JSS COLLEGE FOR WOMEN

(AUTONOMOUS)

Saraswathipuram, Mysore-9

BACHELOR OF SCIENCE GRADUATE COURSE

SYLLABUS FOR DSC AND OPEN ELECTIVES

(I and II Semester)

UNDER NEP

SUBJECT: PHYSICS

PREFACE

The syllabus proposed herein for the B.Sc., course in Physics has evolved through detailed discussions with members of Physics faculty in our college as well as many other Physicists and Physics teachers. The changes proposed have constantly kept in mind certain basic approaches in Physics education along with the dynamism resulting from autonomy in education. We are very much aware that Physics forms a major driving force for the present day developments in technology and the consequent socio-economic development of the world at large. The rapid changes in technology and vast variety of the present day technologies put enormous pressure on the practitioners to ensure that their education is extensive as well as intensive. Consequently there is a need for constant upgrading and revision of basic inputs in education at all levels, ensuring a judicial mix of the topics chosen. We have taken the advantage of impetus gained through autonomy, the consequent academic freedom and the possibility of achieving high quality at the institutional level. We are equally aware of the immense responsibility it entails in ensuring a proper match between the products of the education and the professions they might get into restrictions arising primarily from considerations of the available time, manpower and financial resources have also been emphasized during the formulation of the contents. We also believe that there is a vast scope for future improvements and a pressing need for constant up gradation and revision of the contents. We would also urge that the individual teachers feel free to add, delete or modify topics of their choice and provide the relevant feed back to help improve the content formulation.

We thank and gratefully acknowledge the help we have received from all the member of the Physics community and a special thanks to all the members of the board of Studies.

JSS COLLEGE FOR WOMEN (AUTONOMOUS), SARASWATHIPURAM MYSURU-9
DEPARTMENT OF PHYSICS
COMPOSITION OF BOARD OF STUDIES

Sl. No.	Name	Designation	Category	Address	Phone No	Signature
1	Smt.Sowmya B.	Chairman		Assistant Professor JSS College for Women Saraswathipuram Mysuru	9886161982	
2.	Prof.M.S.Chandrashekar	Member	University (VC Nominee)	Professor DoS in Physics University of Mysuru.	9448600121	
3.	Dr. H.R.Sreepad	Member	Management (AC Nominee)	Associate Professor DoS in Physics Govt. College Autonomous Mandya	9449184109	
4.	Dr.M.V.Manjunath	Member	Management (AC Nominee)	Associate Professor Maharani's Science College Mysuru	9449969986	
5.	Dr.S.R.Kumaraswamy	Member	Management (AC Nominee)	Associate Professor Maharani's Science College Mysuru	9845718972	
6.	Dr.Chandra	Member	Management (AC Nominee)	Assistant Professor Dept. of Physics The NIE College Mananthavadi Road, Mysuru	9980209605	
7.	Sri.Umesh V.	Member		Assistant Professor JSS College for Women Saraswathipuram Mysuru	8453471291	
8.	Kum.Divya A.	Member (Alumni)	Management (AC Nominee)	Lecturer MMS & SDM Mahila Vidyalaya,Mysuru	8050433575	
9.	Sri. E. Manivannan	Member (Industrialist)	Management (AC Nominee)	Project Assistant and Electrician Mani Electronics and Electricals, Shop No.2,Temple Building, K.T.Street		

PROCEEDINGS

Proceedings of the meeting of the Board of Studies in Physics held on 13th October 2021 at 11.00 A.M.

The members of the board of studies are

1. Smt.Sowmya B., Asst.Prof. JSS College for Women (Autonomous), Mysuru.
2. Prof.M.S.Chandrashekar, Professor, DOS in Physics, Manasagangothri, Mysuru.
3. Dr. H.R.Sreepad, Associate Professor, Govt. College Autonomous, Mandya.
4. Dr. M.V.Manjunath., Associate Professor, Maharani's Science College, Mysuru.
5. Dr.S.R.Kumaraswamy., Associate Professor, Maharani's Science College, Mysuru.
6. Dr.Chandra, Assistant Professor, Dept.of Physics, The national Institute of Engineering College, Manathavadi road, Mysuru.
7. Sri.Umesh V., Asst.Prof., JSS College for Women (Autonomous), Mysuru.
8. Kum.Divya A., Asst.Prof., MMS & SDM Mahila Vidyalaya, Mysuru.
9. Sri.E.Manivannan, Project Assistant & Electrician, Mani Electronics and Electricals, Shop No.2, temple Building, K.T.Street, Mysuru.

