DAVANGERE UNIVERSITY
GRADUATE PROGRAMME
Bachelor of Science (B.Sc.)
CBCS Scheme Syllabus (From 2016-17)
Subject: PHYSICS
SEMESTER – V

Paper 5: Atomic Physics and Lasers

(3Hours of Teaching per Week)

Module:1

Atomic Structure

Electron:charge of electron by Millikan's oil drop method (Theory), Specific charge of electron by J.J. Thomson's method(Theory).

3 hours

Vector Atom Model:

Effect of finite nuclear mass on atomic spectra, A qualitative account of Sommerfeld relativistic atom model. Excitation and Ionization potentials - Franck-Hertz experiment. Vector model of atom. Electron spin. Space quantization. Magnetic moment of an electron due to its orbital motion.Stern-Gerlach experiment. Spin-orbit interaction and the fine structure of spectral lines. Quantum number and selection rules. Pauli's exclusion principle,Maximum number of Electrons in a Shell (Derivation), Electronic configuration of atoms. Brief mention of LS and JJ coupling for multi-electron atoms.

10 hours

Module:2

Optical Spectra :Spectral terms, spectral notations selection rules, intensity rules fine structure of spectral lines, Sodium D-lines. Zeeman effect-experimental observations, Normal Zeeman effectfrom quantum theory and anomalous Zeeman effects from quantum theory(Qualitative), Expression for Zeeman shift, Paschen Back effect and stark effect (qualitative)

9 hours

X-raySpectra: Continuous x-rays, production (principle)-Daune-Hunt rule. Characteristics x-rays –Moseley's law –Derivation from Bohr's Theory, X-ray energy level diagram. Theory of Compton scattering.

4 hours

Module:3

LASER: Introduction,Characteristics ofLaser (Directionality, Line width, intensity, spatial and temporal coherence),Spontaneous and Stimulated Emission, Einstein's A and B co-efficient (derivation), Conditions for laser action – (population inversion, active medium, metastable state,

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pumping), different methods of pumping (brief) Ruby Laser. He-Ne laser energy level diagram. Glass Laser (Nd-YAG Laser), CO_2 Laser and Semiconductor Laser construction and working. Laser application in Research,Industries, Medicine, Communication,Defence and Entertainment(Brief).
Holography- principle of recording and reproduction.

13 hours

REFERENCES:

1. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
2. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)
3. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
4. B Basavaraj and P Sadashiva, ***B Sc Physics***, Omkar Publications (2016)
5. S L Gupta and Sanjeev Gupta, ***Unified Physics (Volume IV)***,Jaiprakash Nath Publications.
6. Murugeshan R,KiruthigaSivaprasath***Modern Physics***, S Chand & Company (2016)
7. R B Singh, ***Introduction to Modern Physics (Second Edition)***, New Age International (2009)
8. S L Kakani&ShubhraKakani, ***Modern Physics,*** Viva Books (2011)
9. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
10. C L Arora & P S Hemne, ***Physics for Degree Students***, S Chand & Company. (2016)
11. S N Ghoshal, ***Atomic Physics***, S Chand & Company (2016)
12. H E White, ***Atomic Physics***, McGraw Hill
13. Richtmyer F K, Kennard E H & Cooper J N,***Introduction to Modern Physics (6e),*** McGraw Hill
14. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)
15. Sehgal, Chopra and Sehgal, ***Modern Physics***, Sultan Chand and Co.
16. M N Avadhanulu, ***A Text book of Lasers***, S Chand & Company (2016)
17. B B Laud, ***Lasers and Non-Linear Optics***, New Age International
18. D P Khandelwal, ***Optics and Atomic Physics***, Himalaya Publications
19. Satyaprakash, ***Optics and Atomic Physics***, Ratan Prakashan Mandir

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GRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

CBCS Scheme Syllabus (From 2016-17)

Subject: PHYSICS PRACTICALS

Semester V

Paper 5

List of Experiments:

1) Study of dielectric constant -Charging of Capacitor
2) LDR – Absorption Co-efficient of material of glass
3) Bridge rectifier Ripple factor for different filters
4) LASER – Wavelength using metal ruler
5) LASER – particle size
6) GM counter-Verification of inverse square law for Gamma rays
7) LCR Series Circuit-Phase measurement using CRO
8) Transistor characteristics-Load Line Analysis
9) Amplitude Modulation and Demodulation – BC547
10) BG-Determination of capacitance of Capacitance of Capacitor by absolute method
11) Fine Structure Constant –Sodium D lines using diffraction grating.
12) Basic Logic Gates –using diodes/Transistors

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

REFERENCES –

1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
3. S P Singh, ***Advanced Practical Physics,*** Pragati Prakashan. Meerut, 1985.
4. Arora C.L., **B.Sc., Practical Physics,** S. Chand and Company., New Delhi.
5. Khandelwal D.P., ***A Laboratory Manual of Physics for Undergraduate Classes***. Vani Publications.
6. Saraf B., ***Physics through Experiments,***Vikas Publishing House, New Delhi.
7. Harnam Singh & P S Hemne, ***B.Sc., Practical Physics,*** S. Chand and Company. New Delhi.
8. S L Gupta & V Kumar, ***Practical Physics***, Pragati prakashan, Meerut
9. Indu Prakash & Ramakrishna, ***A Text Book of Practical Physics (11e),*** Kitab Mahal, New Delhi.
10. R K Shukla & Anchal Srivastava, ***Practical Physics,***New Age Publishers, New Delhi
11. P B Zbar, A P Malvino & M A Miller, ***Basic Electronics: A Text Lab Manual,***Tata McGraw Hill, 2009.
12. S Panigrahi & B Mallick,***Engineering Practical Physics,***Cengage Learning, 2015.
13. Worsnop and Flint, **Advanced Practical Physics for Students,** Methuen and Company, London.

