** | **20** |  | **360** | **240** | **600** |
|  |
| **SECOND SEMESTER**  |
| I | Language – Paper II | 4 | 3 | 3 hrs | 60 | 40 | 100 |
| II | English – Paper II | 4 | 3 | " | 60 | 40 | 100 |
| III | PCA Core 2 – Thermal Physics & Acoustics | 7 | 5 | " | 60 | 40 | 100 |
| Allied Paper – Maths II – Theory | 8 | 5 | " | 60 | 40 | 100 |
| PCA Core Practical I | 3 | 4 | " | 60 | 40 | 100 |
| IV | 1(a) Basic Tamil I/(b) Adv. Tamil (or) | 2 | 2 | " | 60 | 40 | 100 |
| 1(c) Non-Major Elective |
| 2. Skill based elective II | 2 | 2 | " | 60 | 40 | 100 |
|   | **TOTAL** | **30** | **24** |  | **420** | **280** | **700** |
|  |
| **THIRD SEMESTER** |
| III | PCA Core 3 – Optics | 5 | 5 | 3 hrs | 60 | 40 | 100 |
| PCA Core 4 – Basic Electronics | 5 | 5 | " | 60 | 40 | 100 |
| *CC 1 – Data Structures* | 4 | 4 | " | 60 | 40 | 100 |
| *CC 2 – Programming in C++*  | 4 | 4 | " | 60 | 40 | 100 |
| PCA Core Practical II – Major Practical II | 3 | 0 | " | 0 | 0 | 0 |
| *CCP 1 – Data Structure* | 3 | 2 | " | 60 | 40 | 100 |
| *CCP 2 – Programming in C++*  | 3 | 2 | " | 60 | 40 | 100 |
| IV | Soft Skill III | 2 | 2 | " | 60 | 40 | 100 |
| Environmental Studies | 1 | 0 | " | 0 | 0 | 0 |
|   | **TOTAL** | **30** | **24** |  | **420** | **280** | **700** |
| **FOURTH SEMESTER** |
| III | PCA Core 5 – Atomic Physics  | 5 | 5 | 3 hrs | 60 | 40 | 100 |
| PCA Core 6 – Elective I – Integrated Electronics | 6 | 5 | " | 60 | 40 | 100 |
| *CC 3 – Operating System* | 5 | 4 | " | 60 | 40 | 100 |
| *CC 4 – Database Management Systems* | 5 | 4 | " | 60 | 40 | 100 |
| PCA Core Practical II  | 3 | 4 | " | 60 | 40 | 100 |
| *CCP 3 – – Practical RDBMS using VB* | 3 | 2 | " | 60 | 40 | 100 |
| IV | Soft Skill IV | 2 | 2 | " | 60 | 40 | 100 |
| Environmental Studies | 1 | 2 | " | 60 | 40 | 100 |
|   | **TOTAL** | **30** | **28** |  | **480** | **320** | **800** |
| **FIFTH SEMESTER** |
| **Part** | **Subject** | **Ins Hrs** | **Credit** | **Exam** | **Ext** | **Int** | **Total** |
| III | PCA Core 7 – Nuclear Physics and Particle Physics | 5 | 5 | " | 60 | 40 | 100 |
| PCA Core 8 – Solid State Physics  | 5 | 5 | " | 60 | 40 | 100 |
| PCA Core 9 – Elective II – Microprocessor Fundamentals | 4 | 5 | " | 60 | 40 | 100 |
| *CC 5 – Programming in JAVA* | 4 | 4 | " | 60 | 40 | 100 |
| *CCP 4 – JAVA Programming Lab* | 3 | 2 | " | 60 | 40 | 100 |
| PCA Core Practical III  | 3 | 0 | " | 0 | 0 | 0 |
| PCA Core Practical IV  | 3 | 0 | " | 0 | 0 | 0 |
| PCA Core Practical V  | 3 | 0 | " | 0 | 0 | 0 |
| IV | Value Education | 0 | 1 | " | 60 | 40 | 100 |
|   | **TOTAL** | **30** | **22** |  | **360** | **240** | **600** |
|   |  |  |  |  |  |  |  |
| **SIXTH SEMESTER** |
| III | PCA Core 10 – Electricity and Electromagnetism  | 6 | 5 | " | 60 | 40 | 100 |
| PCA Core 11 – Relativity and Quantum Mechanics | 5 | 5 | " | 60 | 40 | 100 |
| PCA Core 12 – Mathematical Physics and Numerical Methods  | 6 | 5 | " | 60 | 40 | 100 |
| *CC 6 – Digital Electronics (handled by Physics Department)* | 4 | 4 | " | 60 | 40 | 100 |
| PCA Core Practical III  | 3 | 4 | " | 60 | 40 | 100 |
| PCA Core Practical IV  | 3 | 4 | " | 60 | 40 | 100 |
| PCA Core Practical V  | 3 | 4 | " | 60 | 40 | 100 |
| V | Extension Activities | 0 | 1 | " | 60 | 40 | 100 |
|   | **TOTAL** | **30** | **32** |  | **480** | **320** | **800** |

|  |  |
| --- | --- |
| Note: | PCA Core : Physics with computer applications Core, PCA Core Practical : Physics with computer applications Core Practical  |
| CC : Computer Core CCP : Computer Core Practical |

# SYLLABUS

## SEMESTER I

**Core Paper** – **1**

**MECHANICS AND PROPERTIES OF MATTER**

**No. of credits: 5**   **Q. Pr. No.: 2101**

**No. of hours allotted: 7/week**  **Subject code: 37101**

**Unit 1: Impulse and Impact**

 Basic concepts – Laws of Motion – Friction – Impulse – impact – laws of impact – direct impact and oblique impact between two smooth spheres – loss of kinetic energy – reduced mass – Problems.

**Rigid body dynamics:** Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k – center of mass – determination of motion of individual particle – system of variable mass.

**Unit 2: Centre of Gravity and Centre of Pressure**

 Newton’s Law of Gravitation – Kepler’s Law – Orbital velocity and Escape Velocity – Centre of gravity of a solid and hollow hemisphere – centre of pressure – vertical rectangular lamina – vertical triangular lamina.

**Hydrodynamics:** Equation of continuity of flow – venturimeter – Euler’s equation of unidirectional flow – Torricelli’s theorem – Bernoulli’s theorem and its applications.

**Unit 3: Elasticity**

 Hooke’s law – stress – strain – elastic constants – relation connecting the three elastic constants – expressions for Poisson’s ratio in terms of elastic constants – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion – torsional pendulum – rigidity modulus and moment of inertia.

**Unit 4: Bending of Beams**

 Cantilever – expression for bending moment – expression for depression – cantilever oscillations – expression for time period – uniform bending – expression for elevation– optic lever method – non-uniform bending – experiment to determine Young’s modulus by Koenig’s method – pin and microscope method.

**Unit 5: Fluid Dynamics**

 Surface tension – definition – excess pressure over curved surface – variation of surface tension with temperature – Jaeger’s method. Viscosity – definition – coefficient of viscosity – critical viscosity – Poiseuille’s formula – variation of viscosity with temperature – applications.

**Books for Study**

1. **Properties of Matter** by Brij Lal and N. Subramaniam, S. Chand & Co., New Delhi (1994).
2. **Properties of Matter** by R. Murugeshan, S. Chand & Co., New Delhi (2001).
3. **Mechanics – Part I and II** by Narayanamoorthy, National Publishing Company.
4. **Mechanics** by D.S. Mathur, S. Chand & Co., 2nd Ed (2001).
5. **Mechanics** by P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam, S. Chand & Co., New Delhi (1988).

