

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: F.Y.B.Sc

(AS PER NEP 2020)

Subject: Physics

Choice Based Credit System (CBCS)

with effect from

Academic Year 2025-2026

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in Science Program will be able to	
PO1	Disciplinary Knowledge: Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Program. Execute strong theoretical and practical understanding generated from the specific graduate Program 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 F.Y.B.Sc. as per NEP 2020

Year of implementation- 2025-25

Name of the Department: PHYSICS

Semester	Course Code	Course Title	Vertical	Credit
I	25PHYMJ111	Classical Mechanics	Major	2
	25PHYMJP11	Physics Major Practical	Major	2
	25PHYVC141	Electronic Equipment Maintenance	VSC	2
	25PHYSC151	Household Repairs	SEC	2
II	25PHYMJ212	Electricity and electronics	Major	2
	25PHYMJP21	Physics Major Practical	Major	2
	25PHYOE231	Physics in Everyday Life-2	OE	2
	25PHYVC241	Mobile Handset Maintenance	VSC	2
	25PHYSC251	Computer Simulation	SEC	2

Course Code	MAJOR SEM I	Credits	Lectures/ Week
25PHYMJ111	Classical Mechanics	2	2
Course Outcomes: After successful completion of this course students will be able to CO1: Remember Newton's laws for the calculations of the motion of simple systems CO2: Understand Work and Energy equivalence and its applications through suitable numerical. CO3: Apply Elasticity, Viscosity and Fluid dynamics in daily life. CO4: Analyse the problems and use skills in all the topics covered			
Unit	Topics	No of Lectures	
I	1. Newton's Laws of Motion: Newton's first, second and third laws of motion, interpretation and applications, pseudo forces, inertial and non-inertial frames of reference Worked out examples (with friction present) HCV: 5.1 to 5.5 2. Friction: Advantages & disadvantages of friction in daily life, Friction as the component of Contact force, Kinetic Friction, Static friction, laws of friction, Understanding friction at Atomic level. HCV: 6.1 to 6.5 3. Work and Energy: Kinetic Energy, Work and Work-energy theorem, Potential Energy, Conservative and Non Conservative Forces, Different forms of Energy: Mass Energy Equivalence Worked out Examples HCV: 8.1, 8.2, 8.5, 8.6, 8.11	15	

II	1. Elasticity: An introduction to Elasticity, Stress, Strain, Hooke's Law and Moduli of Elasticity and relation between them HCV: 14.2, 14.3, 14.4, 14.5 2. Viscosity: An introduction to Viscosity, Flow through a Narrow Tube: Poiseuille's Equation, Stokes' Law, Terminal velocity, Measuring Coefficient of Viscosity by Stokes' method, Critical velocity and Reynolds number. Worked out Examples	15
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	HCV: 14.15, 14.16, 14.17, 14.18, 14.19, 14.20 3. Fluid Mechanics: Streamline and Turbulent flow, Equation of Continuity, Bernoulli's equation, Applications of Bernoulli's equation. Worked out Examples HCV: 13.8, 13.10, 13.11, 13.12 <i>Note: A good number of numerical examples are expected to be covered during the prescribed lectures.</i>	
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References: 1. HCV: H. C. Verma, Concepts of Physics – Part I, (Second Reprint of 2020) Bharati Bhavan Publishers and Distributors 2. BSH: BrijLal, Subrahmanyam and Hemne, Heat Thermodynamics and Statistical Physics, S. Chand , Revised, Multi-coloured, (Reprint 2019) Additional References: 1. Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley & Sons. 2. D.S Mathur, P.S Hemne, Mechanics, 2012, S. Chand 3. M. W Zemansky and R. H Dittman, Heat and Thermodynamics, McGraw Hill. 4. Thornton and Marion, Classical Dynamics (5th Ed.) 5. D. S Mathur, Element of Properties of Matter, S. Chand & Co. 6. R. Murugesan and K. Shivprasath, Properties of Matter and Acoustics, S. Chand. 7. D. K Chakrabarti, Theory and Experiments on Thermal Physics,(2006 Ed.), Central books. 8. Hans and Puri, Mechanics, (2nd Ed.) Tata McGraw Hill		

Course Code	PHYSICS MAJOR PRACTICAL SEM I	Credits	Lectures/Week
25PHYMJP11	Practical	2	4
Course Outcomes: On successful completion of this course students will be able to: CO1: Remember the skills while performing experiments. CO2: Understand the use of apparatus and their use without fear & hesitation. CO3: Apply the physics theory concepts to practical application. CO4: Analysis the concept of errors and their estimation. Instructions: - All the measurements and readings should be written with proper units. - 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. - While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result. - Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result. - For practical examinations, the learner will be examined in two experiments (one from each regular experiment group). - Minimum 3 from each regular experiment group and in all minimum 6 regular experiments and 3 skill experiments must be reported in 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 I as per the minimum requirements.			

