BENGALURU CITY UNIVERSITY

CHOICE BASED CREDIT SYSTEM
(As per State Education Policy (SEP) 2024)

Syllabus for III & IV Semesters
B.Sc. Physics 2025-26

BENGALURU CITY UNIVERSITY
CENTRAL COLLEGE CAMPUS
BENGALURU

Board of Studies in Physics (UG) Members

Dr. B. Eraiah , PG Dept. Physics, Bangalore University, Bengaluru-56	Chairman
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Mrs. Nusrath Jabeen, Vijaya College, Basavanagudi, Bengaluru -04	Member
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PROCEEDINGS OF THE MEETING OF THE BOARD OF STUDIES IN PHYSICS (UG), BENGALURU CITY UNIVERSITY HELD ON 28.05.2025 at 10.00 AM IN THE FASHION TECHNOLOGY, JNANAJYOTHI CENTRAL COLLEGE CAMPUS, BENGALURU – 560 001.

Members Present:

1.	Prof. B. Eraiah Professor PG Department of Physics Bangalore University, Bengaluru Email: eraiah@rediffmail.com Ph. No:9449804014	Chairperson
2.	Smt. Nusarth Jabeen, Govt. First Grade College, 7th Main, 3rd Cross Rd, Hampi Nagar, Ward, Vijayanagara, Bengaluru - 560040	Member
3.	Smt. S. N. Manjula, SJR College for Women, 1/D, 59th C Cross, IV 'M' Block, Gopalapura, Rajajinagar, Bengaluru-560009	Member
4.	Dr. Usharani D , MES Degree College of Arts, Science and Commerce 15th Cross, 10th Main Road, Malleshwaram, Bengaluru-560003	Member
5.	Mr. Chandrashekar B Gandigudi, HKES Sree Veerendra Patil Degree College 15th Main Road, 9th Cross Rd, Raj Mahal Vilas Extension, Sadashivanagar, Bengaluru-560080	Member
6.	Dr. Mohan Kumar B.V., Govt. First Grade College, NES Office Rd, Suggappa Layout, Gandhi Nagar,Yelhanka, Bengaluru-560064	Member
7.	Mr. Ramakrishne Gowda, Govt. First Grade College, NES Office Rd, Suggappa Layout, Gandhi Nagar,Yelhanka, Bengaluru-560064	Member
8.	Dr. Srilatha M. C, Govt. First Grade College, 18th Cross Road, Malleshwaram, Bengaluru-560032	Member
9.	Smt. Anupama MLA College for Women, 18th Cross Road, Malleshwaram, Bengaluru-560012	Member

The Chairperson welcomed the members to the BOS meeting. The Board met primarily to discussed and finalized the Syllabus for B.Sc. (Physics) III to VI Semesters of Bengaluru City University.

The Chairman thanked the Board members for their full co-operation and active participation.

Member | Member | Member

Member | Member | Member

Member | Member 28/5/25 | Chairman 28/5/25

BENGALURU CITY UNIVERSITY
CENTRAL COLLEGE CAMPUS, BENGALURU

II YEAR BSc III SEMESTER

PHYSICS SYLLABUS

COURSE CODE: PHY 301

TITLE: OPTICS - I, ELECTRICITY - I & Electromagnetic Waves

Program Name	B.Sc.	Semester	III
Course Title	**OPTICS - I, ELECTRICITY - I & EM Waves** (Theory)		
Course Code	PHY 301	No. of Credits	04
Contact Hours	52hours	Duration of SEP Exam	**3 hours**
Formative Assessment Marks	**20**	Summative Assessment marks - Theory Examination	**80**

UNIT	TOPIC	No. of hours
1	Interference	13
2	Diffraction	13
3	Network Theorems and Transient currents	13
4	Scalars and Vector fields, Electromagnetic waves	13
Total		**52**

Course outcomes: III Semester - Course Code: PHY 301

At the end of the topic, students should be able to:

- **Unit 1: Interference**

1. explain the principles of wave superposition and how it leads to constructive and destructive interference.
2. analyze interference patterns produced by various optical devices like bi-prisms and thin films.
3. calculate quantities like wavelength and film thickness using interference phenomena.
4. understand the concepts of coherence and different methods for producing coherent sources.