**Books for Reference**

1. **General Properties of Matter** by C.J. Smith, Orient Longman Publishers (1960).
2. **Fundamentals of Physics** by D. Halliday, R. Rensick and J. Walker, 6th Ed, Wiley, NY.
3. **Mechanics and General Properties of Matter** by P.K. Chakrabarthy, Books and Allied (P) Ltd. (2001).
4. **Fundamentals of General Properties of Matter** by H.R. Gulati, S. Chand & Co., New Delhi (1982).

## SEMESTER II

**Core Paper – 2**

## THERMAL PHYSICS AND ACOUSTICS

**No. of credits: 5**   **Q. Pr. No.: 2102**

**No. of hours allotted: 7/week**   **Subject code: 37203**

**Unit 1: Thermal Physics**

 Platinum resistance thermometer – Calendar and Griffith’s bridge – thermistor – specific heat capacity of solids – Dulong and Petit’s law – specific heat capacity of liquid – method of mixtures – Barton’s correction – specific heat capacity of gases – Cp and Cv by Regnault’s and Callendar & Barne’s methods. **Low Temperature Physics:** Joule–Kelvin effect – theory of porous plug experiment – Linde’s method of liquefying air.

**Unit 2: Thermodynamics**

 Equation of State – Thermodynamic equilibrium – laws of thermodynamics – reversible and irreversible processes – Carnot’s engine – Carnot’s theorem – petrol and diesel engines – thermodynamic scale of temperature – entropy – temperature entropy diagram for Carnot’s cycle – Nernst’s heat theorem.

**Unit 3: Conduction and Radiation**

 Thermal conductivity – thermal conductivity of a good conductor – Forbe’s method – thermal conductivity of a bad conductor – Lee’s disc method.

**Radiation:** Blackbody radiation – Wien’s law – Stefan’s law – Newton’s law of cooling from Stefan’s law – pyrometry – polarising optical pyrometer – solar constant – determination of solar constant – water flow pyroheliometer.

**Unit 4: Acoustics**

 Simple harmonic motion – combination of two SHMs in a straight – Lissajous’s figures – free, damped, forced oscillations and resonance – intensity and loudness of sound – intensity level – decibel – noise pollution – Doppler Effect – Problems based on Doppler Effect.

#### Unit 5: Ultrasonics

#### Ultrasonics – production – piezo electric crystal method – magnetostriction method – applications – acoustics of buildings – reverberation – absorption coefficient – Sabine’s formula – acoustics aspects of halls and auditoriums.

**Books for Study**

1. **Heat & Thermodynamic**s by Brijlal & N. Subramanyam, S. Chand & Co, New Delhi (2000).
2. **Heat & Thermodynamics** by D.S. Mathur, 3rd Ed Sulthan Chand & Sons, New Delhi (1978).
3. **Thermal Physics** by R. Murugeshan and Er. Kiruthiga Sivaprasath, Revised Edition, Sulthan Chand & Sons, New Delhi (2013).
4. **Heat** by Narayanamoorthy and Krishna Rao, Triveni Publishers, Madras (1969).
5. **Waves and Oscillations** by N.K. Bajaj, Tata McGraw Hill Education, New Delhi (1988)
6. **Text book of Sound** by V.R. Khanna & R.S. Bedi, 1stEd, Kedharnaath Publish & Co, Meerut.
7. **Waves and Oscillations** by Brijlal and N. Subramanyam, Vikas Publishing House, New Delhi
8. **Text Book of Sound** by Ghosh, S.Chand & Co, New Delhi (1996).

**Books for Reference**

1. **Heat and Thermodynamics** by Zemansky, McGraw–Hill Book Co. Inc., New York.
2. **Fundamentals of Physics** by Resnick Halliday and Walker, 6th Ed, John Willey and Sons, Asia Pvt. Ltd., Singapore.
3. **Fundamentals of Thermodynamics** by Carroll M. Leonard, Prentice-Hall India Delhi (1965).
4. **Heat and Thermodynamics** by J.B. Rajam and C.L. Arora, 8th Ed, S. Chand, Delhi (1976).
5. **Principles of Thermodynamics** by Jin Sheng Hsieh, 1st Ed, McGraw–Hill Kogakusha Ltd., Tokyo (1975).
6. **Thermodynamics** by Warren Giedt, 1st Ed, Van Nostrand Reinhold Company, New York (1971).

**SEMESTER III**

**Core Paper – 3**

**OPTICS**

**No. of credits: 5**  **Q. Pr. No.: 2103**

**No. of hours allotted: 5/week**   **Subject code: 37306**

**Unit 1: Geometrical Optics**

Spherical aberration in lenses – methods of minimizing spherical aberration – condition for minimum spherical aberration in the case of two lenses separated by a distance – chromatic aberration in lenses – condition for achromatism of two thin lenses (in and out of contact) – dispersion produced by a thin prism – achromatic prisms – combination of prisms to produce – dispersion without deviation – deviation without dispersion.

**Unit 2: Interference**

Theory of interference – analytical treatment – expression for intensity – condition for maxima and minima in terms of phase and path difference – Airwedge – determination of diameter of thin wire – test for optical flatness – Haidinger’s fringes – Michelson’s interferometer – determination of wavelength of light and thickness of thin transparent material.

**Unit 3: Diffraction**

Fresnel diffraction – diffraction at a circular aperture and straight edge. Fraunhoffer diffraction – single slit – double slit – theory of plane transmission grating – normal incidence – dispersive power of grating. Rayleigh’s criterion for resolution – resolving power of telescope and microscope – resolving power of prism and grating – problems based on resolving power.

**Unit 4: Polarisation**

Double refraction – principle and construction of Nicol prism – Huygen’s explanation of double refraction in uniaxial crystals – quarter wave plate and halfwave plate – production and detection of plane, elliptically and circularly polarized light – Babinet’s compensator – optical activity – Fresnel’s explanation of optical activity – specific rotation – Laurent’s half shade polarimeter.

**Unit 5: Spectroscopy**

Electromagnetic spectrum – Brownian motion – Tyndall effect – blue of the sky – halo of the moon – Raman effect – principle, construction and working of He–Ne laser, CO2 laser – applications of lasers.

**Books for Study**

1. **A Text Book of Optics** by N. Subrahmanyam, Brij Lal and M.N. Avadhanulu, S. Chand & Co., New Delhi (2006).
2. **Optics and Spectroscopy** by R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Co., New Delhi (2006).
3. **Optics** by D.R. Khanna and H.R. Gulati, S. Chand & Co., New Delhi (1979).
4. **Molecular Structure and Spectroscopy** by Aruldhas, Prentice Hall, New Delhi (2005).
5. **Optics** by Ajoy Ghatak, Tata McGraw–Hill Publishing Co. Ltd., 3rd Ed, New Delhi (1998).

**Books for Reference**

1. **Fundamentals of Physics** by D. Halliday, R. Resnick and J. Walker, 6th Ed, New York (2001).
2. **Optics** by Eugene Hecht,Pearson Publications, 4th Ed, Chennai (2011)
3. **The Feynman Lectures on Physics** by R.P. Feynman, R.B. Leighton and M. Sands, Vols. 1, 2 & 3, Narosa, New Dehli (1998).

**SEMESTER III**

**Core Paper – 4**

**BASIC ELECTRONICS**

**No. of credits: 5**  **Q. Pr. No.: 2104**

**No. of hours allotted: 5/week**    **Subject code: 37307**

**Unit 1: Introduction to Semiconductors**

Introduction – classification of materials based on band gap – intrinsic and extrinsic semiconductors – PN junction – V–I characteristics – half wave rectifier – full wave rectifier – efficiency.