Regular and Skill Experiments:

Sr. No.	Name of the Experiment
GROUP A: Regular Experiments	
1	Torsional Oscillation: To determine modulus of rigidity η of a material of wire by Torsional oscillations

2	Bifilar Pendulum: Determination of moment of inertia of rectangular and cylindrical bar about an axis passing through its center of gravity
3	Moment of inertial of Flywheel
4	Constant volume air thermometer
5	Young's Modulus of a wire material by method of vibrations
6	Spectrometer: To determine of angle of Prism
7	Spectrometer: To determine refractive index of prism material
8	Combination of Lenses: To determine equivalent focal length of a lens system by magnification method
9	Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings
10	Determination of diameter of thin wire using Wedge Shaped Film
11	Bifilar pendulum (moment of inertia of rectangular rod)
12	Study of LASER Beam Divergence

GROUP B : Skill Experiments

1	Use of Vernier Callipers, Micrometer Screw Gauge.
2	Graph plotting (Plot BE/A verses A graph for 30 atoms, Plot Packing Fraction graph for 30atoms)
3	Spectrometer: Schuster's Method
4	Use of Travelling Microscope.
5	Radius of ball bearings (single pan balance)
6	Absolute and relative error calculation

References:

1. Advanced course in Practical Physics D. Chattopadhyya, 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)

Additional References:

1. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Ltd.
2. Practical Physics CL Squires (3rd Edition) Cambridge University
3. University Practical Physics – DC Tayal. Himalaya Publication
4. Advanced Practical Physics – Worsnop&Flint.

Course Code	VOCATIONAL SKILL COURSE (VSC) SEM 1 (Practical Course)	Credits	Lectures/ Week
25PHYVC141	Electronic Equipment Maintenance	2	4
Course Outcomes: After successful completion of this course students will be able to CO1: Remember circuits for different types of Electronic Equipments listed below. CO2: Understand how the circuit works. CO3: Apply electrical and electronic principles for sophistication of Equipment. CO4: Analyse quantitative problems and rectify it.			
Unit	Topics	No of Lectures	
	1. Introduction to internal parts of TV 2. Display and of internal parts of TV and its Maintenance 3. Display of internal parts of LAPTOP and its Maintenance 4. Introduction to internal parts of PC 5. Display of internal parts of PC and its Maintenance 6. Display of internal parts of Printer and its Maintenance 7. Working of Mixer / Food Procesor 8. Maintenance of Mixer / Food Processor 9. Working of Water Purifier 10. Maintenance of Water Purifier	60	
References: 1. Practical LCD /LED/ TV training course By Imran Ashraf Khan SAZ Publication. Additional references: 1.Laptop Repairing and upgrading Course : Asian Computech Book			

Course Code	SKILL ENHANCEMENT COURSES (SEC) SEM I (Practical Course)	Credits	Lectures/ Week
25PHYSC151	Household Repairs	2	4
Course Outcomes: After successful completion of this course students will be able to CO1: Remember the basic principles of electric sources CO1: Understand the working of different types of electrical equipment CO1: Apply the skills acquired in day to day life. CO1: Analyse the issues with equipment.			
Unit	Topics	No of Lectures	
	PRACTICALS: 1. Use of DMM 2. Soldering 3. Soldering Techniques 4. Theory of Electric Fuse 5. Replacement of Electric Fuse 6. Calculation of Electric Bill as per Electric Units. 7. Working of Water Heater 8. Repair of Water Heater. 9. Working of Electric Iron 10. Repair of Electric Iron.	60	
References: 1. Handbook of Repair and Maintenance of Domestic Electronics Appliances by Shashi Bhushan Sinha BPB publications. 2. A complete guide to Home Appliance Repair by Evan Powell.			
Additional References: 1. Electric equipment handbook: trouble Shooting and Maintenance by Philip kiameh, The McGraw-Hill publications.			