- **Unit 2: Diffraction**

1. differentiate between Fraunhoffer and Fresnel diffraction.
2. analyze diffraction patterns from single slits and gratings.
3. define and calculate resolving power and dispersive power of optical instruments.
4. explain the working of zone plates.

- **Unit 3: Network Theorems and Transient Currents**

1. apply Kirchhoff's laws and network theorems (Superposition, Thevenin's, Maximum Power Transfer) to solve problems-DC circuits.
2. calculate circuit parameters.
3. analyze the growth and decay of charge and current in RC and RL circuits.
4. describe the behavior of RLC circuits under different damping conditions.

- **Unit 4: Scalar and Vector Fields, Electromagnetic Waves**

1. understand and apply vector calculus concepts like gradient, divergence, and curl.
2. derive Maxwell's electromagnetic equations and their physical significance.
3. derive the wave equation for electromagnetic waves.
4. explain the properties of electromagnetic waves, including Poynting vector and energy density.

UNIT I

Wave theory

Huygen's theory of light: principle and construction of Huygen's wave fronts, laws of reflection and refraction using spherical wave front at a plane surface. **(2 hours)**

Interference

Superposition of waves, conditions for constructive and destructive interference, equation for resultant intensity, Coherent sources, methods of producing coherent sources, conditions for observing interference; Temporal and spatial coherence. (**2 hours**)

Interference by division of wave front

Biprism: Theory of biprism, experiment to determine the wavelength of a monochromatic source of light, effect of thin film in the path of one of the beams, calculation of thickness of the film. Problems **(4 hours)**

Interference by division of amplitude

Definition of thin film, interference at thin film: expression for path difference in reflected system of light, theory and experiment of air wedge, theory and experiment of Newton's rings. Reflected and transmitted systems of light being complimentary to each other(qualitative), colours in thin films. Problems **(5 hours)**

UNIT 2

Fraunhoffer diffraction

Theory of single slit diffraction, theory of grating, normal and oblique incidence, experimental determination of wavelength of light using grating, dispersive power, resolution of point objects, Rayleigh criterion, expression for resolving power of grating, and telescope, comparison of prism with grating spectrum. Problems (**6 hours)**

Fresnel Diffraction

Division of wave front into Fresnel half period zones, theory of rectilinear propagation, principle and construction of zone plate, expression for focal length of zone plate, (derivation), comparison of zone plate with convex lens, theory of diffraction at a straight edge. Problems (**7 hours)**

UNIT 3

Network theorems

Concept of voltage and current source, Kirchhoff's current law and voltage law (statements), statements and proof of superposition theorem, Thevenin's theorem, maximum power transfer theorem (for DC circuits). Problems **(6 hours**)

Transient currents

Self-inductance, magnetic field energy stored in an inductor (derivation), growth and decay of charge in RC circuit, growth and decay of current in RL circuit, time constant of RC and RL circuits and graphical representations. Discharge of a capacitor in RLC circuit: critically damped, under damped and over damped conditions. Problems **(7 hours)**

UNIT 4

Scalar and vector fields

Del operator, Gradient of a scalar function, product rules - Divergence and Curl of a vector and their physical significance. Line, surface and volume integrals (explanation with examples), Statements of Gauss and Stokes' theorem. Problems **(4 hours)**

Electromagnetic waves

Equation of Continuity, Displacement Current. Maxwell's equations in differential form (Derivation and physical significance), Derivation of wave equation (for one dimension), Velocity of electromagnetic waves in free space and isotropic medium (derivation), Relation between refractive index and permittivity, Transverse nature of Plane electromagnetic waves. Poynting theorem, derivation of Poynting Vector, Energy density in electromagnetic field, Electromagnetic waves in a conducting medium – skin effect (qualitative). **(9 hours)**