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GRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

CBCS Scheme Syllabus (From 2016-17)

Subject : PHYSICS

Semester V

Paper 6:Molecular Physics, Nuclear Physics and Statistical Mechanics

(3Hours of Teaching per Week)

Module 1

Molecular Physics

Molecular Band- Band head and tail, molecular spectra-pure rotational spectrum and selection rules, Vibrational spectrum and selection rules. Rotational – Vibrational spectrum, Raman Scattering. Experimental study of Raman effect. Quantum theory of Raman effect. Applications of Raman effect.

6 hours

Statistical Mechanics

Micro and macro systems, statistical nature of macro systems, statistics of distinguishable objects, Most probable distribution, Themodynamical probability, Maxwell-Botzmann distribution law. Indistinguishable particles. Bose-Einstein distribution law. Bose-Einstein Condensation, Fermi-Dirac Distribution, A qualitative comparison of three distribution laws.

7 hours

Module 2

Nuclear Physics I

Radioactivity: Theory of successive disintegration, radioactive equilibrium (secular and transient). Radioactive dating- Carbon dating.

α–decay- Characteristics of alpha spectrum, Range and disintegration energy of α–particle, Geiger- Nuttal law, Gamow's theory of α–decay.

β-decay, Types of β-decay (electron decay, positron decay and electron capture). Characteristics of β-spectrum and Pauli's neutrino hypothesis.

Nuclear Forces: Characteristics of Nuclear Forces, Yukawa's Meson Theory.

Nuclear Models : Liquid drop model, Shell model & Fermi Gas model of nucleus (Qualitative)

13 hours

Module 3

Nuclear Physics II

Detectors: GM Counter, Scintillation counter,

Accelerators: Construction, working and theory of Linear Accelerator, Cyclotron and Betatron,

Nuclear reactions: Types of reactions, Q value of a reaction, threshold energy (mention of expression). Conservation laws.

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Cosmic Rays: Discovery, Primary & Secondary Cosmic rays, Altitude and latitude effects, East west symmetry, cosmic ray showers, Baba's theory of origin of cosmic rays

13 hours

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1. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
2. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)
3. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
4. B Basavaraj and P Sadashiva, ***B Sc Physics***, Omkar Publications (2016)
5. S L Gupta and Sanjeev Gupta, ***Unified Physics (Volume IV)***,Jaiprakash Nath Publications.
6. Murugeshan R,KiruthigaSivaprasath***Modern Physics***, S Chand & Company (2016)
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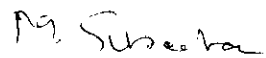
8. S L Kakani&ShubhraKakani, ***Modern Physics,*** Viva Books (2011)
9. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
10. C L Arora & P S Hemne, ***Physics for Degree Students***, S Chand & Company. (2016)
11. S N Ghoshal, ***Nuclear Physics***, S Chand & Company (2016)
12. Richtmyer F K, Kennard E H & Cooper J N,***Introduction to Modern Physics (6e),*** McGraw Hill
13. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)
14. S B Patel, ***Nuclear Physics- An Introduction***, New Age International
15. Sehgal, Chopra and Sehgal, ***Modern Physics***, Sultan Chand and Co.
20. C N Banwell, ***Molecular Spectroscopy***, McGraw Hill
21. G Aruldas, ***Molecular Spectroscopy***, Prentice Hall of India.
22. Kenneth S Krane, ***Introductory Nuclear Physics,*** John Wiley & Sons
23. S P Kuila, ***Concepts of Nuclear Physics,*** New Central Book Agency (2010)



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CBCS Scheme Syllabus (From 2016-17)

Subject: PHYSICS PRACTICALS

Semester V

Paper 6

List of Experiments :

1) Solar cell characteristics- I-V & Power –Load Charactristics
2) Resolving power of prism
3) CE amplifier –Frequency Responce Curves and Gain Band Band width.
4) The excitation energy & force constant of iodine molecule
5) e/m of Electron by Thomson's method
6) GM counter characteristics
7) Rydberg constant – hydrogen spectrum/ solar spectrum
8) 'h' by photo cell
9) Determination of Fermi energy of copper using meter bridge
10) Refractive Index of Glass TIR –using Laser
11) FET Characteristics
12) BG- High resistance by leakage.

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

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1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
3. S P Singh, ***Advanced Practical Physics,*** Pragati Prakashan. Meerut, 1985.
4. Arora C.L., **B.Sc., Practical Physics,** S. Chand and Company., New Delhi.
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6. Saraf B., ***Physics through Experiments,***Vikas Publishing House, New Delhi.
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9. Indu Prakash & Ramakrishna, ***A Text Book of Practical Physics (11e),*** Kitab Mahal, New Delhi.
10. R K Shukla & Anchal Srivastava, ***Practical Physics,***New Age Publishers, New Delhi
11. P B Zbar, A P Malvino & M A Miller, ***Basic Electronics: A Text Lab Manual,***Tata McGraw Hill, 2009.
12. S Panigrahi & B Mallick,***Engineering Practical Physics,***Cengage Learning, 2015.
13. Worsnop and Flint, **Advanced Practical Physics for Students,** Methuen and Company, London.

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GRADUATE PROGRAMME

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CBCS Scheme Syllabus (From 2016-17)

Subject: PHYSICS

SEMESTER – VI

Paper 7: Electronics, Solid State Physics & Nano materials

(3Hours of Teaching per Week)

Module I

Electronics: Transistors-DCand AC current gains DC and AC load Lines-operating point, Self-biasing of Transistor(Voltage divider method). Single Stage CE amplifier, h-parameters, Expressions for Voltage, current and power gain using h-parameters.