**Unit 2: Transistor & Amplifier**

Transistor – CB mode and CE mode operation – analysis of an amplifier using h parameters (CE only) – expression for current gain, voltage gain, input impedance, output impedance and power gain – RC coupled amplifier – frequency response – classification of amplifiers – class A power amplifier – push pull, class B power amplifier.

**Unit 3: Feedback Oscillators**

Concept of feedback – positive and negative feedback – Barkhuesen condition for oscillators – phase shift and Wein’s bridge oscillator – expression for frequency of oscillation and condition for oscillation in each case.

**Unit 4: Wave Shaping Circuits and Multivibrators**

Clipping and clamping circuits – integrating and differentiating circuits – RC time constant – multivibrator using transistors – astable and monostable.

**Unit 5: Special Semiconductor Devices and Applications**

Field effect transistor (FET) – characteristics – unijunction transistor (UJT) – characteristics – UJT as saw tooth generator – SCR characteristics – SCR as a switch.

**Books for Study**

1. **Principles of electronics** by V.K. Mehta, Rohit Mehta, S. Chand & Co., New Delhi (1990).
2. **Handbook of Electronics** by Gupta and Kumar, Pragati Prakashan, Meerut (2002).
3. **Electronics** by M. Arul Thalapathi, Comptek Publishers (2005).
4. **Elements of Electronics** by M.K. Bagde and S.P. Singh, S. Chand & Co., New Delhi (1990).
5. **Applied Electronics** by A. Subrahmanyam, National Publishing Co. (1997).

**Books for Reference**

1. **Electronic Devices** by G.K. Mittal., G.K. Publishers Pvt. Ltd. (1993).
2. **Basic Electronics** by B.L. Theraja, S. Chand & Co. (2008).
3. **Solid State Electronics** by Ambrose and Vincent Devaraj, Meera Publication.
4. **Applied Electronics** by A. Subrahmanyam, National Publishing Co. (1997).

**Website:** http://www.dear.haward.edu/courses/es154

 http://www.phys.ualberta.ca/gingrich/phys395/notes/phy395.html

**SEMESTER IV**

**Core Paper – 5**

**ATOMIC PHYSICS**

**No. of credits: 5**  **Q. Pr. No.: 2107**

**No. of hours allotted: 5/week**    **Subject code: 37412**

**Unit 1: Discharge Phenomenon through Gases**

Detection of charged particles in electric and magnetic fields – determination of e/m – Dunnington’s method – positive rays and its properties – Dempster’s mass spectrographs – Bain bridge’s mass spectrograph.

**Unit 2: Photo-electric Effect**

Richardson and Compton experiment – laws of photoelectric emission – Einstein photo electric equation – Millikan’s experiment – verification of photoelectric equation – photoelectric cells – photo emissive cells – photo voltaic cells – photo conducting cells – photo multiplier.

**Unit 3: Atomic Structure**

Vector atom model – Pauli’s exclusion principle – explanation of periodic table – various quantum numbers – angular momentum and magnetic moment – coupling schemes – LS and JJ coupling – special quantization – Bohr magneton –Stern and Gerlach experiment.

**Unit 4: Effect of Atoms in Electric and Magnetic Fields**

Zeeman effect – experimental arrangement for the normal Zeeman effect – Lorentz’s classical theory of normal Zeeman effect – Larmor’s theorem – quantum mechanical explanation of the normal Zeeman effect – Anamalous Zeeman effect – Paschen – Back effect – Stark effect.

**Unit 5: X-rays**

Introduction – Characteristic X-ray spectrum – continuous X-ray spectrum – X-ray absorption – Moseley’s law – Bragg’s law – Bragg’s spectrometer – uses of X-rays – Compton effect – experimental verification of Compton effect.

**Books for Study**

1. **Atomic and Nuclear Physics** by N. Subrahmanyam and Brijlal, S. Chand & Co., 5th Ed, New Delhi (2000).
2. **Modern Physics** by D.L. Sehgal, K.L. Chopra and N.K. Sehgal, Sultan Chand & Sons Publication, 7th Ed, New Delhi (1991).
3. **Atomic Physics** by J.B. Rajam, S. Chand and Co., 20th Ed, New Delhi, (2004).
4. **Modern Physics** by R. Murugeshan and Kiruthiga Sivaprasad, S. Chand & Co., New Delhi (2008).
5. **Perspectives of Modern Physics** by Arthur Beiser, Tata McGraw Hill, 1st Ed, New Delhi (1969).

**Books for Reference**

1. **Modern Physics** by J.H. Hamilton and Yang, McGraw Hill Publication (1996).
2. **Concepts of Modern Physics** by A. Beiser, Tata McGraw Hill, New Delhi (1997).
3. **Fundamentals of Physics** by D. Halliday, R. Resnick and J. Walker, Wiley, 6th Ed. New York (2001).
4. **Modern Physics** by Kenneth S. Krane, John Willey & Sons, Canada (1998).
5. **The Feynman Lectures on Physics** by R.P. Feynman, R.B. Leighton and M. Sands, Vols. 1, 2 & 3, Narosa, New Dehli (1998).

**Website:** www.abo.fi/~mhottoka/mhottoka/lectnote.html

**SEMESTER IV**

**Core Paper – 6**

**INTEGRATED ELECTRONICS**

**No. of credits: 5**  **Q. Pr. No.: 2111**

**No. of hours allotted: 6/week**   **Subject code: 1537413**

**Unit 1: OP-AMP Basic Applications**

Characteristic parameters – differential gain – CMRR – slew rate – bandwidth – applications – inverting amplifier, non-inverting amplifier, integrator, differentiator, summing and difference – averaging amplifier.

**Unit 2: Analog Computation and Waveform Generation**

Analog computation and waveform generation using op amp – solving simultaneous equation – second order differential equation – square wave generation (astable operation) – sine wave generation – Wien’s bridge oscillator.

**Unit 3: D/A and A/D Convertors**

Introduction – binary weighted resistor D/A convertor – R–2R ladder method – resolution A/D convertor – counter type – successive approximation type – resolution.

**Unit 4: Timer, DAC/ADC**

Timer 555 – internal block diagram and working – astable multivibrator – Schmitt trigger. D/A convertor – binary weighted method – A/D convertor – successive approximation method.

**Unit 5: Semiconductor Memories**

Semiconductor memories – ROM – organization – 1K × 4 ROM – PROM – EPROM – EEPROM – Random Access Memory (RAM) – static RAM – dynamic RAM.

**Books for Study**

1. **Introduction to Integrated Electronics** by V. Vijayendran and S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai (2005).

2. **Digital Principles and Application** by Malvino Leach, 4th Ed, Tata McGraw Hill (1992).

3. **Digital Fundamentals** by Thomas L. Floyd, Universal Book Stall, New Delhi (1998).

4. **OP AMPs and Linear Integrated Circuits** by Ramakant A. Gayakwad, Prentice Hall of India (1994).

**Books for Reference**

1. **Digital Electronics by Practice using Integrated Circuits** by R.P. Jain, Tata McGraw Hill, New Delhi (1996).

2. **Linear Integrated Circuits** by D. Roy Choudhury and Shahil Jain, New Age International Pvt., Ltd (2003).

3. **Electronics – Analog and Digital** by I.J. Nagrath, Prentice Hall of India, New Delhi (1999).

