AC 25.04.24 ITEM NO: 21.2

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for
Program: Bachelor of Science
Course: S.Y.B.Sc
Subject: Physics

Choice Based Credit System (CBCS)
with effect from
Academic Year 2024-2025

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in **Arts/Commerce/Science** Program will be able to	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Programme. Execute strong theoretical and practical understanding generated from the specific graduate Programme in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	**Research-related skills and Scientific temper:** Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

Deccan Education Society's

Kirti M. Doongursee College (Autonomous)

Proposed Curriculum For S.Y.B.Sc. as per NEP 2020

Year of implementation- 2024-25

Name of the Department: PHYSICS

Semester	Course Code	Course Title	Vertical	Credit
III	24PHYMJ311	Thermodynamics and Digital Electronics	Major	2
	24PHYMJ312	Mathematical Methods	Major	2
	24PHYMJP31	Physics Major Practical	Major Practical	4
	24PHYMR321	Electronics	Minor	2
	24PHYMRP31	Physics Minor Practical	Minor Practical	2
	24PHYOE331	Physics in Everyday Life-3	OE	2
	24PHYVC341	Power Supplies	VSC	2
	24PHYMJ411	Electrodynamics	Major	2

IV	24PHYMJ412	Quantum mechanics	Major	2
	24PHYMJP41	Physics Major Practical	Major Practical	4
	24PHYMR421	Optics	Minor	2
	24PHYMRP42	Physics Minor Practical	Minor Practical	2
	24PHYOE431	Physics in Everyday Life-4	OE	2
	24PHYSE451	Digital Electronics	SEC	2

Course Code	MAJOR SEM – III - Course Title (P I)	Credits	Lectures /Week
24PHYMJ311	**Thermodynamics and Digital Electronics**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

- Remember the basic concepts of thermodynamics and digital electronics.
- Understand the events happening around and correlate them with these concepts.
- Apply the conceptual knowledge in daily life situations.
- Think and Analyze the situations critically for the benefit to society.

Unit	Topics	No of Lectures
I	Reversible and irreversible process, Heat Engines, Carnot's cycle, Effective way to increase Efficiency, Carnot's Engines and refrigerator, Coefficient of performance, Second Law of Thermodynamics - Statements, Carnot Theorem, Steam Engine, Otto Engine, Diesel Engine. BSH: 4.20, 4.23, 4.24, 4.25, 4.26, 4.27, 4.28,4.29, 4.30, 4.31& 4.33. Low temp physics: Different methods of liquefaction of gases, Method of freezing, Cooling by Evaporation under reduced Pressure, Cooling by Adiabatic Expansion, , Joule Thomson Cooling, Principle of Regenerative Cooling, Liquefaction of Oxygen. BSH: 6.3, 6.4.1, 6.4.2, 6.4.6, 7.1, 7.2, 7.3, 7.4, 7.7&7.9	**15**

II	**Flip Flops** : RS Flip-Flops (only NOR gate latch, NAND gate latch) , Gated Flip-Flops, Edge-Triggered RS Flip-Flop, Edge- Triggered D Flip-Flop, Edge-Triggered J-K Flip-Flop, JK Master- Slave Flip-Flops. **Types of registers:** SISO , SIPO, PISO , PIPO [in this chapter the teacher should make all IC specific diagrams into general diagrams ie. Ignore pin numbers and IC numbers] Asynchronous counter -3 bit (ignore IC specific diagrams), Synchronous counter only mod 8, Decade Counters Mod 5 and Mod 10 **LMS Articles:** FFs: 8.1 to 8.5, 8.7 Registers: 9.1 to 9.5 Counters: 10.1, 10.3(upto fig 10.12) 10.5(upto fig 10.22).	**15**

Textbooks:

- BSH: Brijlal, Subramanyam and Hemne, Heat Thermodynamics and Statistical Physics, S Chand,Revised, Multi-coloured,2007 Ed.
- LMS: Digital Principles and Applications - Leach, Malvino, Saha_ 6th ed

Additional References:

- M W Zemansky and R H Dittman, Heat and Thermodynamics, McGraw Hill.
- D K Chakrabarti, Theory and Experiments on Thermal Physics, (2006 Ed) Central books.
- Evelyn Guha,Basic Thermodynamics (Narosa Publications)

Course Code	MAJOR SEM – III - Course Title (P II)	Credits	Lectures /Week
24PHYMJ312	Mathematical Methods	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- To understand and learn Mathematical Techniques required to Physical phenomena at the under graduate level and get exposure to important ideas of differential equations.
- To understand and solve non homogeneous differential equation and partial differential equation using simple methods.
- To apply the principles of physics to solve new and unfamiliar problems.
- To analyze different types of differential equation in program.