Operational Amplifiers: Symbol, characteristics of ideal op-amp, concept of virtual ground, inverting andnon-inverting amplifiers (Theory), Mention of Applications of op-amp.

Oscillators: Concept of feedback-Positive and negative feedback, Barkhausen criteria, Wein Bridge and Phase shift oscillators (construction and working using IC741, Multivibrators – Types (brief), Astable multivibrator-Circuit Operation(using IC555).

Digital Electronics : Analog and Digital signals, Construction of OR, AND gate using diodes, NOT Logic gate using Transistor,Symbols and Truth Tables of NOR, NAND and XOR Logic gates. Boolean Algebra(brief), De-Morgan's Theorems, Boolean expressions(Simple) -Implementation by Basic Logic gates.

13 hours

Module II

Solid state Physics

Crystal Structure: Concept of Lattice, unit cell,Bravias Lattice,crystal plane,crystal systems and Miller indices.X-ray diffraction- Bragg's Law,Bragg's Spectrometer, Crystal structure of NaCl.

Specific heat of solids: Dulong and Petit's law.Einstein'sTheory of specific heat of solids, LatticeVibration-Phonons(Brief),Debye's Theory of Specific Heat of Solids.

Free electron theory of Metals: The classical free electron theory of metals- expression of electrical conductivityand thermal conductivity (derivation)– Wiedemann-Franz Law, Limitations of classical theory, Quantum free electron theory-Energy states of free electrons in Metals-Statement of density of states.Expression for Fermi energy and average energy.

13 hours

Module III

Band theory of solids: Origin of bands in solids,intrinsic and extrinsic semiconductors,Electrical conductivity of Intrinsic Semiconductor- expression for carrier concentration in intrinsic semiconductors-Band Gap(derivation), Fermi level in case of intrinsic and extrinsic semiconductors (qualitative), Hall effect - expression for Hall coefficient,experimental determination and applications.

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Superconductivity: Experimental facts (Transition temperature, persistent current, Isotope effect, Meissner effect), Critical magnetic field,BCS theory, Josephson's effect(AC & DC), Type I & Type II superconductors - Applications of Superconductors- Maglev & Squids (Brief).

Magnetic materials: Langevin's theory of Diamagnetism and paramagnetism,Curie Law, Domain theory of Ferromagnetism (Qualitative).

Nanomaterials: Introduction,Properties of Nanoparticles (Mechanical, Optical, Magnetic and Electronic), Preparation of nanomaterials (Bottom up and Top-down approaches), Quantum nano structures:quantum wells,wires and dots. Graphene and Fullerene (Brief), Carbon Nanotubes - properties and uses, Synthesis for CNT (high pressure carbon monoxide deposition and chemical vapour deposition),Applications of Nanotechnology.

13 hours

REFERENCES:

1. V K Mehta & Rohit Mehta, ***Principles of Electronics,***S Chand & Company (2016)
2. S L Gupta and Sanjeev Gupta, ***Unified Physics (Volume IV),***Jaiprakash Nath Publications.
3. R S Sedha, ***Elements of Electronics,***S Chand & Company
4. D Roy Choudary & Sheel B Jain, ***Linear Integrated Circuits (4e),*** New Age International
5. Thomas L Floyd, ***Digital Fundamentals (9e),*** Pearson
6. Albert Malvino & David J Bates, ***Electronic Principles (7e),***Tata McGraw Hill
7. S O Pillai , ***Solid State Physics,*** New Age International
8. M Ali Omer, ***Solid State Physics,*** Pearson Education
9. Charles Kittel, ***Introduction to Solid State Physics,*** John Wiley & Sons.
10. J P Srivatsava, ***Solid State Physics,*** Prentice Hall of India
11. Sundararajan N, George Thomas & Syed Azeez, ***College Physics,*** United Publishers (2006).
12. B Basavaraj and P Sadashiva, ***B Sc Physics***, Omkar Publications (2016)
13. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
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16. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
17. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)

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CBCS Scheme Syllabus (From 2016-17)
Subject: PHYSICS PRACTICALS
Semester VI

Paper 7
List of Experiments:

1) Photodiode-characteristics
2) Study of Hysteresis Curve for a Ferromagnetic Substance
3) RI of a Liquid using Hollow Prism.
4) Astable Multivibrator-IC555
5) Zener diode – characteristics – voltage regulation
6) Phase shift oscillator using transistor
7) Operational amplifier – IC 741-Difference amplifier
8) Energy gap of Thermistor using meter bridge.
9) Verification of De Morgan's Laws using ICs
10) Triode Valve Characteristics
11) NAND Gate as Universal Gate.
12) Transistor Characteristics-CE Configuration

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

REFERENCES –

1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
3. S P Singh, ***Advanced Practical Physics,*** Pragati Prakashan. Meerut, 1985.
4. Arora C.L., **B.Sc., Practical Physics,** S. Chand and Company., New Delhi.
5. Khandelwal D.P., ***A Laboratory Manual of Physics for Undergraduate Classes***. Vani Publications.
6. Saraf B., ***Physics through Experiments,***Vikas Publishing House, New Delhi.
7. Harnam Singh & P S Hemne, ***B.Sc., Practical Physics***, S. Chand and Company. New Delhi.
8. S L Gupta & V Kumar, ***Practical Physics***, Pragati prakashan, Meerut
9. Indu Prakash & Ramakrishna, ***A Text Book of Practical Physics (11e),*** Kitab Mahal, New Delhi.
10. R K Shukla & Anchal Srivastava, ***Practical Physics,***New Age Publishers, New Delhi
11. P B Zbar, A P Malvino & M A Miller, ***Basic Electronics: A Text Lab Manual,***Tata McGraw Hill, 2009.
12. S Panigrahi & B Mallick,***Engineering Practical Physics,***Cengage Learning, 2015.
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GRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