All the members of the board assembled on 13th October 2021 at 11.00 A.M. in the Department of Physics, JSS College for Women (Autonomous), Mysuru to discuss in length and to frame the new Syllabus (**Under NEP)** for I and II Semesters.

The members made a deep analysis on various topics and recommended some of the valuable suggestions in framing the syllabus.

The board of studies approved the syllabus, scheme of teaching and examination pattern, department regulations, the panel of examiners and structure of question papers for I and II semesters.

This scheme should be effective from the academic year 2018-2019.

The copy of the B.Sc Physics CBCS Scheme Syllabus is annexed herewith.

Department Regulations

1. **Teaching instruction per week:**

   For I to II Semester:

   "Course duration: 16 weeks with 4 hours of instructions per week."

   a) Lecture classes: DSC-4 Hrs of duration per week (One Paper).

   b) Practical classes: DSC-4 Hrs of duration per week (One Practical).

2. **Examination:**

   a) Theory:

   C1- Will be assessed for I to II semester for 20 marks after the completion of first half of the semester by 8th week through Test/Activity/Assignment/Attendance/Seminar/Projects in group and Poster presentation (after the completion of 50% of the syllabus).

   C2- Will be assessed for I to II semester for 20 marks after the completion second half of the semester by 16th week through Test/Activity/Assignment/Attendance/Seminar/Projects in group and poster presentation (after the completion of rest 50% of the syllabus).

   C3- Examinations for I to II semester are conducted at the end of every semester for TWO hours of duration. The question paper shall be set for a maximum of 60 marks from I to II semester.

   b) Practical:

   C1- Will be assessed for I to II semester for 10 marks after the completion of first half of the semester by 8th week through experiment/continuous assessment of experimental work and record completion/procedure writing/viva/ attendance (after the completion of 50% of the experiments).

   C2- Will be assessed for I to II semester 15 marks after the completion of second half of the semester by 16th week through experiment/continuous assessment of experimental work and record completion/procedure writing/viva/ attendance (after the completion of all the experiments).

   C3- Examinations for I to II semester are conducted at the end of every semester for THREE hours of duration for a maximum of 25 marks ONE experiment shall be conducted in each practical examination.

3. **Eligibility criteria for students :**

   Only the students who have scored minimum of 30% in C1 and C2 put together are eligible to take C3 examination.

4. **Eligibility criteria for teaching faculty:**

   a) Paper setting-the teacher with minimum of 5 years of teaching experience in the first grade college are eligible to set the question paper.

   b) Paper valuation and Practical examination – the teacher with minimum of 3 years of experience is eligible to become an evaluator and examiner.

Course Structure
(Core and Open Electives)

Sem	Course	Paper	Title of the Paper	Instructions per week (Hrs)	Credits	Components Max. Marks			Total Marks	Exam Duration (Hrs)
					L:T:P	C1	C2	C3		
I	**DSC-1**	Theory	Mechanics and properties of Matter	4	4:0:0	20	20	60	100	02
		Practical	Mechanics and properties of Matter	4	0:0:2	10	15	25	50	03
	OE - 1	Theory	Energy Sources	3	3:0:0	20	20	60	100	02
	OE - 2	Theory	Climate Science	3	3:0:0	20	20	60	100	02
II	**DSC-2**	Theory	Electricity and Magnetism	4	4:0:0	20	20	60	100	02
		Practical	Electricity and Magnetism	4	0:0:2	10	15	25	50	03
	OE - 3	Theory	Astronomy	3	3:0:0	20	20	60	100	02
	OE - 4	Theory	Medical Physics	3	3:0:0	20	20	60	100	02

Proposed Curriculum Structure-Physics
(Core Papers)
Semesters- I & II

SEM	DSC	Core Papers
Sem-1	A1	Mechanics & Properties of Matter
Sem -2	A2	Electricity and Magnetism

Detailed Syllabus for Semesters I & II

Course Title: **Mechanics & Properties of Matter**	Course Credits: 4
Total Contact Hours: 52	Duration of ESA: 3 hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	Physics Expert Committee