4. **Integrated Electronics** by J. Millman and C. Halkias, Tata McGraw Hill, New Delhi (2001).

**Website:** http://www.dear.harward.edu/courses/es154

## SEMESTER V

**Core Paper – 7**

### NUCLEAR PHYSICS AND PARTICLE PHYSICS

**No. of credits: 5**  **Q. Pr. No.: 2115**

**No. of hours allotted: 5/week**  **Subject code: 37518**

**Unit 1: General Properties of Nuclei**

 Nuclear size, charge, mass – determination of nuclear radius-mirror nucleus method – mass defect and binding energy-packing fraction – nuclear spin – magnetic dipole moment – electric quadrupole moment – nuclear models – liquid drop model – Weizacker semi empirical mass formula – shell model and magic numbers – collective model-nuclear forces – meson theory of nuclear force (qualitative).

**Unit 2: Radioactivity**

 Natural radioactivity – law of disintegration – half life and mean life period – units of radioactivity – transient and secular equilibrium – radiocarbon dating – age of earth – alpha rays – characteristics – Geiger Nuttal law – α-ray spectra – Gamow’s theory of α-decay (qualitative study) – beta rays –characteristics – beta ray spectra – neutrino hypothesis – violation of parity conservation – experimental verification with Co60 – gamma rays and internal conversion – nuclear isomerism.

**Unit 3: Radiation Detectors and Particle Accelerators**

 Principle and working of – ionisation chamber – GM Counter – quenching and resolving time – scintillation counter – photo multiplier tube – thermoluminescence – thermoluminescence dosimetry (TLD) – linear accelerator –cyclotron – synchrocyclotron, betatron.

**Unit 4: Nuclear Reactions**

 Conservation laws – nuclear reaction kinematics – Q-value – threshold energy – artificial radioactivity – radioisotopes and its uses – classification of neutrons – nuclear fission – chain reaction – critical mass and size – nuclear reactor – breeder reactor – transuranic elements – nuclear fusion –thermonuclear reactions-sources of stellar energy.

**Unit 5: Elementary Particles**

 Classification of elementary particles fundamental interaction – elementary particle quantum numbers – isospin and strangeness – conservation laws and symmetry – basic ideas about quark–quark model.

**Books for Study**

1. **Nuclear Physics** by D.C. Tayal, Himalaya Publishing House, Mumbai (2006).
2. **Atomic and Nuclear Physics** by N. Subrahmanyam and Brijlal, S Chand & Co., New Delhi (1996).
3. **Nuclear** **Physics** by R.C. Sharma, K. Nath & Co., Meerut (2000)
4. **Nuclear** **Physics** by Irving Kaplan, Narosa Publishing House, New Delhi.

**Books for Reference**

1. **Nuclear** **Physics** by R.R. Roy and B.P. Nigam, New Age International (P) Ltd., New Delhi (1997).
2. **Fundamentals** **of** **Elementary** **Particle** **Physics** by Longo, Mc Graw-Hill.
3. **Nuclei** **and** **Particles** by Serge, W.A. Benjamin, USA
4. **Elements** **of Nuclear Physics** by ML Pandya and RPS Yadav, Kedarnath Ram Nath, Meerut

**Website:** http://ocw.mit.edu/ocw Web/physics/8-701 spring 2004/Lectine notes.

 http://faraday.physics.utoronto.ca/GeneralInterest/D.Bailey/SubAtomic/Lectures/Lect.html.

## SEMESTER V

**Core Paper – 8**

 **SOLID STATE PHYSICS**

**No. of credits: 5**   **Q. Pr. No.: 2112**

**No. of hours allotted: 5/week**  **Subject code: 37519**

 **Unit 1: Crystal Structure**

 Crystal lattice – primitive and unit cell – seven classes of crystal – Bravais lattice – Miller indices – structure of crystals – simple cubic, hexagonal close packed structure, face centred cubic structure, body centred cubic structure – sodium chloride structure, zinc blende structure, diamond structure.

**Unit 2: Defects in Solids**

 X ray diffraction – Bragg’s law in one dimension – experimental methods – Laue method, powder crystal method and rotating crystal method. Defects in solids – point defects – Frenkel and Schottky defects – equilibrium concentrations – line defects – edge dislocation and screw dislocation – surface defects – grain boundary – effects of crystal imperfections.

**Unit 3: Chemical Bonds and Crystallography**

 Interatomic forces – different types of chemical bonds – ionic bond – cohesive energy of ionic crystals and Madelung constant – covalent bond – metallic bond – Van der Waal’s bond – hydrogen bond.

 Superconductivity – general properties – type I and II superconductors – Meissner effect – BCS theory – applications of super conductors.

 **Unit 4: Dielectric Properties**

 Dielectric materials – polarization, susceptibility and dielectric constant – local field or internal field – Clausius–Mossoti relation – sources of polarizability – electronic polarizability – ionic polarizability – orientational polarizability – frequency and temperature effects on polarization – dielectric breakdown – properties of different types of insulating materials.

**Unit 5: Magnetic Properties**

 Different types of magnetic materials – classical theory of diamagnetism (Langevin theory) – Langevin theory of paramagnetism – Weiss theory of paramagnetism – Heisenberg interpretation on internal field and quantum theory of ferromagnetism – antiferromagnetism – hard and soft magnetic materials.

**Books for Study**

**1. Solid State Physics** by S.O. Pillai, New Age International (P) Ltd. (2002).

**2. Solid State Physics** by R.L. Singhal, Kedarnath Ram Nath & Co., Meerut (2003)

3. **Introduction to Solid State Physics** by Kittel, Willey Eastern Ltd (2003).

**4. Materials Science and Engineering** by V. Raghavan, Prentice Hall of India Private Limited, New Delhi (2004).

**Books for Reference:**

1. **Materials Science** by M. Arumugam, Anuradha Agencies Publishers.(2002)

**2. Solid State Physics** by A. J.Dekker, Macmillan India (1985).

3. **Solid State Physics** by HC Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (2001).

**Web Site:** http://folk.uio.no//dragos//solid/fys230-Exerciser.html.

 http://www.physics.brocku.ca/courses/4p7d.

## SEMESTER V

**Core Paper – 9**

Elective 2

**MICROPROCESSOR FUNDAMENTALS**

**No. of credits: 5**  **Q. Pr. No.: 2118**

**No. of hours allotted: 4/week**   **Subject code: 37625**

**Unit 1: Architecture**

 Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer’s model of 8085 – pin out diagram – functions of different pins.

**Unit 2: Programming Techniques**

 Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes.

**Unit 3: Interfacing memory to 8085**

 Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte).

Memory interfacing – interfacing 2kx8 ROM and RAM, timing diagram of 8085 (MOV Rd, Rs – MVI Rd, data(8)) .

**Unit 4: Interfacing I/O Ports to 8085**

Programmable peripheral interface 8255–8255 – pin out functions, block diagram, control word, modes of operation of 8255, interface, I/P&O/P port to 8085, flashing LEDs.

**Unit 5: Interrupts**

 Interrupts in 8085 – hardware and software interrupts – RIM, SIM instructions – priorities – simple polled and interrupt controlled data transfer.

**Books of Study**

1. **Microprocessor Architecture Programming and Application** with 8085/8080A by R.S. Gaonkar, Wiley Eastern Ltd. (1992).
2. **Fundamental of microprocessor 8085** by V. Vijayendran, S. Viswanathan Publishers, Chennai (2003).
3. **Fundamentals of Microprocessors and Microcomputers** by B. Ram, Dhanpat RAI Publication.