CBCS Scheme Syllabus (From 2016-17)

PHYSICS

SEMESTER – VI

Paper 8: Relativity, Astrophysics, Quantum Mechanics and Space Physics

(3 Hours of Teaching per Week)

Module I: RELATIVITY

The Special Theory of Relativity: Limitations of classical (Galilean) Relativity, The Michelson-Morley Experiment (Theory), Postulates of the Special Theory of Relativity, Lorentz Transformation (No derivation), Relativity of Simultaneity, Length Contraction, Time dilation.

6 hours

Relativistic Mechanics: Relativistic transformation of velocity (derivation), relativistic variation of mass (derivation), Einstein's mass energy equivalence($E=mc^2$ - derivation) with illustrations, Energy-momentum relation, Relativistic Doppler Effect (Derivation).

7 hours

Module II: QUANTUM MECHANICS

Matter Waves: Concept of Matter Waves- de Broglie hypothesis, Characteristics of matter waves, Group and phase velocity of matter Waves, relation between group and phase velocity (derivation), experimental evidence for existence of matter waves ,Davison-Germer Experiment withTheory.

3 hours

Heisenberg's Uncertainty Principle: Statement, explaination and illustration (gamma ray microscope experiment-(quantitative), Applications of the Uncertainty Principle - The size of an atom, non-existence of electrons inside the nucleus.

3 hours

Principles of Quantum Mechanics: concept of wave function, Properties of wave function, Physical significance (Born's interpretation of the wave function), Normalisation of wave function. Basic postulates of quantum mechanics, Operators in quantum mechanics (Mention – position, momentum, Kinetic and Total energy).

3 hours

Schrodinger Wave Equation: Schrodinger's Wave Equation in time independent and time dependent forms (derivation), Application of Schrodinger's equation to particle in one dimensional box - wave function & energy values (derivation). Qualitative discussion of Simple Harmonic Oscillator (expression for energy, energy level diagram and Zero point energy).

4 hours

Module III: ASTROPHYSICS & SPACE PHYSICS

Stars-Stellar Parallax-Parallax method of determining the stellar distance,units of stellar distance(Light year and parsec),Stellar Magnitude (Hipparchus magnitude Scale -apparent and absolute magnitudes & their relations), Stellar Spectra – Colour index, U-B-V

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system,Harvard Classification Scheme for Stars, Stellar Mass and size, HR Diagram and its importance.

4hours

Stellar Structure: Hydrostatic equilibrium, Basic Equations of stellar structure (Mention of equations for mass conservation & momentum conservation), Virial Theorem, Linear density model of a star - Expression for internal pressure and temperature of a star, Mass-Luminosity Relation, Photon diffusion Time (Qualitative).

4hours

Stellar Evolution: Block diagram of Stellar Evolution – Qualitative discussion of different stages of Stellar Evolution (Formation, main sequence stage, red giant stage and death stage), super dense remnants – White dwarf- Chandrasekhar limit, neutron star and black hole (qualitative- mass limits and expression for radius).

3hours

Space Physics: Solar atmosphere (Photosphere, Chromosphere & Corona), electromagnetic radiations from the sun, Solar wind, solar cycles.

2 hours

REFERENCES:

1. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
2. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)
3. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
4. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
5. Murugeshan R,KiruthigaSivaprasath, ***Modern Physics***, S Chand & Company (2016)
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8. C L Arora & P S Hemne, ***Physics for Degree Students,***S Chand & Company (2016)
9. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)

RELATIVITY

1. P L Sardesai,***A Primer of Special Relativity***, New Age International (2004)
2. Satyaprakash, ***Relativistic Mechanics***, PragatiPrakashan.
3. Robert Resnick, ***Introduction to Special Theory of Relativity,***John Wiley & Sons (1968)
4. A P French, ***Special Relativity***, W W Norton & Company (1968)

QUANTUM MECHANICS

1. Kamal Singh&S P Singh, ***Elements of Quantum Mechanics,***S Chand & Company (2013)
2. S P Kuila, ***Perspective of Quantum Mechanics,*** New Central Book Agency (2010)
3. David J Griffiths, ***Introduction to Quantum Mechanics(3e)***, Pearson Education(2005)
4. Bransden B H and Joachain C J, ***Quantum Mechanics(2e),*** Pearson Education (2000)
5. NouredineZettili,***Quantum Mechanics(Second Edition),*** John Wiley & Sons (2009)

ASTROPHYSICS & SPACE PHYSICS

1. BaidarinathBasu***An Introduction to Astrophysics (Second Edition),*** Prentice Hall of India
2. K.S. Krishnaswamy, ***Astrophysics : A Modern Perspective***, New Age International (2006)
3. Stein R F & A G W Cameron, ***Stellar Evolution***, Plenum (1966)
4. Abhyankar K D, ***Astrophysics of Stars and Galaxies***, Universities Press.

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GRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

CBCS Scheme Syllabus (From 2016-17)

Subject: PHYSICS PRACTICALS

Semester VI

Paper 8

List of Experiments:

1. Realisation of Boolean expression – using Logic ICs
2. Determination of Work function using diode valve.
3. Logic gates – IC7400
4. Flip Flops (RS) – IC 7400
5. Phase Shift Oscillator
6. Operational Amplifier as summing amplifier
7. Astable Multivibrator –Transistor Circuit
8. Wein bridge oscillator
9. Determination of Boltzmann's Constant using diode
10. BG - Determination of mutual inductance by absolute method
11. Transistor characteristics- calculation of h parameters.