Course Code	MAJOR SEM II	Credits	Lectures/ Week
25PHYMJ212	Electricity and electronics	2	2
Course Objectives: On successful completion of this course students will be able to: CO1: Describe the basic concepts of Alternating current theory, AC bridges and Circuit Theorems. CO2: Understand the basics of Analog and Digital Electronics and apply them in real life situations. CO3: Apply quantitative problem solving skills in all the topics covered CO4: Analyze the Demorgan's theorem.			
Unit	Topics	No of Lectures	
I	Electricity and Analog Electronics Alternating current theory:(Concept of L, R, and C: Review), AC circuit containing pure R, pure L and pure C, representation of sinusoids by complex numbers, Series L-R, C-R and LCR circuits. Resonance in LCR circuit (both series and parallel), Power in ac circuit. Q-factor. AC bridges: AC-bridges: General AC bridge, Maxwell,de-Sauty, Wien Bridge , Hay Bridge.	15	
II	Digital Electronics: Transistor as a switch: circuit and working. Number Systems: Binary number system, decimal number system and Hexadecimal number system. Conversion of decimal number into binary and hexadecimal numbers and vice versa, conversion of binary number into decimal and hexadecimal numbers and vice versa, Conversion of hexadecimal number into decimal and binary numbers and vice versa. Derived Gates: NAND and NOR gates as universal building blocks, Ex-OR gate, Parity generator and checker, Half adder and Full adder, De-Morgans theorems. 15 Suitable numerical with appropriate difficulty level.	15	

References:

1. R.L. Boylestad and L. Nashelsky, Electronic devices and circuits theory- 10 th edition, pearson.
2. Leach, Malvino, Saha, Digital Principles and applications- 6 th edition, Tata McGraw Hill.

Additional Reference:

1. Tokheim Roger L., Digital electronics principles and applications.

Course Code	PHYSICS MAJOR PRACTICAL SEM II	Credits	Lectures/ Week
25PHYMJP21	Practical	2	4

Course Outcomes:

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

CO1: Remember the skills while performing experiments.

CO2: Understand the use of apparatus and their use without fear & hesitation.

CO3: Apply the physics theory concepts to practical application.

CO4: Analyze the errors and their estimation.

Instructions:

1. All the measurements and readings should be written with proper units.
 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.
- Minimum 3 from each regular experiment group and in all minimum 6 regular experiments and 3 demonstration experiments must be reported in journal.
 - Evaluation in viva voce will be based on regular experiments and demonstration 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 II as per the minimum requirements.

Sr.No.	Name of the Experiment	
Group A : Regular Experiments		60
1	Frequency of AC Mains: To determine frequency of AC mains (Sonometer wire)	
2	LDR Characteristics: To study the dependence of LDR resistance on intensity of light	
3	Study of Logic gates & To verify De Morgan’s Theorems	
4	To study EX-OR Gate and verify its truth table	
5	To study half adder and full adder and verify their truth table Ex-OR Gate	
6	To study Zener Diode as Regulator	
7	To study NAND/NOR gates as Universal Building Blocks	
8	LR Circuit: To determine the value of given inductance and phase angle	
9	CR Circuit: To determine value of given capacitor and Phase angle	
10	Transistor configurations : CB/CE/CC (study of input-output characteristics)	
11	LCR series Resonance: To determine resonance frequency of LCR series circuit	
12	To study Thermistor characteristics: Resistance vs. Temperature	
Group B: Demonstration Experiments		
1	Use of digital multimeter	

2	Use of Oscilloscope: Wave forms at output of half wave , bridge rectifiers with and without Capacitor filter, Ripple	
3	Use of PC for graph plotting	
4	I-V Characteristics of LED	
5	Testing of components (Resistors , Diode , Transistor , capacitor)	
6	Study of I-V characteristics of solar cell	

References:

1. Advanced course in Practical Physics D. Chattopadhyaya, 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)

Additional References:

1. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Ltd.
2. Practical Physics CL Squires (3rd Edition) Cambridge University
3. University Practical Physics – DC Tayal. Himalaya Publication
4. Advanced Practical Physics – Worsnop&Flint.