Reference Books

1. Optics by A. K. Ghatak, 5th Edition, Tata McGraw-Hill Education
2. Optics by M. R. Srinivasan, 1st Edition, New Age International
3. Optics by A. K. Ghatak and K. Thyagarajan, 2nd Edition, Macmillan India
4. Physics of Optics by J. B. A. Williamson, 1st Edition, Prentice-Hall India
5. Fundamentals of Optics by Francis A. Jenkins and Harvey E. White, 4th Edition, Tata McGraw-Hill Education
6. Modern Optics by B. D. Gupta, 1st Edition, I.K. International Publishing House
7. Optics by N. Subrahmanyam and B. R. Gupta, 1st Edition, S. Chand Publishing
8. Problems in Optics by M. C. Agarwal, 1st Edition, S. Chand Publishing
9. Textbook of Optics by Dr. D. S. Mathur, 1st Edition, S. Chand Publishing

10. Problems in Physics by I. E. Irodov (Translated by Indian Authors), 1st Edition, published by Wiley India Pvt. Ltd.)
11. A Textbook of Optics by R. K. Gaur and S. L. Gupta, 1st Edition, S. Chand Publishing
12. Electricity and Magnetism by Brij Lal and Subramanyam Ratan Prakasam Mandir, edition, 1993
13. Electricity and Magnetism, Volume 2 , Edward M Purcell Berkeley Physics Course, 2008
14. Network Analysis by M.E. Van Valkenburg Third Edition, PHI, Eastern Economy Edition
15. Electricity & Magnetism, N S Khare & S S Srivastava, AtmaRam & Sons, New Delhi
16. Introduction to Electrodynamics by D J Griffiths 4th Edition January 2020

Course Title	**OPTICS - I, ELECTRICITY - I & EM WAVES (Practical)**	Practical Credits	02
Course Code	**PHY 302**	Contact Hours	**04 hours**
Internal Assessment			**10 marks**
Practical examination			**40 marks**
Total			**50 marks**

Internal Assessment for Practical PHY 302	
	Marks
Internal Test	05 marks
Assignment /Activity	05 marks
Total	10 marks

SYLLABUS for III semester BSc Physics
PHY 302: PRACTICAL PHYSICS III

1. Bi prism- determination of wavelength of light
2. Air wedge- determination of thickness of object
3. Newton's rings- determination of radius of curvature of a lens surface
4. Newton's rings- determination of refractive index of a liquid
5. Refractive index of a liquid by parallax method
6. Diffraction grating- Minimum deviation method: determination of wavelengths of Hg source
7. Diffraction grating- normal incidence method: determination of wavelengths of Hg source
8. Dispersive power and Cauchy's constants of the material of prism using Hg source
9. Dispersive power and resolving power of a plane diffraction grating
10. Resolving power of telescope
11. Verification of Superposition theorem
12. Verification of Thevenin's theorem
13. Verification of Maximum power transfer theorem
14. Charging and discharging of a capacitor - determination of time constant and capacitance

Note: A minimum of EIGHT (8) experiments must be performed

Reference Books for Physics practical syllabus III semester

1. Physics through experiments B. Saraf, Vikas Publications 2013
2. A Laboratory manual of Physics for Undergraduate classes, 1st Edition, D P Khandelwal, Vikas Publications 1985
3. BSc Practical Physics (Revised Edition) C L Arora, S Chand & Co, 2007
4. An Advanced course in practical Physics, D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency Pvt. Ltd., 2002
5. Advanced Practical Physics for students, B L Flint and Worsnop, Asia Publishing House, 1971
6. A Text book of Practical Physics, I Prakash & Ramakrishna, Kitab Mahal, 11th Edition,2011
7. Practical Physics K Shukla and Anchal Srivastava, New Age Publishers
8. University Practical Physics, D.C. Tayal, Mumbai Himalaya Publishing House 2000

IV SEMESTER

COURSE CODE: PHY 401

TITLE: OPTICS - II, ELECTRICITY & MAGNETISM

Program Name	**B.Sc.**	**Semester**	**IV**
Course Title	**OPTICS - II & ELECTRICITY & MAGNETISM** (Theory)		
Course Code	PHY 401	No. of Credits	04
Contact Hours	52 hours	Duration of SEP Exam	**3 hours**
Formative Assessment Marks	**20**	Summative Assessment marks	**80**