Mechanics & Properties of Matter		**Hrs**
Credit : 4+2	**Unit – 1 Theory : 4 hours /Week**	
Chapter No. 1	**Frames of references:** Inertial and non inertial reference frames A frame moving with uniform velocity with respect to another inertial frame is also inertial, an accelerated frame of reference with respect to an inertial frame is non inertial, Galilean transformation equations, Lorentz transformation equations.	(13)
Chapter No. 2	**Momentum and Energy**: Work and energy, Conservation of momentum (linear). Conservation of energy with examples. Motion of rockets.	
Chapter No. 3	**Special Theory of Relativity:** Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	
Topics for self study(If any)	**Self Study** **Units and measurements:** System of units (CGS and SI), measurement of length, mass and time, dimensions of physical quantities, dimensional formulae. Minimum deviation, errors.	
	Suggested Activities	
Activity No. 1	1. i). Students can measure diameters of small balls of different size and estimate their volumes. 2. ii). Students can measure lengths of nails of different size. iii). Students can measure volume of a liquid iv). Students can measure distances and put the result both in CGS and SI units in 2, 3 and 4 significant figures. Ask them to mention the precession of the measurement. v). students can estimate standard deviations wherever possible.	
Activity No. 2	Students can try and understand conservation of energy in every day examples. For example: i) What happens in solar conservation panels ii) Pushing an object on the table it moves iii) Moving car hits a parked car causes parked car to move. In these cases, energy is conserved. How? Understand and verify if possible.	
Unit – 2		

Chapter No. 4.	**Laws of Motion:** Newton's Laws of motion. Dynamics of single and a system of particles. Centre of mass.	(13)
Chapter No. 5.	**Dynamics of Rigid bodies**: Rotational motion about an axis, Relation between torque and angular momentum, Rotational energy. moment of inertia: M I of a rectangular Lamina and solid cylinders. Flywheel, Theory of compound pendulum and determination of g.	
Chapter No. 6.	**Gravitation:** Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's laws (statements). Satellite in a circular orbit.	
Topics for self	**Chapter 7**: Geosynchronous orbits. Basic idea of global	
study(If any)	positioning system (GPS). Ref: 1-4,9,10	
	Suggested Activities	
Activity No. 3	Activity: Moment of inertia is an abstract concept. It simply gives a measure of rotational inertia of a rigid body and it is proportional to the product of the square of radius, r of the body and its mass, m. Students by referring to websites, can construct and perform simple experiments to verify that MI α mr^2.	
	Reference : www.khanacademy.org, www.pinterest.com, www.serc.cerleton.edn	
Activity No. 4	Activity: Prepare suitable charts and give seminar talks in the class.	

	Unit - 3	
Chapter No. 7	**Elasticity:** Hooke's law - Stress-strain diagram, elastic moduli-relation between elastic constants, Poisson's Ratio-expression for Poisson's ratio in terms of elastic constants. Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder. Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, η and σ by Searle's method	(13)
	Suggested Activities	
Activity No. 5	**Activity:** Arrange a steel spring with its top fixed with a rigid support on a wall and a meter scale along side. Add 100 g load at a time on the bottom of the hanger in steps. This means that while putting each 100g load, we are increasing the stretching force by 1N. Measure the extension for loads up to 500g. Plot a graph of extension versus load. Shape of the graph should be a straight line indicating that the ratio of load to extension is constant. Go for higher loads and find out elastic limit of the material.	

Activity No.6	**Activity:** Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret.	

	Unit - 4	
Chapter No. 8	**Surface tension:** Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface example, excess pressure inside spherical liquid drop, angle of contact.	(13)
Chapter No. 9	**Viscosity:** Streamline flow, turbulent flow, equation of continuity, determination of coefficient of viscosity by Poisulle's method, Stoke's method. Problems.	
Topics for self study(If any)	Capillarity determination of surface tension by drop weight method. Ref: 6,7,9,10	
	Suggested Activities	
Activity No.7	1. Measure surface tension of water and other common liquids and compare and learn i) Why water has high ST? think of reasons. ii) Check whether ST is a function of temperature? You can do it by heating the water to different temperatures and measure ST. iii) Plot ST versus T and learn how it behaves. Mix some quantity of kerosene or any oil to water and measure ST. Check whether ST for the mixture is more or less than pure water. List the reasons.	
Activity No. 8	Activity: 1) Collect a set of different liquids and measure their viscosity.) Find out whether sticky or non-sticky liquids are most viscous. List the reasons. ii) Mix non sticky liquid to the sticky liquid in defined quantities and measure viscosity. Find out viscosity is increasing or decreasing with increase of non-sticky liquid concentration. iii) Do the above experiment by mixing sticky liquid to the non sticky liquid. Find out change in viscosity with increase of concentration of sticky liquid. List the applications where concept of Viscosity plays a dominant role	