Unit	Topics	No of Lectures
I	Differential Equations: Introduction, Ordinary differential equations: first order homogeneous and non-homogeneous differential equations with variable coefficients, Variable separable method, exact differentials equation General first order Linear Differential equation and Second-order homogeneous differential equations with constant coefficients. Problems depicting physical situations like LC and RL circuits.	15
II	Second-order non homogeneous equations with constant coefficients, partial differential equations, some important partial differential equations in physics, method of separation of variables. Applications of Partial differential Equation: Modeling of vibrating stretched string and two dimensional heat flow equation, Laplace's equation in two dimensions, Solution of wave equation and Helmoltz's equation.	15

Textbooks:

- Higher Mathematical Physics, 1st Edition, 2014, by H.K. Dass and Dr. Rama Verma, S.Chand Publishing ,New Delhi -110 055(Article no.12.1 to 12.7 , page no :273-305)

Additional References:

- Mathematical Physics, B.D. Gupta-Vikas Publishing House, 4th Edition (2006)
- Mathematical Physics, Sathya Prakash, Sultan Chand, 6th edition (2014)
- Mathematical Physics Rajput, Pragathi Prakasan Pub., (2017)
- Mathematical Physics, H.K. Dass, S. Chand & Co., Eighth edition (2018)
- Mechanics and mathematical methods by R Murugeshn, S Chand. Elements of mechanics by Gupta.
- Mathematical physics- Piyoosh kumar tyagi , RBSA Publishers
- Mathematical Methods for Physicists: A concise introduction, - Tai L. Chow - Cambridge University Press.

Course Code	MINOR SEM – III - Course Title	Credits	Lectures /Week
24PHYMR321	ELECTRONICS	2	2

Course Outcomes:

1. Remember the basics of transistor biasing, operational amplifiers, their applications
2. Understand the basic concepts of oscillators and be able to perform calculations using them
3. To apply quantitative problem solving skill in all the topics covered
4. To analyze and apply techniques of electronics for betterness of society

Unit	Topics	No of Lectures
I	1.Faithful amplification, Transistor Biasing, Inherent Variations of Transistor Parameters, Essentials of a Transistor Biasing Circuit, Methods of Transistor Biasing, Base Resistor Method, Emitter Bias Circuit, Circuit analysis of Emitter Bias, Voltage Divider Bias Method. 2.General amplifier characteristics**:** Concept of amplification, amplifier notations, current gain, Voltage gain, power gain, input resistance, output resistance, frequency response, Decibel gain and Band width. General theory of feedback, reasons for negative feedback, loop gain.	15
II	1. Oscillators**:** Introduction, effect of positive feedback. Requirements for oscillations, phase shift oscillator, Wien Bridge Oscillator, Colpitt's oscillator. 2. **Operational Amplifiers:** Introduction, Schematic symbol of OPAMP, Output voltage from OPAMP, ,	15

	Bandwidth of an OPAMP, Slew rate, Frequency Response of an OPAMP, Virtual ground concept , gain , offset voltage and current , OPAMP with Negative feedback, Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower, Summing Amplifier, Applications of Summing amplifier, OPAMP Integrator and Differentiator, Critical frequency of Integrator, Comparator.	

References:

- Principles of Electronics – V. K. Mehta and Rohit Mehta. (S. Chand – Multicolour
- revised edition)
- Digital Principles and Applications - Leach, Malvino, Saha_ 6th ed
- Electronic devices and circuits – An introduction Allan Mottershead (PHI Pvt. Ltd.– EEE – 1986)

Course Code	OPEN ELECTIVE –SEM III -	Credits	Lectures /Week
24PHYOE331	**Physics in Everyday Life-3**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

- (Remember) Physical laws, Fundamental dimensions, various parameters of waves and geometrical optics
- (Understanding) Laws of motion, light reflection and refraction and common features of waves.
- (Apply) laws of motion, wave propagation and concepts optics in daily life
- (Analyze) the problem on the basis of laws of mechanics, sound and optics.