**Books for Reference**

1. **Introduction to Microprocessor** by Aditya Mathur – Tata McGraw Hill Publishing Company Ltd. (1987).
2. **Microprocessor and Digital System** by Dougles V. Hall, 2nd Ed, McGraw Hill Company (1983).

I**Web Site:** http://www.engj.ulst.ac.uk/sidk/eeellla/lecture-series//microprocessor.

## SEMESTER VI

**Core Paper – 10**

**ELECTRICITY AND ELECTROMAGNETISM**

**No. of credits: 5**  **Q. Pr. No.: 519**

**No. of hours allotted: 6/week**   **Subject code: 37520**

**Unit 1: Electrostatics**

 Coloumb’s law – electric intensity and electric potential – electrical images – electric intensity and potential due to an earthed conducting sphere applying the principle of electrical images – electric dipole – potential and intensity due to a dipole – capacity – capacitance of a spherical and cylindrical capacitor – energy of a charged capacitor – loss of energy due to sharing of charges.

**Unit 2: Chemical effects of electric current**

 Faraday’s laws of electrolysis – ionic velocities and mobilities. Calculation and experimental determination of ionic mobilities – transport number. Thermoelectricity – Peltier effect – experimental determination of Peltier coefficient – Thomson coefficient – experimental determination of Thomson coefficient – application of thermodynamics to a thermocouple and connected relations – thermoelectric diagram and uses.

**Unit 3: DC and AC Circuits**

 **DC Circuits:** Growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit – condition for the discharge to be oscillatory – frequency of oscillation.

 **AC Circuits:** AC voltage and current – power factor and current values in and AC circuit containing LCR circuit – series and parallel resonant circuits – single phase – three phase – electric fuses – circuit brakers.

**Unit 4: Electromagnetic induction and its applications**

 Faraday’s laws of electromagnetic induction – determination of coefficient of self inductance of a solenoid – mutual inductance – experimental determination of absolute mutual inductance of a solenoid – coefficient of coupling – earth inductor – uses of earth inductor – measurement of horizontal component of the earth’s magnetic field – measurement of vertical component of earth’s magnetic field – calibration of B.G. – induction coil and its uses.

**Unit 5: Maxwell’s equations and Electromagnetic theory**

 Review of Gauss law in electrostatics and magnetism – Problems – Ampere’s law – Faraday’s law – displacement current – Maxwell’s equations – differential and integral forms – scalar and vector potentials – derivation of Maxwell’s equations in free space – Hertz experiment – energy density of e.m. wave – Poynting’s theorem.

**Books for Study**

1. **Electricity & Magnetism** by M.Narayanamurthy & N.Nagarathnam, NPC pub., Revised edition.
2. **Electricity and Magnetism** by Brijlal and Subrahmanyam; S.Chand & Co., New Delhi, (2000).
3. **Electricity & Magnetism** by D.Chattopadhyay and P.C. Rakshit, Books and Allied (P) Ltd.(2001).
4. **Fundamentals of Electricity and Magnetism** by B.D. Dugal and C.L. Chhabra, Shobanlal Nagin, S. Chand & Co., 5th Ed, New Delhi(2005).
5. **Electricity and Magnetism** by R. Murugeshan, S.Chand & Co., New Delhi, (2008).

**Books for Reference**

1. **Electricity & Magnetism** by K.K. Tewari, S.Chand & Co., New Delhi (2002).
2. **Introduction to Electrodynamics** by D.J. Griffiths, Prentice Hall of India., 3rd Ed, New Delhi (2003).
3. **Fundamentals of Physics**, D. Halliday, R. Resnick and J. walker, Wiley, 6th Ed, New York (2001).

**SEMESTER VI**

**Core Paper – 11**

 **RELATIVITY AND QUANTUM MECHANICS**

**No. of credits: 5**  **Q. Pr. No.: 2116**

**No. of hours allotted: 5/week**   **Subject code: 37623/24**

**Unit 1: Relativity**

 Frames of reference – Galilean transformation – Michelson – Morley experiment – postulates of special theory of relativity – Lorentz transformation – length contraction – time dilation – relativity of simultaneity – addition of velocities – variation of mass with velocity – mass energy relation – problems – elementary ideas of general relativity.

**Unit 2: Wave Nature of Matter**

 Phase and group velocity – wave packet – expression of De Brogile’s wave length – Davisson and Germer’s experiment – G.P. Thompson’s experiment – electron microscope – Heisenberg’s uncertainty principle and its consequences.

**Unit 3: Schrodinger Equation**

 Inadequacy of classical mechanics – basic postulates of wave mechanics – Schrodinger equation – properties of wave function – probability interpretation of wave function – normalization of wave function – linear operators – self adjoint operators – expectation value – Eigen values and Eigen functions – commutativity and compatibility.

**Unit 4: Angular Momentum in Quantum Mechanics**

 Orbital angular momentum operators and their commutation relations – separation of three dimensional Schrodinger equation into radial and angular parts – elementary ideas of spin angular momentum of an electron – Pauli’s matrices.

**Unit 5: Solutions of Schrodinger Equation**

 Free particle solution – particle in a box – potential well of finite depth (one dimension) – linear harmonic oscillator – rigid rotator and hydrogen atom.

**Books for Study**

1. **Quantum Mechanics** by Aruldhas, 2nd Ed, Prentice Hall, New Delhi (2008).
2. **Introduction to Quantum Mechanics** by David Griffiths, 2nd Ed, Prentice Hall of India (2004).
3. **Quantum Mechanics** by V.K. Thankappan, New Age International (P) Ltd. Publishers, New Delhi (2003).
4. **Quantum mechanics** by K.K. Chopra and G.C. Agrawal, Krishna Prakasam Media (P) Ltd., Meerut 1st Ed (1998).
5. **Modern Physics** by R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Co. (2008)

**Books for Reference**

1. **Mechanics and Relativity** by Brijlal Subramanyam, S. Chand & Co., New Delhi,(1990).

2. **Concepts of Modern Physics** by A. Beiser. Tata McGraw–Hill, 5th Ed, New Delhi (1997).

3. **Introduction to Quantum Mechanics** by Pauling and Wilson, McGraw–Hill.

4. **Quantum Mechanics** by A. Ghatak and Loganathan, Macmillan India Pvt. Ltd.

**Web Site:** http://physics.usc.edu/~bars.

 http://www.nscl.msu.edu/~pratt/phy851/lectrues/lectures.html

## SEMESTER VI

**Core Paper** –12

**MATHEMATICAL PHYSICS & NUMERICAL METHODS**

**No. of credits: 5**  **Q. Pr. No.: 2117**

**No. of hours allotted: 6/Week**    **Subject code: 37624/25**

**Unit 1: Matrices**

 Real, symmetric, skew symmetric, orthogonal matrices – characteristic equation of a matrix – Eigen values and Eigen vectors – Hermitian and unitary matrices – properties of their Eigen values and Eigen vectors – diagonalisation of matrices – trace of a matrix – Cayley–Hamilton theorem

**Unit 2: Elementary Complex Analysis**

 Functions of a complex variable – continuity and differentiability – single and multivalued functions – analytic function – Cauchy–Riemann conditions (necessary and sufficient). Cauchy–Riemann conditions in the polar (r,θ) coordinates.

**Unit 3: Vector Analysis**

 Scalar and vector fields – gradient, divergence and curl – equations of motion in the vector notation – equations of motion (components) in cartesian coordinates – equations of motion in polar coordinates.