UNIT	**TOPIC**	**No. of hrs**
1	Polarisation and Lasers	13
2	Optical fibers and Holography	13
3	Magnetic fields and forces, Electromagnetic induction	13
4	Alternating Currents and AC Bridges	13
Total		**52**

Course outcomes: IV Semester - Course Code: PHY 401

At the end of the topic, students should be able to:

- **Unit 1: Polarization and Lasers**

1. explain the phenomenon of polarization and various methods of producing polarized light.
2. analyze the behavior of light in anisotropic media and understand the function of polarizing optical devices.
3. explain the principles of laser operation, including stimulated emission and population inversion.
4. describe the construction and working of different types of lasers and their applications.

- **Unit 2: Optical Fibers and Holography**

1. explain the principles of light propagation in optical fibers.
2. classify optical fibers and analyze factors affecting signal transmission.
3. understand the applications of optical fibers in communication and sensing.
4. explain the basic principles of holography and its applications.

- **Unit 3: Magnetic Fields and Forces, Electromagnetic Induction**

1. understand the Magnetic Fields and Forces,
2. understand the concepts of Sources of Magnetic Field, Electromagnetic Induction.
3. explain the principles and applications Sources of Magnetic Field, Electromagnetic Induction

- **Unit 4: Alternating Currents and AC Bridges**

1. analyze AC circuits containing resistors, capacitors, and inductors.
2. understand the concepts of impedance, resonance, and power in AC circuits.
3. explain the principles and applications of AC bridge circuits.

Course Code: PHY 401

UNIT - I

Polarization

Review of plane polarized light and method of production; Double refraction at crystals; Huygens' explanation of double refraction; Theory of superposition of two plane polarized waves with perpendicular vibrations; Production and detection of linearly, elliptically and circularly polarized light; Theory of retarding plates - Quarter wave plates and Half wave plates. Optical activity - Fresnel's explanation, Laurent's half shade polarimeter, Problems. **(7 hours)**

LASERs

Introduction to LASER. Characteristics of a LASER ,Spontaneous and stimulated emission; Einstein's coefficients and optical amplification; Population inversion; Main components of a LASER; Lasing action; Ruby LASER- construction and working - energy level diagram; He-Ne LASER- construction and working - energy level diagram. Spatial Coherence and directionality, estimates of beam intensity; temporal coherence and spectral energy density. Applications of LASERS. Problems **(6 hours)**

UNIT II

Optical fibers

Principle, Description and classification; coherent bundle, glass fibers and their advantages, Acceptance angle, acceptance cone, Numerical aperture of optic fiber (derivation); square law medium in optical fibres, Attenuation in optical fibers - types and causes. Derivation of attenuation coefficient.

Single mode and Multimode optical fibers, Ray dispersion in multi-mode step index fibers and in graded index fibers. Dispersion due to material: Dispersion and maximum bit rates. Applications of optical fibres. Problems **(10 hours)**

Holography

Principle of Holography, types of holograms, Recording of holograms; Reconstruction Method in hologram. Theory of Holography between two plane waves. Point source hologram. Applications of holography: 3D reconstruction, Interferometry. (**3 hours**)

UNIT III

Magnetic fields and forces

Force on a moving charge in a magnetic field, Theory of Ballistic galvanometer, Ampere's law and Biot – Savart's law (magnetic force and magnetic flux), Magnetic force on a current carrying conductor, Magnetic field due to a straight current-carrying conductor (Derivation for Finite and Infinite Length), Ampere's swimming rule, Right hand rule, Force between parallel conductors and definition of ampere; Magnetic field of a circular loop; Force and torque on a circular current loop in a magnetic field, magnetic dipole moment, Field on the axis of a solenoid (derivation), Lorentz force. Problems

(**9 hours**)

Electromagnetic induction

Conducting rod moving in a magnetic field, Expression for induced emf, Faraday's laws of induction, Lenz's law. Mutual inductance, transformer- types of transformers, turns ratio, Eddy currents and applications. Problems (**4 hours**)