Unit	Topics	No of Lectures
I	**Classical Mechanics:** Galileo's laws, Keplers laws , Dimensions and unit of physical quantities (Fundamental units and derived units), Action of physical force on an object, Introduction to Newton's laws, Conservation of momentum (Newton cradle) and their application in daily life, Friction and its application to simple problems,	**15**
II	**Sound and Optics**: Types of waves, common properties of waves, characteristics of transverse waves and longitudinal waves, Echo and Acoustics, qualities of sound, Doppler effect. Nature of light, Geometrical optics and physical optics, laws of reflection and refraction, reflection from plane and curved surfaces, aberrations, total internal reflection and its applications, dispersion, microscopes and telescopes.	**15**

References:

1. Fundamental of Physics, by Haliday, Robert Resnick, Jearl Walker, 12 edition, Wiley
2. The Feynman Lectures on Physics, by Richard Feynman, Leighton, Sands, Pearson Education
3. University of Physics, by Hugh D. Young, Roger A. Freedman, Fifteenth Edition, Pearson
4. Dr. N. Subrahmanyam, Brijlal, and Dr. M. N. Avadhanulu, A Textbook of Optics, 25th Revised Edition 2012(Reprint 2016), S. Chand and Company Pvt. Ltd.
5. H. J. Pain, The physics of vibrations and waves, 6 th edition.

Course Code	VOCATIONAL SKILL COURSE SEM III	Credits	Lectures /Week
24PHYVC341	POWER SUPPLIES	2	4

Course Objectives:

On successful completion of this course students will be able to:

1. Understand & practice the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate the physics theory concepts to practical application.
4. Understand the concept of errors and their estimation.

EXPERIMENT NO.	POWER SUPPLIES	No of Lectures
1	Study of Transformer	60
2	Half Wave Rectifier	
3	Full Wave Rectifier (Two Diodes)	
4	Bridge Rectifier	
5	Ripple factor and percentage regulation measurement	
6	Power supply using IC	
7	Regulated Power supplies	
8	Unregulated Power Supplies	

All 8 experiments should be completed and reported in the journal, in the first semester.

Certified Journal is a must, to be eligible to appear for practical examination.

Course Code	PRACTICAL SEM III	Credits	Lecture s/ Week
24PHYMJP31	Practical (Major)	4	8

Course Objectives:

On successful completion of this course students will be able to:

5. Understand & practice the skills while performing experiments.
6. Understand the use of apparatus and their use without fear & hesitation.
7. Correlate the physics theory concepts to practical application.
8. Understand the concept of errors and their estimation.

Instructions:

1. All the measurements and readings should be written with proper units in SI system only.
2. After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.
3. While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
4. Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Learning Outcomes:

On successful completion of this course students will be able to:

1. Understand & practice the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate the physics theory concepts to practical application.
4. Understand the concept of errors and their estimation**.**

- Each experiment will be of four lecture hours' duration.
- A Minimum 12 from each group and in all minimum 24 experiments must be reported in journal.
- Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments.

A learner will be allowed to appear for the external practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester III as per the minimum requirements.

EXPERIMENT NO.		No of Lectures
GROUP A		
1	Helmholtz resonator- determination of unknown frequency	120
2	Young's modulus by Koenig's method/ Y by bending.	
3	Young's Modulus (Y) of Flat spiral spring.	
4	Modulus of rigidity for the material of Flat spiral spring.	
5	Determination of acceleration due to gravity using BAR pendulum	
6	Y By Bending	
7	Log Decrement using Simple Pendulum	
8	LCR parallel resonance	
9	Verification of Stefan's law (Electrical method)	
10	Use of oscilloscope- for phase-shift measurement	
11	CE amplifier: Determination of bandwidth	
12	PC simulations: graph, curve fitting, etc	
13	CE amplifier : Variation of gain with load	
14	Searl's experiment: Determination for Young's Modulus	
GROUP B		

15	Square wave oscillator using gates	
16	Study of MS-JK flip flop	
17	MOD 2 , MOD 5 & MOD 10 counter using IC 7490	
18	Opamp- Summing Amplifier	
19	Opamp – Difference Amplifier	
20	Opamp: Differentiator	
21	Opamp: Integrator	
22	Shift registers	
23	Soldering technique	
24	Wiring of a simple circuit using bread board	
25	Use of DMM- for component testing- diode and transistor	
26	Radius of ball bearings (single pan balance)	
27	Use of Oscilloscope	
28	Traveling microscope: Radius of capillary	

Note: Minimum **24** experiments (Twelve From each group) should be completed and reported in the journal, in the first semester. **Certified Journal is a must,** to be eligible to appear for the semester end practical examination.