**Unit 4: Simultaneous Linear Algebraic Equations**

 Method of triangularisation – Gauss elimination method – inverse of a matrix – Gauss–Jordan method.

 **Numerical Solution of Algebraic, Transcendental & Differential Equation**

 Bisection method – Regula falsi method – Newton–Raphson method – solution of ordinary differential equation – Euler’s method.

**Unit 5: Curve Fitting**

 Principles of least squares – fitting a straight line – linear regression – fitting an exponential curve.

**Numerical Integration**

Trapezoidal rule – Simpson’s 1/3 rule and 3/8 rule.

**Books for Study**

1. **Mathematical Physics** by Sathya Prakash, Sultan Chand and Sons, New Delhi (1996)

2. **Numerical Methods** by M.K. Venkatraman, National Publishing Company, (1990).

3. **Numerical Methods** by V. Rajaraman, Prentice – Hall India Pvt. Ltd., (2003).

4. **Numerical Methods** by P. Kandasamy, K. Thilagavathy and K. Gunavathy, S. Chand & Co. (2002).

**Books for Reference**

1. **Mathematical Physics** by B.D. Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (1996).

2. **Numerical methods** for Scientific and Engineering computation by Jain Iyenger and Jain, New Age International (P) Ltd.,(2004).

3. **Numerical methods** by S.S. Sastry, Prentice Hall of India Pvt. Ltd., New Delhi (2003).

## SEMESTER VI

**Computer Core – 6**

**DIGITAL ELECTRONICS (Handled by Physics Department)**

**No. of credits: 4**  **Q. Pr. No.:**

**No. of hours allotted: 4/week**  **Subject code:**

**Unit 1: Number System and Binary Code**

Introduction,binary, octal and hexadecimal number system. binary operations-addition; subtraction, multiplication and division. Subtraction using 1’s and 2’s complement; BCD system.

**Unit 2: Combinational Logic Design**

Boolean algebra – De Morgan’s theorem – basic logic gates – NAND and NOR as universal gates –SOP, POS – Karnaugh map representation and simplification, pair, quad, octet (limited to four variables). Arithmetic circuits – half and full adders, half and full subtractors), BCD adder. Demultiplexers/decoders, multiplexers, encoders, code converters (BCD-to binary, binary to BCD converters).

**Unit 3: Flip Flops**

Sequential logic circuits – 1-bit memory, latch, R-S flip flop, J-K flip flop – race-around comdition – master – slave flip flop – T and D flip flops.

**Unit 4: Registers and Counters**

Registers, modes of operation, shift right, shift left registers. Counters (4 bit). Ripple (or) asynchronous counters – synchronous counters –up – down counters – decade counter – BCD counter.

**Unit 5: Introduction to IC Technology**

Basic fabrication steps: epitaxial growth, oxidation, photolithography, etching, diffusion, ion implantation, film deposition and metallization – fabrication of diodes and transistor.

**Books for Study**

1. **Introduction to Integrated Electronics** by V. Vijayendran, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai (2005).
2. **Digital Electronics by Practice Using Integrated Circuits** by R.P. Jain – Tata McGraw Hill (1996).
3. **Integrated Electronics** by J. Millman and C. Halkias, Tata McGraw Hill, New Delhi (2001)
4. **Digital Principles and Application** by Malvino Leach, Tata McGraw Hill, 4th Ed (1992).

**CORE PRACTICAL – I**

**(Practical Examination at the end of the Second semester)**

**No. of credits: 4**

**External: 60 marks. Record: 10 marks Practical Exam: 50 marks**

1. Young’s modulus – Non-uniform bending – Pin & microscope

2. Young’s modulus – Uniform bending – Optic lever

3. Rigidity modulus – Torsional pendulum (without identical masses)

4. Rigidity modulus and moment of inertia – Torsional pendulum (with identical masses)

5. Surface tension and interfacial surface tension – drop weight method

6. Coefficient of viscosity of liquid using graduated burette (radius of capillary tube by Mercury pellet method)

7. Sonometer – Verification of laws and frequency of tuning fork

8. Sonometer – Relative density of a solid and liquid

9. Specific heat capacity of a liquid – Newton’s law of cooling

10. Specific heat capacity of liquid – Method of mixtures (Half-time correction)

11. Focal length, power, R and refractive index of a long focus convex lens

12. Focal length, power, R and refractive index of a concave lens

13. Spectrometer – Refractive index of a liquid – hollow prism

14. P.O. Box – Temperature coefficient of resistance of a coil

15. Potentiometer – Internal resistance

**Note: Use of digital balance is permitted**

**CORE PRACTICAL – II**

**(Practical Examination at the end of the Fourth semester)**

**No. of credits: 4**

**External: 60 marks. Record: 10 marks Practical Exam: 50 marks**

1. Young’s modulus – cantilever – depression – Static method-Scale and telescope

2. Basic logic gates – AND, OR, NOT gates using diodes & transistors.

3. Rigidity modulus – Static torsion

4. Compound pendulum – g and k

5. Sonometer – A.C. Frequency – Using steel wire.

6. Melde’s string – Frequency, relative density of a solid and liquid

7. Thermal conductivity of a bad conductor – Lee’s disc method

8. Spectrometer – μ of a glass prism – i–d curve

9. Spectrometer – Grating N and λ – normal incidence method

10. Spectrometer – Grating N and λ – minimum deviation method

11. Air wedge – Thickness of a wire

12. m and BH – deflection magnetometer–Tan C position and vibration magnetometer

13. Carey Foster’s bridge – Temperature coefficient of resistance of a coil

14. Potentiometer – Calibration of low range voltmeter

15. Potentiometer – Calibration of ammeter.

16. Figure of merit of table galvanometer

**Note: Use of Digital balance is permitted**

**CORE PRACTICAL – III**

**(Practical Examination at the end of the Sixth semester)**

**No. of credits: 4**

**External: 60 marks. Record: 10 marks Practical Exam: 50 marks**

**General (Any 15 experiments)**

1. Young’s modulus – Koenig’s method – Non-uniform bending.
2. Young’s modulus – Non-uniform bending – optic lever – scale and telescope.
3. Newton’s Rings – R1 R2 and µ of a long focus convex lens.
4. Spectrometer i–iʹ curve fixing i.
5. Spectrometer – Cauchy’s constants.
6. Field along the axis of a circular coil – Deflection magnetometer – BH and M.
7. Field along the axis of a circular coil – Vibration magnetic needle.
8. EMF of thermocouple – Potentiometer (199P method).
9. EMF of thermocouple – Potentiometer (108P method).
10. Calibration of high range voltmeter – Potentiometer.
11. Figure of merit – B.G.
12. Internal resistance of a cell – B.G.
13. Comparison of capacitances – B.G.
14. Comparison of EMFs – B.G.
15. Absolute capacitance of a capacitor -B.G.
16. Series resonance circuit – LCR – finding L, resonant frequency, bandwidth, Q.
17. Spectrometer – Narrow angled prism.

**CORE PRACTICAL – IV**

**(Practical Examination at the end of the Sixth semester)**

**No. of credits: 4**

**External: 60 marks Record: 10 marks Practical Exam: 50 marks**

**Basic Electronics (Any 15 experiments)**

1. Full wave rectifier.
2. Bridge rectifier.
3. Zener regulated power supply – 9V – Regulation characteristics.
4. Transistor characteristics – CB mode.
5. Transistor characteristics – CE mode.
6. Single stage RC coupled amplifier – gain – Frequency response.
7. Emitter follower.
8. Hartley oscillator.
9. Colpitt’s oscillator
10. Transistor – Astable multivibrator.
11. Regulated power supply – IC 7805
12. NAND/NOR universal building blocks.
13. De Morgan’s theorem – Verification.
14. Half adder – Full adder using IC – XOR, AND and OR gates.
15. Half subtractor, full subtractor using IC – XOR, AND and OR gates.
16. 4 bit ripple counter using IC 7473.
17. Decade counter – IC 7490.