12)Operational Amplifier –Inverting & non Inverting

NOTE: 1) Minimum of EIGHT experiments are to be performed

2) Any Relevant experiment can also be performed

REFERENCES –

1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
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CBCS Scheme Syllabus (From 2016-17)

Subject: PHYSICS

SEMESTER – V

Paper 5: Atomic Physics and Lasers

(3Hours of Teaching per Week)

Module:1

Atomic Structure

Electron:charge of electron by Millikan's oil drop method (Theory), Specific charge of electron by J.J. Thomson's method(Theory).

3 hours

Vector Atom Model:

Effect of finite nuclear mass on atomic spectra, A qualitative account of Sommerfeld relativistic atom model. Excitation and Ionization potentials - Franck-Hertz experiment. Vector model of atom. Electron spin. Space quantization. Magnetic moment of an electron due to its orbital motion.Stern-Gerlach experiment. Spin-orbit interaction and the fine structure of spectral lines. Quantum number and selection rules. Pauli's exclusion principle,Maximum number of Electrons in a Shell (Derivation), Electronic configuration of atoms. Brief mention of LS and JJ coupling for multi-electron atoms.

10 hours

Module:2

Optical Spectra :Spectral terms, spectral notations selection rules, intensity rules fine structure of spectral lines, Sodium D-lines. Zeeman effect-experimental observations, Normal Zeeman effectfrom quantum theory and anomalous Zeeman effects from quantum theory(Qualitative), Expression for Zeeman shift, Paschen Back effect and stark effect (qualitative)

9 hours

X-raySpectra: Continuous x-rays, production (principle)-Daune-Hunt rule. Characteristics x-rays –Moseley's law –Derivation from Bohr's Theory, X-ray energy level diagram. Theory of Compton scattering.

4 hours

Module:3

LASER: Introduction,Characteristics ofLaser (Directionality, Line width, intensity, spatial and temporal coherence),Spontaneous and Stimulated Emission, Einstein's A and B co-efficient (derivation), Conditions for laser action – (population inversion, active medium, metastable state,

(Chairman, BoS)

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pumping), different methods of pumping (brief) Ruby Laser. He-Ne laser energy level diagram.. Glass Laser (Nd-YAG Laser), CO_2 Laser and Semiconductor Laser construction and working.
Laser application in Research,Industries, Medicine, Communication,Defence and Entertainment(Brief).
Holography- principle of recording and reproduction.

13 hours

REFERENCES:

1. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
2. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)
3. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
4. B Basavaraj and P Sadashiva, ***B Sc Physics***, Omkar Publications (2016)
5. S L Gupta and Sanjeev Gupta, ***Unified Physics (Volume IV)***,Jaiprakash Nath Publications.
6. Murugeshan R,KiruthigaSivaprasath***Modern Physics***, S Chand & Company (2016)
7. R B Singh, ***Introduction to Modern Physics (Second Edition)***, New Age International (2009)
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9. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
10. C L Arora & P S Hemne, ***Physics for Degree Students***, S Chand & Company. (2016)
11. S N Ghoshal, ***Atomic Physics***, S Chand & Company (2016)
12. H E White, ***Atomic Physics***, McGraw Hill
13. Richtmyer F K, Kennard E H & Cooper J N,***Introduction to Modern Physics (6e),*** McGraw Hill
14. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)
15. Sehgal, Chopra and Sehgal, ***Modern Physics***, Sultan Chand and Co.
16. M N Avadhanulu, ***A Text book of Lasers***, S Chand & Company (2016)
17. B B Laud, ***Lasers and Non-Linear Optics***, New Age International
18. D P Khandelwal, ***Optics and Atomic Physics***, Himalaya Publications
19. Satyaprakash, ***Optics and Atomic Physics***, Ratan Prakashan Mandir

DAVANGERE UNIVERSITY
GRADUATE PROGRAMME
Bachelor of Science (B.Sc.)
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Semester V

Paper 5

List of Experiments:

1) Study of dielectric constant -Charging of Capacitor
2) LDR – Absorption Co-efficient of material of glass
3) Bridge rectifier Ripple factor for different filters
4) LASER – Wavelength using metal ruler
5) LASER – particle size
6) GM counter-Verification of inverse square law for Gamma rays
7) LCR Series Circuit-Phase measurement using CRO
8) Transistor characteristics-Load Line Analysis
9) Amplitude Modulation and Demodulation – BC547
10) BG-Determination of capacitance of Capacitance of Capacitor by absolute method
11) Fine Structure Constant –Sodium D lines using diffraction grating.
12) Basic Logic Gates –using diodes/Transistors

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

REFERENCES –

1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
3. S P Singh, ***Advanced Practical Physics,*** Pragati Prakashan. Meerut, 1985.
4. Arora C.L., **B.Sc., Practical Physics,** S. Chand and Company., New Delhi.
5. Khandelwal D.P., ***A Laboratory Manual of Physics for Undergraduate Classes***. Vani Publications.
6. Saraf B., ***Physics through Experiments,***Vikas Publishing House, New Delhi.
7. Harnam Singh & P S Hemne, ***B.Sc., Practical Physics,*** S. Chand and Company. New Delhi.
8. S L Gupta & V Kumar, ***Practical Physics***, Pragati prakashan, Meerut
9. Indu Prakash & Ramakrishna, ***A Text Book of Practical Physics (11e),*** Kitab Mahal, New Delhi.
10. R K Shukla & Anchal Srivastava, ***Practical Physics,***New Age Publishers, New Delhi
11. P B Zbar, A P Malvino & M A Miller, ***Basic Electronics: A Text Lab Manual,***Tata McGraw Hill, 2009.
12. S Panigrahi & B Mallick,***Engineering Practical Physics,***Cengage Learning, 2015.
13. Worsnop and Flint, **Advanced Practical Physics for Students,** Methuen and Company, London.