Semester End Practical Examination:

Scheme of Examination:

There will be a sem end assessment for practical. A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that the candidate has completed the practical course of that semester of S.Y.B.Sc. Physics as per the minimum requirement. The duration of the practical examination will be of two hours per experiment. There will be two experiments

(one from each group) through which the candidate will be examined in practical. The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of physics.

References:

1. Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& B Saha. (6th Edition) Book and Allied Pvt.Ltd.
2. B.Sc PRACTICAL Physics – Harnam Singh S.Chand& Co. Ld. 2001
3. A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh, New Central Book Agency (3rd edition)
4. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Ltd.
5. Practical Physics CL Squires (3rd Edition) Cambridge University
6. University Practical Physics – DC Tayal. Himalaya Publication
7. Advanced Practical Physics – Worsnop&Flint.

Course Code	PRACTICAL SEM – III - Course Title	Credits	Lectures /Week
24PHYMRP31	**PHYSICS MINOR PRACTICAL**	**2**	**2**

Course Objectives:

On successful completion of this course students will be able to:

1. Understand & practice the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate the physics theory concepts to practical application.
4. Understand the concept of errors and their estimation.

EXPERIMENT NO.	MINOR	No of Lectures
1	OPAMP: Inverting Amplifier with different gain	**60**
2	OPAMP: Non-inverting amplifier	
3	Study of CE Amplifier: Determination of Bandwidth	
4	Study of CE Amplifier: Verification of gain with load	
5	OPAMP: Difference amplifier	
6	OPAMP: Unity gain follower	
7	C1/C2 by Wien Bridge Oscillator	
8	OPAMP: As integrator	
9	OPAMP: As differentiator	
10	To study output characteristics of common emitter amplifier.	

8 experiments should be completed and reported in the journal, in the third semester.

Certified Journal is a must, to be eligible to appear for practical examination.

Course Code	SEM – IV MAJOR PAPER I	Credits	Lectures /Week
24PHYMJ411	**Electrodynamics**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

- Remember terms and concepts related to the course.
- Understand the topics and identify their applications.
- Apply the knowledge the knowledge acquired to solve the related problems.
- Analyse the problems properly to come out with concrete solutions to existing situatios

Unit	Topics	No of Lectures
I	**Electrodynamics and Vector calculus:** Line, surface, volume integrals, Fundamental theorems of Gradient, Curvilinear co-ordinates, Divergence and Curl. **DG**: 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.4, 2.2.2, 2.2.4	**15**
II	**Electromagnetism (Electrostatics & Magnetostatics)** Coulomb's law, Comments on potential, Poisson's equation and Laplace's equation. Solution and properties of 1D Laplace equation. Properties of 2D and 3D Laplace equation (without proof). First & Second Uniqueness theorem **DG**: 2.1.2, 2.1.3, 2.3.2, 2.3.3, 3.3.2, 3.3.3, 3.3.4, 3.1.5, 3.1.6 Magnetization, The Divergence and Curl of B, Ampere's law in magnetized materials, Comparison of Magnetostatics and Electrostatics , Bound currents and their physical interpretation, Magnetic susceptibility and permeability. **DG**: 5.2.1, 5.2.2, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 6.1.4, 6.2.1, 6.2.2, 6.4.1	**15**

Textbooks: • DG : Introduction to Electrodynamics : David J. Griffiths (3rd Ed) Prentice Hall of India. **Additional References:** • Introduction to Electrodynamics: A. Z. Capria and P. V. Panat. Narosa Publishing House. • Engineering Electrodynamics : William Hayt Jr. & John H. Buck (TMH). • Electricity and Magnetism :Navina Wadhwani (PHI – 2010).		