UNIT IV

Alternating currents

Reactance of a capacitor and an inductor, AC applied to series RL and RC circuits – phasor diagrams, expressions for impedance and current; series and parallel RLC circuits (R in series with L for parallel RLC circuit) - phasor diagrams, expressions for impedance and current, electrical resonance, resonant frequency, sharpness of resonance; Q factor, power and wattless current in AC circuit. Problems **(9 hours)**

AC Bridges

Definition, Basic ac bridge circuit with impedances and two balance conditions, De Sauty's Bridge, expression for capacitance of a capacitor (derivation), Maxwell's Impedance Bridge, expression for the self inductance of an inductor (derivation) and Anderson's Bridge, mention the expression for the self-inductance of an inductor. Problems **(4 hours)**

Reference Books

1. Optics by A. K. Ghatak, 5th Edition, Tata McGraw-Hill Education
2. Optics by M. R. Srinivasan, 1st Edition, New Age International
3. Optics by A. K. Ghatak and K. Thyagarajan, 2nd Edition, Macmillan India
4. Introduction to Modern Optics by Grant R. Fowles, 2nd Edition, Dover Publications
5. A text book of Optics, Brij Lal, M N Avadhanulu and Subramanyam, S Chand Publishing, 2012
6. Principles of Electronics, VK Mehta and Rohit Mehta S Chand and Company, 11th edition 2008
7. Feynman Lecture Series, volume 2, R P Feynman et al, Narosa Publishing House, New Delhi, 2013,

8. Electricity and Magnetism, D L Sehgal, K L Chopra N K Sehgal, S Chand and Company, 6th edition 1988
9. Electricity and Electronics, DC Tayal, Himalaya publishing house, 6th edition, 1988
10. Electricity and Magnetism, R Murugeshan, S. Chand Publishing, 2017
11. Electricity and Electromagnetism, ICFAI Pearson 2012
12. Introduction to Electrodynamics, DJ Griffiths, 4th edition Pearson, 2015
13. Fundamentals of Electricity and Magnetism, DN Vasudeva, S Chand, 2013
14. A textbook of Electrical Technology, B LThereja and A K Thereja, revised by S K Tarnekar, S Chand and Company, 2005
15. Fundamentals of Physics by Halliday, Resnick and Walker, Asian books, Pvt Ltd, New Delhi, 5th edition 1994
16. Electromagnetics by B B Laud, 3rd edition, New Age Internal Publishers, 2011
17. Introduction to Fiber Optics, A. Ghatak, Cambridge University Press, 1998
18. Introduction to Modern Optics, G. Fowles, Dover Publications, 1989
19. Optics, E. Hecht & A. Ganesan, Pearson Prentice Hall, 2009
20. Fibre optics through experiments, M.R.Shenoy, S.K.C. Khijwania, et.al. 2009, Viva Books
21. Optical Fiber Communications, Keiser, G., McGraw-Hill International, 2000
22. Optical Fiber Communications – Principles and Practice, Seniors J M, Prentice-Hall of India, 1996
23. An Introduction to Optical Fibers, Cherin, A.H., McGraw Hill Book Company, 1983.
24. The complete book of hologram- How they work and how to make them- By Joseph Emil Kasper, Steven A Feller, 2001
25. The hologram-Principles and techniques by Richardson Martin J John Wiley & Sons

Course Title	**OPTICS - II & ELECTRICITY & MAGNETISM (Practical)**	Practical Credits	02
Course Code	PHY 402	Contact Hours	04 hours
Internal Assessment			**10 marks**
Practical examination			**40 marks**
Total			**50 marks**

Internal Assessment for Practical PHY 402	
	Marks
One Internal Test	05 marks
Assignment /Activity	05 marks
Total	10 marks

SYLLABUS for IV semester BSc Physics
PHY 402: PRACTICAL PHYSICS IV

1. Refractive index of glass - Brewster's law
2. Specific rotation of a liquid using polarimeter
3. Wavelength of LASER- diffraction at a wire/due to graduations of a metal scale
4. Wavelength of LASER - diffractions Wavelength of LASER – diffraction at a single slit
5. Measurement of numerical aperture of an optical fiber

6. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece.
7. Determination of L & C by equal voltage method
8. Determination of high resistance by leakage using BG
9. Determination of capacitance of a capacitor using BG
10. Determination of earth's magnetic field using BG
11. De Sauty's bridge- Determination of Capacitance
12. Maxwell's impedance bridge- Determination of Inductance
13. Anderson's bridge- Determination of Inductance
14. Series LCR circuit-Determination of resonant frequency, bandwidth, Q factor
15. Parallel LCR circuit- Determination of resonant frequency
16. Black box- identification of R, L and C and determination of the values
17. Determination of frequency of ac mains using sonometer

Note: A minimum of EIGHT (8) experiments must be performed

Reference Books for Physics practical syllabus IV semester

1. BSc Practical Physics (Revised Edition) C L Arora, S Chand & Co, 2007
2. An Advanced course in practical Physics, D Chatopaddhyay, P C Rakshit, B Saha, New Central Book Agency Pvt. Ltd., 2002
3. Physics through experiments B. Saraf, Vikas Publications 2013
4. A Laboratory manual of Physics for Undergraduate classes, 1st Edition, D P Khandelwal, Vikas Publications 1985
5. Advanced Practical Physics for students, B L Flint and Worsnop, Asia Publishing House, 1971
6. A Text book of Practical Physics, I Prakash & Ramakrishna, Kitab Mahal, 11th Edition,2011
7. Advanced Level Physics Practicals, Michael Nelson & Jon M Ogborn, Heinemann Educational Publishers, 4th Edition, 1985

BSc Course for Bengaluru City university Frame work for Physics as per Higher Education Council Guidelines (for three major)

Sem	Course category	Course code	Course title	Credits assigned	Instructional hours per week		Duration of exam (hrs)	Marks		
					Theory	Practical		IA	Exam	Total
III	Physics	**PHY 301**	OPTICS - I & ELECTRICITY - I & EM Waves (Theory)	04	04	-------	3 hrs	20	80	100
III	Physics	**PHY 302**	OPTICS - I & ELECTRICITY - I & EM Waves (Practical)	02	--------	04	4 hrs	10	40	50
IV	Physics	**PHY 401**	OPTICS - II & ELECTRICITY & MAGNETISM (Theory)	04	04	-------	3 hrs	20	80	100
IV	Physics	**PHY 402**	OPTICS - II & ELECTRICITY & MAGNETISM Practical)	02	-----	04	4 hrs	10	40	50

B.Sc. Course Physics Question paper pattern

PART A		Total marks
1 Mark answers		
1x10=10 marks (10 out of 12)	a) True or false b) Fill in the blanks c) One word / one phrase d) MCQs	10
PART B		
2 Mark answers (10 out of 12 questions)		
2x10=20 marks	Short answers (direct and conceptual)	20
PART C		
6 Mark answers (answer any 5 out of 8)	Long answers (Single or Split questions in one main question)	
6x5=30 marks		30
PART D		
4 Mark answers (answer any 5 out of 8)		
4x5=20 marks	Problems	20
	Total	80 marks

Dr. B.ERAIAH
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B.Sc. Course Physics Question paper pattern

PART A		Total marks
1 Mark answers		
1x10=10 marks (10 out of 12)	a) True or false b) Fill in the blanks c) One word / one phrase d) MCQs	10
PART B		
2 Mark answers (10 out of 12 questions)		
2x10=20 marks	Short answers (direct and conceptual)	20
PART C		
6 Mark answers (answer any 5 out of 8)	Long answers (Single or Split questions in one main question)	
6x5=30 marks		30
PART D		
4 Mark answers (answer any 5 out of 8)		
4x5=20 marks	Problems	20
	Total	80 marks

Distribution of Marks for the Practical Examination		
Sl. no.	Particulars	Marks
1.	Writing Formulae / Statement with symbols, units and explanation of terms	05
2.	Drawing illustrative diagrams and expected graphs	05
3.	Setting up of the experiment& taking readings	10
4.	Calculations and graphs drawn based on experimental data.	10
5.	Accuracy of results with units	05
6.	Valuation of Practical Record	05
	Total	40

Dr. B.ERAIAH
M.Sc.M.Phil.Ph.D.,
Professor, Department of Physics
Bangalore University, Bangalore - 560056