Text Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Mechanics by, New Eition	D. S. Mathur	S.Chand & Co.	2000
2	Mechancis and Relativity by 3rd Edition,	Vidwan Singh Soni,	PHI Learning Pvt. Ltd.	
3	Mechanics Berkeley Physics Course, Vol.1:	Charles Kittel, *et.al*.	Tata McGraw-Hill	2007
4	Properties of Matter	Brijlal & Subramanyam.		

References/Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics. 9th Edn,	Resnick, Halliday & Walter,	Wiley	2010
2	Physics Vol-I	Halliday and Resnick,		

List of Experiments to be performed in the Laboratory:

1.	Determination of g using bar pendulum (L versus T and L versus LT^2 graphs).
2.	Determination of moment of inertia of a Fly Wheel.
3.	Determination of rigidity modulus using torsional pendulum.
4.	Modulus of rigidity of a rod – Static torsion method.
5.	Determination of elastic constants of a wire by Searle's method.
6.	Young's modulus by Koenig's method.
7.	Viscosity by Stoke's method.
8.	Determination of surface tension of a liquid and the interfacial tension between two liquids using drop weight method.
9.	Study of motion of a spring and to calculate Spring constant, g and unknown mass.
10.	Determination of Young's modulus of a bar by the single cantilever method.
11.	Determination of Young's modulus of a bar by uniform bending method.
12.	Radius of capillary tube by mercury pellet method.
13.	Verification of parallel and perpendicular axis theorems.
14	Determination of Young's modulus, rigidity modulus and ρ - Searl's double bar

(Minimum EIGHT experiments have to be carried out)

Reference Book for Laboratory Experiments

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics through experiments	B.Saraf	Vikas Publications	2013
2	A lab manual of Physics for undergraduate classes, 1st Edition,		Vikas Publications.	
3	BSc Practical Physics Revised Ed	CL Arora	S.Chand & Co.	2007

4	An advanced course in practical physics.	D. Chatopadhyay, PC Rakshit, B.Saha	New Central Book Agency Pvt Ltd.	2002

Formative Assessment	
Assessment Occasion	**Marks**
End of Unit-1 (Activity)/Test	10
End of Unit-2 (Test)	10
End of Unit-3 (Activity)/Test	10
End of Unit-2 (Test)	10
Total	40

Semester – II

Electricity & Magnetism

Course Title: Electricity and Magnetism	Course Credits: 4
Total Contact Hours: 52	Duration of ESA: 3 hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	Physics Expert Committee

Electricity & Magnetism		**Hrs**
Unit – 1		
Chapter No. 1	**Topics to be covered/taught/learnt:** Electric charge and field Coulomb's law, electric field strength, electric field lines, point charge in an electric field and electric dipole, work done by a charge (derivation of the expression for potential energy)	3
Chapter No. 2	**Topics to be Covered** Gauss's law and its applications (electric fields of a (i) spherical charge distribution, (ii) line charge and (iii) an infinite flat sheet of charge).	3
Chapter No. 3	**Topics to be Covered** Electric potential, line integral, gradient of a scalar function, relation between field and potential. Potential due to point charge and distribution of charges (Examples: potential associated with a spherical charge distribution, infinite line charge distribution, infinite plane sheet of charges). Constant potential surfaces, Potential due to a dipole and electric quadrupole.	7
Topics for self study(If any)	*Constant potential surfaces - for self learning* *Work out problems listed in the reference*	
	Suggested Activities	
Activity No. 1	1. Learn the difference between and DC and AC electricity and their characteristics. Voltage and line frequency standards in different countries. 2. A small project report on production of electricity as a source of energy: Different methods	
Activity No. 2	1. Learn to use a multimeter (analog and digital) to measure voltage, current and resistance. Continuity testing of a wire. 2. Learn about household electrical connection terminals: Live, neutral and ground and voltage between the terminals. Role of earthing and safety measures	
Unit – 2		