Course Code	OPEN ELECTIVE (OE) SEM 2	Credit s	Lecture s/ Week
25PHYOE231	Physics in Everyday Life-2	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Remember the concept of heat engines, atomic excitation and LASER principles. . CO2: Understand working principle of refrigerators, heat pumps and electromagnetic waves and its spectrum. CO3: Apply the techniques to know coefficient of performance, the types of thermometers and their usage, types and sources of electromagnetic waves and applications. CO4: Analyze the defects in engines, lasers and electromagnetic waves.			
Unit	Topics	No of Lectu res	
I	1.Heat transfer mechanisms: Heat Engines: Otto cycle and its efficiency ii. Diesel cycle and its efficiency. Refrigerators: General Principle and Coefficient of performance of refrigerator, simple structure of vapour compression refrigerator. Air conditioning: principle and its applications. Temperature Scales: Centigrade, Fahrenheit and Kelvin scale. 2. LASER: Absorption, Spontaneous Emission, and Stimulated Emission, Population Inversion and Laser Action, Applications of Lasers.	15	
II	1. Electromagnetic Waves: Historical Perspective of Electromagnetic Waves, electromagnetic spectrum, sources of electromagnetic waves: Radio waves, Microwaves, Infrared, Visible light, Ultraviolet, X-rays, Gamma rays, Production of electromagnetic waves (Hertz experiment), Plank hypothesis of photons (concept only). 2. Applications of electromagnetic waves: Microwave oven, RADAR , Pyro electric thermometer, X-ray radiography and CT Scan, solar cell.	15	

References:

1. Brijlal, N. Subramanyam, Heat and thermodynamics, S. Chand and company Ltd.
2. Mark, W.Zemensky, Richard H. Dittman, Heat and thermodynamics- 7 th edition, TMc Graw Hill international.

Additional references:

1. Thermodynamics and Statistical Physics: J.K. Sharma, K.K. Sarkar, Himalaya Publishing House
2. Thermal Physics (Heat & Thermodynamics): A.B. Gupta, H.P. Roy Books and Allied (P) Ltd, Calcutta.
3. Concepts of Modern Physics: A Beiser (6th ed., McGraw Hill, 2003.
Modern Physics: Raymond A. Serway, Clement J. Moses, Curt A. Moyer

Course Code	VOCATIONAL SKILL COURSE (VSC) SEM II (Practical Course)	Credits	Lectures/ Week
25PHYVC241	Mobile Handset Maintenance	2	4
Course Outcomes: On successful completion of this course students will be able to: CO1: Remember different types of mobile cell phones CO2: Understand potential hazards in the repair of mobile cell phones CO3: Apply the skills to diagnose the parts of a mobile cell phone CO4: Analyze correct hardware tools to repair mobile cell phones			
Unit	Topics	No of Lectures	
	1. Disassembling A Mobile Phone. 2. Assembling a Mobile Phone. 3. Mobile Phone Diagnosis. 4. Repair of common mobile phone faults. (Software faults). 5. Replacement or repairs of screen. 6. Repairs of Mobile battery related problems. 7. Water Damage Repair Techniques. 8. Troubleshooting Network Issues. 9. Soldering and De-Soldering Techniques. 10. Sensor and Camera Module Repairing.	60	
References: 1. Mobile Phones and Tablets Repairs by Chukky Oparandu 2. Advance Mobile Repairing by Sanjeev Pandit 1st Edition BPB Publications			
Additional reference: 1.Smartphones and Tablet Repairs : By Chukky Oparandu			

Course Code	SKILL ENHANCEMENT COURSES (SEC) SEM II (Practical Course)	Credits	Lectures/ Week
25PHYSC251	Computer Simulation	2	4

Course outcomes:

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

CO1: Remember basic concepts of simulation.

CO2: Understand different ways and tools for simulation.

CO3: Apply techniques of graph plotting and its analysis.

CO4: Analyze and use simulation techniques for basic experimental data collection and measurements.

Unit	Topics	No of Lectures
	PRACTICALS 1. Input modeling and parameter estimation in Matlab 2. 2d, 3d graph plotting 3. Solving mathematical equations in matlab. 4. Solving matrix in matlab 5. Solving differential eqautions in matlab 6. Solving Integration in matlab 7. Creating simulated experimental models in Simphy/Matlab 8. Random number generation in Matlab. 9. Creating three dimensional plots. 10. Creating simple,multi bar graphs in Matlab.	60

References:

1. Basics of modelling and simulation by Lari and Singh, S.K Kataria and sons Publications
2. Introduction to computer simulations for integrated stem college education by Mohamed M Hafez, William E Tavernetti.

Additional reference:

1. Computer simulations in science and engineering, J.M. Duran- Cham: Springer, 2018 - Springer.

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

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment(CIA) Assignment – 10 marks

1) 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. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination (external examination only)

- Each core subject carries 50 Marks (one experiment- 40 marks, viva- 5 marks, Journal-5 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 Theory (Internal & External) and Practical Examinations.