PHYSICS ELECTIVE COURSE

Sem	Course category	Course code	Course title	Credits assigned	Instructional hours per week		Duration of exam (hrs)	Marks		
					Theory	Practical		IA	Exam	Total
III	Physics	**PHY E01**	**ENERGY SOURCES**	02	02	-------	$1\frac{1}{2}$	10	40	50
IV	Physics	**PHY E02**	**SPORTS SCIENCE**	02	02	-------	$1\frac{1}{2}$	10	40	50

ELECTIVE PAPER PHYSICS PHY E01

III SEMESTER

ENERGY SOURCES

UNIT I	**hrs**
Non-renewable energy resources Introduction: energy concept, sources in general, classification of energy sources; conventional and non-conventional energy, renewable and non-renewable energy – based on origin –examples and limitations.	**2**
Conventional energy sources: Fossil fuels and nuclear energy – their extraction and production, usage and limitations, impact on environment. Overview of Indian and world energy scenario with latest statistics, consumption and necessity. Need for eco-friendly and green energy technology.	**8**
Renewable energy sources Introduction: Need for renewable energy, wind, energy, tidal energy, wave energy, solar energy, Ocean thermal energy hydroelectricity. Biomass generation, biochemical conversion, biogas generation, geothermal energy	**3**
UNIT II	
Solar energy- key features, merits and demerits of solar energy, applications of solar energy-solar water heater, solar cooker, solar greenhouses, solar cell, brief description of each. Photovoltaic cell – construction and principle	. 5
Wind energy and tidal harvesting: Fundamentals of wind energy, wind turbines, and different electrical machines in wind turbines, ocean energy & Ocean thermal energy conversion - two technologies/methods used, significance, plants in India.	**5**
Geothermal and hydro energy: geothermal resources, geothermal technology, hydro power resources, hydro power technologies, and environmental impact of hydro power	**3**
Total	**26 hours**

ELECTIVE PAPER PHYSICS PHY E02
IV SEMESTER
SPORTS SCIENCE

Unit-I	Hrs.
Measurement: Physical quantities, Standards and Units, International system of Units, Standards of time, length and mass, Precision and significant figures (4 hours) **Newton's laws of motion**: Newton's first law. Force, mass. Newton's second law. Newton's third law, Mass and weight. Applications of Newton's laws. (5 hours) **Projectile motion**: Shooting a falling target, Physics behind Shooting, Javelin throw and Discus throw. (4 hours) **Topics for self study:** https://www.real-world-physics-problems.com/physics-of_sports.html	13
Unit-II	
Conservation laws: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing) (4 hours) **Centre of mass**: Physics behind Cycling, Rock climbing, Skating (5 hours) **Gravitation**: Origin, Newton's law of gravitation, Archimedes's principle, Buoyancy & Physics behind swimming (4 hours) **Topic for self-study:** Archimedes' Principle: Made EASY | Physics in You tube	13
Total	**26**

Text Books

1. Yakov Perelman. Physics for Entertainment. Createspace Independent Pub, 2010.
2. Yakov Perelman. Physics Everywhere. Prodinnova Publishers, 2014.
3. Yakov Perelman. Mechanics for Entertainment. Prodinnova Publishers, 2014.
4. Vassilios McInnes Spathopoulos. An Introduction to the Physics of Sports. Createspace Independent Publishing Platform, 2013.
5. Walter Lewin. For the Love of Physics. Taxmann Publications Pvt. Ltd., 2012.
6. Swaminathan M. Handbook of Food and Nutrition. Bangalore Press. 2012.
7. Srilakshmi B. Food Science. New Age International Pub. 2015.

Internet Resources for Reference: Internet resources

https://www.topendsports.com/biomechanics/physics.htm
https://www.real-world-physics-problems.com/physics-of-sports.html
https://www.healthline.com/
https://www.mayoclinic.org/
https://www.who.int/news-room/

Question Paper Pattern			
PART A	Two-mark questions	10/12 questions	10x2= 20marks
PART B	Five-mark questions	4/6 questions	4x5= 20marks
Total			**40 marks**