Course Code	MAJOR SEM – IV - Course Title P II	Credits	Lectures /Week
24PHYMJ412	QUANTUM MECHANICS	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- (Remember)To remember difference between classical and Quantum Mechanics
- (Understanding)To Understand Concept of Quantum mechanics
- (Apply)Apply the knowledge acquired to solve the related problems.
- (Analyze)Analyze the problems properly to come out with concrete solutions to existing situations

Unit	Topics	No of Lectures
I	Concepts of operator in quantum mechanics examples – position, momentum and energy operators.Eigenvalue equations, expectation values of operators.Schrodinger equation.Postulates of Quantum Mechanics. Analogy between Wave equation and Schrodinger equation. Time dependent and time independent (Steady State) Schrodinger equation, Stationary State Superposition principle. Probability current density, Equation of continuity and its physical significance.Concept of wave function, Born interpretation of wave function.Concepts of operator in quantum mechanics examples – position, momentum and energy operators.Eigenvalue equations, expectation values of operators. Schrodinger equation.Postulates of Quantum Mechanics. Analogy between Wave equation and Schrodinger equation. Time dependent and time independent (Steady State) Schrodinger equation, Stationary State Superposition principle.Probability current density, Equation of continuity and its physical significance. Concept of wave function, Born interpretation of wave function. Concepts of operator in quantum mechanics examples – position, momentum and energy operators. Eigenvalue equations, expectation values of operators.	15

	Schrodinger equation.Postulates of Quantum Mechanics. Analogy between Wave equation and Schrodinger equation. Time dependent and time independent (Steady State) Schrodinger equation, Stationary StateSuperposition principle. Probability current density, Equation of continuity and its physical significance.	
II	Applications of Schrodinger steady state equation-I Free particle.Particle in infinitely deep potential well (one - dimension).Particle in finitely deep potential well (one - dimension).Step potential.Particle in three dimension rigid box, degeneracy of energy state.	**15**

Additional References:

1. Concepts of Modern Physics – A. Beiser (6th Ed.) Tata McGraw Hill.

2 Quantum Mechanics – S P Singh, M K Bagade, Kamal Singh, - S. Chand : 2004 Ed.

3. Quantum Mechanics of Atoms, Molecules, Solids, Nuclei and particles. - By R. Eisberg and R. Resnik Published by Wiley.

4.Introduction to Quantum Mechanics. - By D. Griffiths Published by Prentice Hall.

5.Quantum Mechanics. - By Ghatak and Lokanathan Published by Mc. Millan.

6.Quantum Mechanics. - By L. I. Schiff.

Course Code	MINOR SEM – IV - Course Title	Credits	Lectures /Week
24PHYMR421	**Optics**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

- To Understand the diffraction, polarization processes and applications of them in physical situations.
- To Understand the applications of interference in design and working of interferometers.
- To Understand the resolving power of different optical instruments.

Unit	Topics	No of Lectures
I	Diffraction and Polarization 1. **Fresnel diffraction:** Introduction, Huygens-Fresnel's theory, Fresnel's assumptions, Distinction between interference and diffraction, Fresnel and Fraunhoffer types of diffraction, Diffraction pattern due to straight edge: positions of maximum and minimum intensity SBA: 17.1, 17.2, 17.3, 17.6, 17.7, 17.10, 17.10.1 2. **Fraunhoffer diffraction:** Introduction, Fraunhoffer diffraction at a single slit, intensity distribution in diffraction pattern due to a single slit, Fraunhoffer diffraction at double slit, Distinction between single slit and double slit diffraction patterns SBA: 18.1, 18.2, 18.2.1, 18.4, 18.4.2 3. **Polarization:** Introduction, Malus' Law, Production of Polarized light: The wire grid polarizer and a Polaroid, Polarization by Reflection, Polarization by Double Refraction, Interference of Polarized light: Quarter wave plates and half wave plates (Qualitative) Ordinary and Extraordinary Rays, Positive and Negative crystals AG: 22.1, 22.2, 22.3, 22.3.1, 22.3.2, 22.3.3, 22.6 SBA: 20.11.2, 20.11.3	**15**