**PRACTICAL – V**

**(Practical Examination at the end of the Sixth semester)**

**No. of credits: 4**

**External: 60 marks Record: 10 marks Practical Exam: 50 marks**

**Applied Electronics (Any 15 experiments)**

1. OP Amp – IC 741 – Inverting amplifier, non-inverting amplifier, unity follower.
2. OP Amp – Summing and difference amplifier.
3. Op Amp – Differential amplifier – CMRR.
4. OP Amp – AC frequency response.
5. OP Amp – Square wave generator.
6. OP Amp – Wien’s bridge oscillator.
7. OP Amp – Phase Shift oscillator.
8. 555 Timer – Astable multivibrator.
9. 555 Timer – Schmitt trigger.
10. D/A convertor – 4 bit binary weighted resistor method.
11. µp – 8085 8 bit addition, multiplication.
12. µp – 8085 8 bit subtraction, division.
13. µp – Sorting in ascending order – 8 bit data.
14. µp – Sorting in descending order – 8 bit data.
15. µp – Finding the largest number in an array.
16. µp – Finding the smallest number in an array.

**Books for Study & Reference**

1. **Practical Physics** by D. Chattopadhyay, P.C. Rakshit, New Central Book Agency (p) Ltd. Kolkata (2007).

2. **Practical Physics and Electronics** by C.C. Ouseph, U.J. Rao and Vijayendran, S. Viswanathan (Printers & Publishers) Pvt., Ltd (2007).

3. **Practical Physics** by C.L. Arora, S. Chand & Co., New Delhi (2008).

**COMPUTER CORE PAPERS (Handled by Computer Science Department)**

**SEMESTER III**

**Core Paper – 1**

**DATA STRUCTURES**

**Unit 1:** Data Structures: Definition of a Data structure – primitive and composite Data Types, Arrays, Operations on Arrays, Order lists.

**Unit 2:** Stacks – Operations on stack – Applications of Stack – Infix to Postfix Conversion – Evaluation of postfix expression; Recursion. Queues – Circular Queue – Operations on Queues, Queue Applications.

**Unit 3:** Singly Linked List – Operations, Application – Representation of a Polynomial, Polynomial Addition; Doubly Linked List – Operations.

**Unit 4:** Trees: Binary Trees – definitions – Binary search tree – Conversion of Forest to Binary Tree, Operations – Tree Traversals;

**Unit 5:** Graph – Definition, Types of Graphs – memory representation – Graph traversal. Hashing Tables and Hashing Functions – handling collusions.

**Recommended Texts**

i..E.Horowitz & S.Shani, 1999, Fundamentals of Data Structures in C++, Galgotia Pub.

**Reference Books**

i. R. Kruse C.L. Tondo & B. Leung, 1997, Data Structures & Program design in C, PHI.

ii. Cangsam,Auguenstein,Tenenbaum,Data Structures using C & C++,PHI

iii.D.Samantha, 2005, Classic Data Structures, PHI,New Delhi.

**COMPUTER CORE PRACTICAL – I**

**DATA STRUCTURES USING C++**

1. Implement PUSH, POP operations of stack using Arrays.

2. Implement PUSH, POP operations of stack using Pointers.

3. Implement add, delete operations of a queue using Arrays.

4. Implement add, delete operations of a queue using Pointers.

5. Addition of two polynomials using Arrays and Pointers.

6. Binary tree traversals using recursion.

7. Depth First Search and Breadth first Search for Graphs using Recursion.

**SEMESTER III**

**Core Paper 2**

**OBJECT ORIENTED PROGRAMMING USING C++**

**Unit 1:** Procedure oriented programming (POP) – Examples – Object oriented programming (OOP) – Examples – OOPs concepts – Comparison of POP and OOP – Applications OOPs.

**Unit 2:** Introduction to C++; Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures in C++; Pointers – Functions in C++ – Main Function – Function Prototyping – Parameters Passing in Functions – Values Return by Functions – Inline Functions – Friend Functions.

**Unit 3:** Classes and Objects; Constructors and Destructors; Type of Constructors; Type Conversions – Function overloading – Operator overloading.

**Unit 4:** Inheritance: Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance. Virtual Functions and Polymorphism; Managing Console I/O operations.

**Unit 5:** Working with Files: Classes for File Stream Operations – Opening and Closing a File – End-of-File Deduction – File Pointers – Updating a File – Error Handling during File Operations – Command-line Arguments.

**Recommended Texts**

i. E. Balagurusamy, 1995,Object Oriented Programming with C++, Tata McGraw–Hill

 Publishing Company Ltd.

ii. Robert Lafore, Object Oriented Programming in Microsoft C++, Galgotia publication.

iii. H.Schildt, C++, 1998,The Complete Reference-1998-TMH Edition, 1998

**COMPUTER CORE PRACTICAL – II**

 **C++ Programming**

1. Simple interest calculation.
2. Determining the Perimeter and Area of a Triangle.
3. Solving Quadratic equation.
4. Program to calculate the average of ‘n’ numbers
5. Program to demonstrate Function overloading
6. Program to demonstrate Operator overloading
7. Program to demonstrate inheritance (Single, Multiple).
8. Virtual functions.
9. Program to copy the content of one file to another.

**SEMESTER IV**

**Core Paper – 3**

**OPERATING SYSTEMS**

**Unit 1:** Introduction: Views –Goals –Types of system – OS Structure –Components – Services – System Structures – Layered Approach -Virtual Machines – System Design and Implementation. Process Management: Process – Process Scheduling – Cooperating Process –Threads – Interprocess Communication. CPU Scheduling: CPU Schedulers – Scheduling criteria – Scheduling Algorithms

**Unit 2:** Process Synchronization: Critical-Section problem – Synchronization Hardware – Semaphores – Classic Problems of Synchronization – Critical Region – Monitors. Deadlock: Characterization – Methods for handling Deadlocks – Prevention, Avoidance, and Detection of Deadlock – Recovery from deadlock.

**Unit 3:** Memory Management: Address Binding – Dynamic Loading and Linking – Overlays – Logical and Physical Address Space – Contiguous Allocation – Internal & External Fragmentation . Non-contiguous Allocation: Paging and Segmentation schemes –Implementation – Hardware Protection – Sharing – Fragmentation.

**Unit 4:** Virtual Memory: Demand Paging – Page Replacement – Page Replacement Algorithms – Thrashing. – File System: Concepts – Access methods – Directory Structure –Protection Consistency Semantics – File System Structures – Allocation methods – Free Space Management.

**Unit 5:** I/O Systems: Overview – I/O Hardware – Application I/O Interface – Kernel I/O subsystem – Transforming I/O Requests to Hardware Operations – Performance. Secondary Storage Structures: Protection – Goals – Domain Access matrix – The security problem – Authentication – Threats – Threat Monitoring – Encryption..

**Recommended Texts**

1. Silberschatz A., Galvin P.B., Gange. 2002, Operating System Principles, Sixth Ed, John Wiley & Sons.

**Reference Books**

1. H.M. Deitel, 1990, An Introduction to Operating System, – 2nd Ed,Addison Wesley.

**SEMESTER IV**

**Core Paper – 4**

**DATABASE MANAGEMENT SYSTEMS USING VISUAL BASIC**

**Unit 1:** Form –Form Property – variables – data types – string – numbers – Writing simple programs – toolbox – Creating controls – name property – command button – access keys – image controls – text boxes – labels – Radio buttons – Check box – Frame – message boxes.