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GRADUATE PROGRAMME

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Semester V

Paper 6:Molecular Physics, Nuclear Physics and Statistical Mechanics

(3Hours of Teaching per Week)

Module 1

Molecular Physics

Molecular Band- Band head and tail, molecular spectra-pure rotational spectrum and selection rules, Vibrational spectrum and selection rules. Rotational – Vibrational spectrum, Raman Scattering. Experimental study of Raman effect. Quantum theory of Raman effect. Applications of Raman effect.

6 hours

Statistical Mechanics

Micro and macro systems, statistical nature of macro systems, statistics of distinguishable objects, Most probable distribution, Themodynamical probability, Maxwell-Botzmann distribution law. Indistinguishable particles. Bose-Einstein distribution law. Bose-Einstein Condensation, Fermi-Dirac Distribution, A qualitative comparison of three distribution laws.

7 hours

Module 2

Nuclear Physics I

Radioactivity: Theory of successive disintegration, radioactive equilibrium (secular and transient). Radioactive dating- Carbon dating.

α–decay- Characteristics of alpha spectrum, Range and disintegration energy of α–particle, Geiger- Nuttal law, Gamow's theory of α–decay.

β-decay, Types of β-decay (electron decay, positron decay and electron capture). Characteristics of β-spectrum and Pauli's neutrino hypothesis.

Nuclear Forces: Characteristics of Nuclear Forces, Yukawa's Meson Theory.

Nuclear Models : Liquid drop model, Shell model & Fermi Gas model of nucleus (Qualitative)

13 hours

Module 3

Nuclear Physics II

Detectors: GM Counter, Scintillation counter,

Accelerators: Construction, working and theory of Linear Accelerator, Cyclotron and Betatron,

Nuclear reactions: Types of reactions, Q value of a reaction, threshold energy (mention of expression). Conservation laws.

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Cosmic Rays: Discovery, Primary & Secondary Cosmic rays, Altitude and latitude effects, East west symmetry, cosmic ray showers, Baba's theory of origin of cosmic rays

13 hours

REFERENCES:

1. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
2. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)
3. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
4. B Basavaraj and P Sadashiva, ***B Sc Physics***, Omkar Publications (2016)
5. S L Gupta and Sanjeev Gupta, ***Unified Physics (Volume IV)***,Jaiprakash Nath Publications.
6. Murugeshan R,KiruthigaSivaprasath***Modern Physics***, S Chand & Company (2016)
7. R B Singh, ***Introduction to Modern Physics (Second Edition)***, New Age International (2009)
8. S L Kakani&ShubhraKakani, ***Modern Physics,*** Viva Books (2011)
9. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
10. C L Arora & P S Hemne, ***Physics for Degree Students***, S Chand & Company. (2016)
11. S N Ghoshal, ***Nuclear Physics***, S Chand & Company (2016)
12. Richtmyer F K, Kennard E H & Cooper J N,***Introduction to Modern Physics (6e),*** McGraw Hill
13. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)
14. S B Patel, ***Nuclear Physics- An Introduction***, New Age International
15. Sehgal, Chopra and Sehgal, ***Modern Physics***, Sultan Chand and Co.
20. C N Banwell, ***Molecular Spectroscopy***, McGraw Hill
21. G Aruldas, ***Molecular Spectroscopy***, Prentice Hall of India.
22. Kenneth S Krane, ***Introductory Nuclear Physics,*** John Wiley & Sons
23. S P Kuila, ***Concepts of Nuclear Physics,*** New Central Book Agency (2010)

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Semester V

Paper 6

List of Experiments :

1) Solar cell characteristics- I-V & Power –Load Charactristics
2) Resolving power of prism
3) CE amplifier –Frequency Responce Curves and Gain Band Band width.
4) The excitation energy & force constant of iodine molecule
5) e/m of Electron by Thomson's method
6) GM counter characteristics
7) Rydberg constant – hydrogen spectrum/ solar spectrum
8) 'h' by photo cell
9) Determination of Fermi energy of copper using meter bridge
10) Refractive Index of Glass TIR –using Laser
11) FET Characteristics
12) BG- High resistance by leakage.

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

REFERENCES –

1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
3. S P Singh, ***Advanced Practical Physics,*** Pragati Prakashan. Meerut, 1985.
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7. Harnam Singh & P S Hemne, ***B.Sc., Practical Physics,*** S. Chand and Company. New Delhi.
8. S L Gupta & V Kumar, ***Practical Physics***, Pragati prakashan, Meerut
9. Indu Prakash & Ramakrishna, ***A Text Book of Practical Physics (11e),*** Kitab Mahal, New Delhi.
10. R K Shukla & Anchal Srivastava, ***Practical Physics,***New Age Publishers, New Delhi
11. P B Zbar, A P Malvino & M A Miller, ***Basic Electronics: A Text Lab Manual,***Tata McGraw Hill, 2009.
12. S Panigrahi & B Mallick,***Engineering Practical Physics,***Cengage Learning, 2015.
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Subject: PHYSICS
SEMESTER – VI

Paper 7: Electronics, Solid State Physics & Nano materials

(3Hours of Teaching per Week)

Module I

Electronics: Transistors-DCand AC current gains DC and AC load Lines-operating point, Self-biasing of Transistor(Voltage divider method). Single Stage CE amplifier, h-parameters, Expressions for Voltage, current and power gain using h-parameters.