II	**Interferometers and Resolving Power** 1. **Michelson's Interferometer**: Principle, construction, working, circular fringes, localized fringes, White light fringes, Visibility of fringes. Applications of Michelson Interferometer: a) Measurement of wavelength b) Determination of the difference in the wavelength of two waves c)Thickness of a thin transparent sheet d) Determinaton of the refractive index of gases . SBA: 15.7, 15.7.1 to 15.7.7, 15.8, 15.8.1 to 15.8.4 2. **Resolving Power**:Introduction, Rayleigh's criterion, Resolving power of optical instruments, Criterion for resolution according to Lord Rayleigh, Resolving power of a telescope, Resolving power of a prism, Resolving power of a plane transmission grating. SBA: 19.1, 19.2, 19.5, 19.6, 19.7, 19.11, 19.12	**15**
Textbooks: ● (SBA) Dr. N. Subrhmanyam, Brijlal, and Dr. M. N. Avadhanulu A Textbook of Optics, 25th Revised Edition (2012) S. Chand ● (AG) Ajoy Ghatak, Optics 6E Mc Graw Hill Education		

Course Code	OPEN ELECTIVE SEM – IV- Course Title	Credits	Lectures /Week
24PHYOE431	**Physics in Everyday Life-4**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

- (Remember) Examine the atomic model, origin of electric and magnetic fields.
- (Understanding) Concept of atom, photoelectric effect and optical fiber, comparison of electric and magnetic fields and their sources.
- (Apply) Laws of physics, electricity and magnetism to application in modern physics.
- (Analyze) the problems on the basis of basic concept.

Unit	Topics	No of Lectures
I	**Modern Physics and its applications:** Constituents of atom, Atomic structure, What is modern physics, Black body radiation, Introduction to photoelectric effect and its application, LASER and its application, Optical fiber and its applications, Introduction to relativity and quantum mechanics.	**15**
II	**Electricity and Magnetism:** Sources of electricity and magnetism and laws governing electric and magnetic field forces, Flux of electric and magnetic fields, Gauss law law in electrostatics, Amperes law in magnetostatics, Ohm's law, conductors, insulators and semiconductors, electromotive force (emf), Bar magnet, earths magnetism, Applications of electricity and magnetism.	**15**

References:

1. Elements of modern physics by R Murugeshan, Kiruthiga Sivaprasth, S Chand publication.
2. Modern Physics by Kenneth S. Krane, Fourth Edition, Willey Publication.
3. Problems in modern physics by P.Mandal, 2nd edition, Techno word Publication.
4. Electricity and Magnetism by Brijlal.
5. Electromagnetism by John C. Slater.

Course Code	SKILL ENHANCEMENT COURSE SEM – IV	Credits	Lectures /Week
24PHYSE451	**Digital Electronics**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

- To learn about logic gates and understand verification.
- To provide a comprehensive understanding of digital systems and their design process.
- (Apply)
- To analyze and create basic digital circuits for practical real world application.

Topics	No of Lectures
1.Introduction to Number systems and their conversion.	**60**
2.To study basic logic gates and verify its truth table.	
3.To study EX-OR gate and verify its truth table.	
4.Construct basic logic gates using Universal gates.	
5.Verify De-Morgan's Theorem.	
6. Working of Half adder circuit.	

Textbooks:

- R.P Jain,"Modern digital electronics", Tata McGraw Hill.
- Gotham,"Digital Electronics-An introduction to theory and practice",Pearson Education.
- Douglas-Hall,"Digital Circuits and systems", Tata McGraw Hill.

Course Code	MAJOR PRACTICAL SEM – IV- Course Title	Credits	Lectures /Week
24PHYMJP41	SEM – IV MAJOR PRACTICAL	4	8

Course Objectives:

On successful completion of this course students will be able to:

1. Understand & practice the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate the physics theory concepts to practical application.
4. Understand the concept of errors and their estimation.

Instructions:

1. All the measurements and readings should be written with proper units in SI system only.
2. After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.
3. While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
4. Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Learning Outcomes:

On successful completion of this course students will be able to:

1. Understand & practice the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate the physics theory concepts to practical application.

4. Understand the concept of errors and their estimation**.**

- For practical examinations, the learner will be examined in three experiments (one from each group).
- Each experiment will be of four lecture hours' duration.
- A Minimum 12 from each group and in all minimum 24 experiments must be reported in journal.
- Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.
- A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has

completed the practical course of Physics Semester IV as per the minimum requirements.