 **Unit 2:** Displaying information – Determinate loops – indeterminate loops – conditional statement – built-in functions (String, Numeric) – functions and procedures. Arrays – controls arrays – Lists box combo boxes.

**Unit 3:** Flex grid control – projects with multiple forms – Menus – MDI forms. Data access techniques: SQL – DDL – DML and Query command. ADO – Connection object – Recordset object – Connecting VB with Back end RDBMS.

**Unit 4:** Database Management System – Advantages – Components – Feasibility Study – Class Diagram – Events – Normalization – 1 NF – 2 NF – 3 NF

**Unit 5:** Forms and Reports: Design of form and Report – Form Layout – Reports – Procedural Languages – Data on Form – Programs to Retrieve and Save Data.

**Recommended Texts:**

1. Gary Cornell. Visual Basic 6 from the Ground up. Tata McGraw–Hill, 1999.

2. G. V. Post – Database Management Systems Designing and Building Business Application – McGraw–Hill International edition – 1999.

**Reference Books**

1.Raghu Ramakrishnan – Database Management Systems – WCB/McGraw–Hill, 1998.

2.C.J. Date -An Introduction to Database Systems – 7th Ed – Addison Wesley, 2000.

3. Noel Jerke. *Visual Basic 6 (The Complete Reference)* Tata McGraw Hill, 1999.

**SEMESTER V**

**Core Paper – 5**

**PROGRAMMING IN JAVA**

**Unit 1:** Introduction to Java-Features of Java-Basic Concepts of Object Oriented Programming-Java Tokens-Java Statements-Constants-Variables-Data Types – Type Casting-Operators-Expressions-Control Statements: Branching and Looping Statements.

**Unit 2:** Classes, Objects and Methods-Constructors-Methods Overloading-Inheritance-Overriding Methods-Finalizer and Abstract Methods-Visibility Control –Arrays, Strings and Vectors-String Buffer Class-Wrapper Classes.

**Unit 3:** Interfaces-Packages-Creating Packages-Accessing a Package-Multithreaded Programming-Creating Threads-Stopping and Blocking a Thread-Life Cycle of a Thread-Using Thread Methods-Thread Priority-Synchronization-Implementing the Runnable Interface .

**Unit 4:** Managing Errors and Exceptions-Syntax of Exception Handling Code-Using Finally Statement-Throwing Our Own Exceptions-Applet Programming-Applet Life Cycle-Graphics Programming-Managing Input/Output Files: Concept of Streams-Stream Classes-Byte Stream Classes-Character Stream Classes – Using Streams-Using the File Class-Creation of Files-Random Access Files-Other Stream Classes.

**Unit 5:** Network basics –socket programming – proxy servers – TCP/IP – Net Address – URL – Datagrams -Java Utility Classes-Introducing the AWT: Working with Windows, Graphics and Text – AWT Classes – Working with Frames-Working with Graphics-Working with Color-Working with Fonts-Using AWT Controls, Layout Managers and Menus.

**Recommended Texts**

1. E.Balagurusamy, 2004,Programming with JAVA, 2ndEd,Tata McGraw-Hill Publishing Co.Ltd.
2. Herbert Schildt, 2005,The Complete Reference JavaTM 2, 5th Ed, Tata McGraw-Hill Publishing Co. Ltd.

**Reference Books**

1. Y. Daniel Liang, 2003, An Introduction to JAVA Programming, Prentice-Hall of India Pvt. Ltd.
2. Cay S. Horstmann and Gary Cornell, 2005, Core JavaTM2 Volume I-Fundamentals, 7th Ed – Pearson Education.
3. Ken Arnold, James Gosling and David Holmes, 2003, The JavaTM Programming Language, 3rd Ed, Pearson Education.

**COMPUTER CORE PRACTICAL – III**

**RDBMS LAB**

Use VB as the front end tool and any RDBMS (Oracle or MySQL or any standard RDBMS) as the back end tool. Create database and performing the operations given below using a Menu Driven program:a) Insertion, (b)Deletion, (c)Modification, (d)Generating simple reports.

1. Payroll
2. Mark sheet Processing
3. Savings bank account for banking
4. Student information system
5. Electricity bill preparation system
6. Telephone directory maintenance.

**COMPUTER CORE PRACTICAL – IV**

 **JAVA PROGRAMMING LAB**

**APPLICATIONS**

1. Substring Removal from a String. Use String Buffer Class.
2. Determining the Perimeter and Area of a Triangle. Use Stream Class.
3. Determining the Order of Numbers Generated randomly using Random Class.
4. Usage of Calendar Class and Manipulation.
5. Implementation of Point Class for Image Manipulation.
6. String Manipulation Using Char Array.
7. Database Creation for Storing E-mail Addresses and Manipulation.
8. Implementing Thread based Applications and Exception Handling.
9. Textfiles (copy, display, counting characters, words and lines)
10. Data file creating and processing for electricity billing.

**APPLETS**

11. Working with Frames and Various Controls.

12. Working with Dialog Box and Menus.

13. Working with Colors and Fonts.

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**Non Major Elective 1 – Digital Electronics**

UNIT 1 Review of Number Systems and Codes: Binary, Octal and hexadecimal conversions

UNIT-2: Binary addition and subtraction-1's complement and 2’s complement arithmetic.

Unit-3: Logic Gates: Basic Gates-Universal Gates and realization of other gates using universal gates

Unit*-4*: Boolean Algebra: Rules and laws of Boolean algebra-Demorgan’s Theorems- Boolean Expressions and Truth Tables

Unit -5: Minterm and Maxterms- Simplification of Boolean Expressions using Karnaugh Map

**Text Book:**

1. Floyd T.L, Digital Fundamentals, 10/e, Pearson Education, 2011

2. C.H.Roth and L.L.Kimney Fundamentals of Logic Design, 7/e, Cengage Learning, 2013

 **References:**

 1. Donald P Leach, Albert Paul Malvino and GoutamSaha., Digital Principles and Applications, 8/e, by Mc Graw Hill

2. Mano M.M, Logic and Computer Design Fundamentals, 4/e, Pearson Education.

3. Tocci R.J and N.S.Widmer, Digital Systems, Principles and Applications, 11/e, Pearson Education.

4. John F. Wakerly, Digital Design: Principles and Practices, 4/e , Pearson, 2005

5. Taub & Schilling: Digital Integrated Electronics, McGraw Hill, 1997

**Non Major Elective 2 – Practical Physics**

1. Screw Gauge-to find thickness

2. Vernier Calipers-to find breadth

3. Surface tension of water

4. Torsion pendulum-L/T2 is constant

5. Sonometer-$ \frac{\sqrt{T}}{l}is constant$

6. P.O.Box- to find resistance of coil

7. Comparison of viscosities of water and kerosene

8. Spectrometer-Angle of prism

Book for Study:

1. B. Sc. Practical Physics by C. L. Arora - S. Chand Publishing.
2. B. Sc. Practical Physics by Harnam Singh - S. Chand Publishing.
3. Practical Physics and Electronics by C.C. Ouseph, U.J. Rao - Viswanathan, S., Printers & Publishers Pvt Ltd.
4. A Textbook of Practical Physics by Balasubramanian S. Ranganathan R. , Srinivasan M.N. - Sultan Chand & Sons.