Operational Amplifiers: Symbol, characteristics of ideal op-amp, concept of virtual ground, inverting andnon-inverting amplifiers (Theory), Mention of Applications of op-amp.

Oscillators: Concept of feedback-Positive and negative feedback, Barkhausen criteria, Wein Bridge and Phase shift oscillators (construction and working using IC741, Multivibrators – Types (brief), Astable multivibrator-Circuit Operation(using IC555).

Digital Electronics : Analog and Digital signals, Construction of OR, AND gate using diodes, NOT Logic gate using Transistor,Symbols and Truth Tables of NOR, NAND and XOR Logic gates. Boolean Algebra(brief), De-Morgan's Theorems, Boolean expressions(Simple) -Implementation by Basic Logic gates.

13 hours

Module II

Solid state Physics

Crystal Structure: Concept of Lattice, unit cell,Bravias Lattice,crystal plane,crystal systems and Miller indices.X-ray diffraction- Bragg's Law,Bragg's Spectrometer, Crystal structure of NaCl.

Specific heat of solids: Dulong and Petit's law.Einstein'sTheory of specific heat of solids, LatticeVibration-Phonons(Brief),Debye's Theory of Specific Heat of Solids.

Free electron theory of Metals: The classical free electron theory of metals- expression of electrical conductivityand thermal conductivity (derivation)– Wiedemann-Franz Law, Limitations of classical theory, Quantum free electron theory-Energy states of free electrons in Metals-Statement of density of states.Expression for Fermi energy and average energy.

13 hours

Module III

Band theory of solids: Origin of bands in solids,intrinsic and extrinsic semiconductors,Electrical conductivity of Intrinsic Semiconductor- expression for carrier concentration in intrinsic semiconductors-Band Gap(derivation), Fermi level in case of intrinsic and extrinsic semiconductors (qualitative), Hall effect - expression for Hall coefficient,experimental determination and applications.

Superconductivity: Experimental facts (Transition temperature, persistent current, Isotope effect, Meissner effect), Critical magnetic field,BCS theory, Josephson's effect(AC &

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DC), Type I & Type II superconductors - Applications of Superconductors- Maglev & Squids (Brief).

Magnetic materials: Langevin's theory of Diamagnetism and paramagnetism,Curie Law, Domain theory of Ferromagnetism (Qualitative).

Nanomaterials: Introduction,Properties of Nanoparticles (Mechanical, Optical, Magnetic and Electronic), Preparation of nanomaterials (Bottom up and Top-down approaches), Quantum nano structures:quantum wells,wires and dots. Graphene and Fullerene (Brief), Carbon Nanotubes - properties and uses, Synthesis for CNT (high pressure carbon monoxide deposition and chemical vapour deposition),Applications of Nanotechnology.

13 hours

REFERENCES:

1. V K Mehta & Rohit Mehta, ***Principles of Electronics,***S Chand & Company (2016)
2. S L Gupta and Sanjeev Gupta, ***Unified Physics (Volume IV),***Jaiprakash Nath Publications.
3. R S Sedha, ***Elements of Electronics,***S Chand & Company
4. D Roy Choudary & Sheel B Jain, ***Linear Integrated Circuits (4e),*** New Age International
5. Thomas L Floyd, ***Digital Fundamentals (9e),*** Pearson
6. Albert Malvino & David J Bates, ***Electronic Principles (7e),***Tata McGraw Hill
7. S O Pillai , ***Solid State Physics,*** New Age International
8. M Ali Omer, ***Solid State Physics,*** Pearson Education
9. Charles Kittel, ***Introduction to Solid State Physics,*** John Wiley & Sons.
10. J P Srivatsava, ***Solid State Physics,*** Prentice Hall of India
11. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
12. B Basavaraj and P Sadashiva, ***B Sc Physics***, Omkar Publications (2016)
13. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
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18. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)
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Semester VI

Paper 7
List of Experiments:

1) Photodiode-characteristics
2) Study of Hysteresis Curve for a Ferromagnetic Substance
3) RI of a Liquid using Hollow Prism.
4) Astable Multivibrator-IC555
5) Zener diode – characteristics – voltage regulation
6) Phase shift oscillator using transistor
7) Operational amplifier – IC 741-Difference amplifier
8) Energy gap of Thermistor using meter bridge.
9) Verification of De Morgan's Laws using ICs
10) Triode Valve Characteristics
11) NAND Gate as Universal Gate.
12) Transistor Characteristics-CE Configuration

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

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1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
2. D C Tayal, ***University Practical Physics***, Himalaya Publishing House.
3. S P Singh, ***Advanced Practical Physics,*** Pragati Prakashan. Meerut, 1985.
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PHYSICS

SEMESTER – VI

Paper 8: Relativity, Astrophysics, Quantum Mechanics and Space Physics

(3 Hours of Teaching per Week)

Module I: RELATIVITY

The Special Theory of Relativity: Limitations of classical (Galilean) Relativity, The Michelson-Morley Experiment (Theory), Postulates of the Special Theory of Relativity, Lorentz Transformation (No derivation), Relativity of Simultaneity, Length Contraction, Time dilation.

6 hours

Relativistic Mechanics: Relativistic transformation of velocity (derivation), relativistic variation of mass (derivation), Einstein's mass energy equivalence($E=mc^2$ - derivation) with illustrations, Energy-momentum relation, Relativistic Doppler Effect (Derivation).