EXPERIMENT NO.		No of Lectures
GROUP A		
1	Optical lever: determination of μ	120
2	Cylindrical obstacle: determination of λ/ Fresnel's bi-prism: determination of λ	
3	Determination of Couchy's constants	
4	R.P. of telescope/ R.P. of grating	
5	Brewster's law: determination of μ	
6	Polarimeter: Determination of specific rotation of sugar solution	
7	Determination of wavelength of laser using grating	
8	Cylindrical abstract: Determination of wavelength.	
9	Determination of R.I. of liquid by laser	
10	Fresnel diffraction-straight edge, cylindrical obstacle using LASER	
11	Fraunhoffer diffraction- Single slit, Double slit, Diffraction grating, reflection grating (steel ruler, CD, etc.), transmission grating (wire gauge, fabric, etc.)	
12	Total internal reflection using LASER	
13	Spectrometer: Mean refractive index for Yellow doublet of mercury source.	
14	Error analysis of a given experiment.	
GROUP B		
15	Study of 8 Bit D latch.	
16	Study of 8 Bit Unidirectional Buffer/ Bidirectional Buffer.	

17	Verification of Inverse square law using LUX meter	
18	Gauss Meter: Determination of Magnetic Field with change in current in electromagnet	
19	Diode as a temperature sensor	
20	16-bit Data manipulation (Addition, subtraction) Display result on Address field.	
21	To determine self inductance of a coil by Maxwell bridge.	
22	Passive band pass filter	
23	Passive low pass filter	
24	Passive high pass filter	
24	Slew rate of OPAMP	
25	Wave form generation using OPAMP- Square wave, triangular wave	
26	Slew rate of OPAMP	
27	First order active notch filter	
28	Transistorized bistable multivibrator	

Note: Minimum **24** experiments (Twelve From each group) should be completed and reported in the journal, in the first semester. **Certified Journal is a must,** to be eligible to appear for the semester end practical examination.

Semester End Practical Examination:

Scheme of Examination:

There will be a sem end assessment for practical. A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that the candidate has completed the practical course of that semester of S.Y.B.Sc. Physics as per the minimum requirement. The duration of the practical will be of two hours examination per experiment. There will be two experiments

(one from each group) through which the candidate will be examined in practical. The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of physics.

References:

1. Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& B Saha. (6th Edition) Book and Allied Pvt.Ltd.
2. B.Sc PRACTICAL Physics – Harnam Singh S.Chand& Co. Ld. 2001
3. A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh, New Central Book Agency (3rd edition)
4. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Ltd.
5. Practical Physics CL Squires (3rd Edition) Cambridge University
6. University Practical Physics – DC Tayal. Himalaya Publication
7. Advanced Practical Physics – Worsnop&Flint.

Course Code	MINOR PRACTICAL SEM – IV- Course Title	Credits	Lectures /Week
24PHYMRP41	SEM – IV MINOR PRACTICAL	2	4

Course Objectives:

On successful completion of this course students will be able to:

1. Understand & practice the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate the physics theory concepts to practical application.
4. Understand the concept of errors and their estimation.

EXPERIMENT NO.	MINOR	No of Lectures
1	Determination of Couchy's constants	60
2	R.P. of telescope/ R.P. of grating	
3	Brewster's law: determination of μ	
4	Polarimeter: Determination of specific rotation of sugar solution	
5	Determination of wavelength of laser using grating	
6	Determination of R.I. of liquid by laser	
7	Study Michelson Interferometer	
8	Single slit fraunhofer diffraction	
9	Optical lever determination of refractive index	
10	Recognition of positive/negative crystal	

8 experiments should be completed and reported in the journal, in the fourth semester.

Certified Journal is a must, to be eligible to appear for practical examination.

Evaluation Scheme for Second Year (UG) under NEP (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1. Continuous Internal Assessment(CIA) Assignment - Tutorial/ Case Study/Project / Presentations/ Group Discussion / Ind. Visit. – 10 marks

2. Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern: All questions are compulsory.

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & theallocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 100 Marks.
- Duration: 2 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

NOTE: To pass the examination, attendance is compulsory in both Internal &