7 hours

Module II: QUANTUM MECHANICS

Matter Waves: Concept of Matter Waves- de Broglie hypothesis, Characteristics of matter waves, Group and phase velocity of matter Waves, relation between group and phase velocity (derivation), experimental evidence for existence of matter waves ,Davison-Germer Experiment withTheory.

3 hours

Heisenberg's Uncertainty Principle: Statement, explaination and illustration (gamma ray microscope experiment-(quantitative), Applications of the Uncertainty Principle - The size of an atom, non-existence of electrons inside the nucleus.

3 hours

Principles of Quantum Mechanics: concept of wave function, Properties of wave function, Physical significance (Born's interpretation of the wave function), Normalisation of wave function. Basic postulates of quantum mechanics, Operators in quantum mechanics (Mention – position, momentum, Kinetic and Total energy).

3 hours

Schrodinger Wave Equation: Schrodinger's Wave Equation in time independent and time dependent forms (derivation), Application of Schrodinger's equation to particle in one dimensional box - wave function & energy values (derivation). Qualitative discussion of Simple Harmonic Oscillator (expression for energy, energy level diagram and Zero point energy).

4 hours

Module III: ASTROPHYSICS & SPACE PHYSICS

Stars-Stellar Parallax-Parallax method of determining the stellar distance,units of stellar distance(Light year and parsec),Stellar Magnitude (Hipparchus magnitude Scale -apparent and absolute magnitudes & their relations), Stellar Spectra – Colour index, U-B-V

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system,Harvard Classification Scheme for Stars, Stellar Mass and size, HR Diagram and its importance.

4hours

Stellar Structure: Hydrostatic equilibrium, Basic Equations of stellar structure (Mention of equations for mass conservation & momentum conservation), Virial Theorem, Linear density model of a star - Expression for internal pressure and temperature of a star, Mass-Luminosity Relation, Photon diffusion Time (Qualitative).

4hours

Stellar Evolution: Block diagram of Stellar Evolution – Qualitative discussion of different stages of Stellar Evolution (Formation, main sequence stage, red giant stage and death stage), super dense remnants – White dwarf- Chandrasekhar limit, neutron star and black hole (qualitative- mass limits and expression for radius).

3hours

Space Physics: Solar atmosphere (Photosphere, Chromosphere & Corona), electromagnetic radiations from the sun, Solar wind, solar cycles.

2 hours

REFERENCES:

1. Arthur Beiser, ***Concepts of Modern Physics (Sixth Edition)***, Tata McGraw Hill (2003)
2. Kenneth S Krane, ***Modern Physics (Third Edition)***, John Wiley & Sons (2012)
3. Sundararajan N, George Thomas & Syed Azeez, ***College Physics***, United Publishers (2006).
4. Rajagopal P and Aruldhas G, ***Modern Physics,*** Prentice Hall of India (2009)
5. Murugeshan R,KiruthigaSivaprasath, ***Modern Physics***, S Chand & Company (2016)
6. R B Singh, ***Introduction to Modern Physics (Second Edition)***, New Age International (2009)
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8. C L Arora & P S Hemne, ***Physics for Degree Students,***S Chand & Company (2016)
9. Paul A Tipler& Ralph A Llewellyn, ***Modern Physics (Sixth Edition)***, W H Freeman (2012)

RELATIVITY

1. P L Sardesai,***A Primer of Special Relativity***, New Age International (2004)
2. Satyaprakash, ***Relativistic Mechanics***, PragatiPrakashan.
3. Robert Resnick, ***Introduction to Special Theory of Relativity,***John Wiley & Sons (1968)
4. A P French, ***Special Relativity***, W W Norton & Company (1968)

QUANTUM MECHANICS

1. Kamal Singh&S P Singh, ***Elements of Quantum Mechanics,***S Chand & Company (2013)
2. S P Kuila, ***Perspective of Quantum Mechanics,*** New Central Book Agency (2010)
3. David J Griffiths, ***Introduction to Quantum Mechanics(3e)***, Pearson Education(2005)
4. Bransden B H and Joachain C J, ***Quantum Mechanics(2e),*** Pearson Education (2000)
5. NouredineZettili,***Quantum Mechanics(Second Edition),*** John Wiley & Sons (2009)

ASTROPHYSICS & SPACE PHYSICS

1. BaidarinathBasu***An Introduction to Astrophysics (Second Edition),*** Prentice Hall of India
2. K.S. Krishnaswamy, ***Astrophysics : A Modern Perspective***, New Age International (2006)
3. Stein R F & A G W Cameron, ***Stellar Evolution***, Plenum (1966)
4. Abhyankar K D, ***Astrophysics of Stars and Galaxies***, Universities Press.

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GRADUATE PROGRAMME
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Semester VI

Paper 8

List of Experiments:

1. Realisation of Boolean expression – using Logic ICs
2. Determination of Work function using diode valve.
3. Logic gates – IC7400
4. Flip Flops (RS) – IC 7400
5. Phase Shift Oscillator
6. Operational Amplifier as summing amplifier
7. Astable Multivibrator –Transistor Circuit
8. Wein bridge oscillator
9. Determination of Boltzmann's Constant using diode
10. BG - Determination of mutual inductance by absolute method
11. Transistor characteristics- calculation of h parameters.
12)Operational Amplifier –Inverting & non Inverting

NOTE: 1) Minimum of EIGHT experiments are to be performed
2) Any Relevant experiment can also be performed

REFERENCES –

1. Chattopadhyaya D., Rakshit P.C & B. Saha, **An Advanced Course in Practical Physics,** New Central Book Agency (P) Limited.Kolkata.
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