Chapter No. 4.	**Topics to be covered** Conductors in electrostatic field Conductors and insulators, conductors in electric field. Capacitance and capacitors, calculating capacitance in a parallel plate capacitor, parallel plate capacitor with dielectric, dielectrics: an atomic view. Energy stored in a capacitor, Dielectric and Guass's law.	6
Chapter No. 5.	**Topics to be covered** Electric currents and current density. Electrical conductivity and Ohm's law. Physics of electrical conduction, conduction in metals and semiconductors, circuits and circuit elements: Variable currents in capacitor circuits, Resistor, inductor and capacitor and their combination. force on a moving charge.	7
Topics for self study(If any)	*Currents and voltage in combination of R, L and C circuits*	
	Suggested Activities	
Activity No. 3	1. Learn about electrical appliances which work with AC and DC electricity 2. Learn about types of resistors and their colour codes and types of capacitors(electrolytic and non-electrolytic)	
Activity No. 4	1. Learn about power transmission: 3-phase electricity, voltage and phase 2. Visit a nearby electrical power station. Interact with line men, Electrical engineers and managers. Discuss about power loss in transmission. How to reduce it? 3. Prepare a small project report on street lighting and types of electrical bulbs.	
Unit – 3		
Chapter No.6	**Topics to be covered** Magnetism Definition of magnetic field, Ampere's law and Biot-Savart law (magnetic force and magnetic flux), Magnetic force on a current carrying conductor, Hall effect. Electromagnetic induction, conducting rod moving in a magnetic field, law of induction and mutual inductance, self inductance and energy stored in a magnetic field.	7
Chapter No. 7	**Topics to be covered** Alternating current circuits: Resonant circuit, alternating current, quality factor, RL, RC, LC, LCR circuits, admittance and impedance, power and energy in AC circuits.	6
Topics for self study(If any)	Hall Effect	
	Suggested Activities	

Activity No. 5	**Activity:** 1. Prepare a small project report on street lighting and types of electrical bulbs. 2. Learn the measurement of electric current using tangent galvanometer.	
Activity No.6	**Activity:** Build a small coil with insulated copper wire. Connect an ammeter micro/milli ammeter. Verify magnetic induction using a powerful bar magnet.	
Unit - 4		
Chapter No. 8	Electromagnetic waves: Equation of continuity, Maxwell's equations, displacement current, electromagnetic wave, energy transported by electromagnetic waves. Electromagnetic waves in different frames of reference, Field of a current loop, magnetic moment, Electric current in atoms, electron spin and magnetic moment, magnetization and magnetic susceptibility.	8
Chapter No. 9	**Topics to be covered:** Types of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials. B-H hysteresis curves.	5
Topics for self study(If any)	*B-H curves and its characteristics* *Ferrites*	
	Suggested Activities	
Activity No.7	**Activity:** 1. Prepare a small project report on production of magnetic field: Permanent magnets, electromagnets and superconducting magnets. 2. Learn the principle of working of a Gauss meter to measure magnetic field	
Activity No. 8	**Activity:** 1. Model the earth's magnetic field with a diagram. Explain the effect of tilt of the earth's axis and reasons for the change in the tilt of the earth's axis over thousands of years.	

References Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics-Part-II,	David Halliday and Robert Resnick	Wiley Eastern Limited	2001
2	Berkeley Physics Course, Vol-2, Electricity and Magnetism,	Edward M Purcell	Tata Mc Graw-Hill Publishing Company	2008

	Special Edition		Ltd, New Delhi	

List of Experiments to be performed in the Laboratory

1.	Experiments on tracing of electric and magnetic flux lines for standard configuration.
2.	Determination of components of earth's magnetic field using a Ballistic galvanometer.
3.	Determination of capacitance of a condenser using B.G.
4.	Determination of high resistance by leakage using B.G.
5.	Determination of mutual inductance using BG.
6.	Charging and discharging of a capacitor(energy dissipated during charging and time constant measurements.
7.	Series and parallel resonance circuits (LCR circuits).
8.	Impedance of series RC circuits- determination of frequency of AC.
9.	Study the characteristics of a series RC and RL Circuit.
10.	Determination of self inductance of a coil-Anderson's Bridge
11.	Verification of laws of combination of capacitances and determination of unknown capacitance using de - Sauty bridge.
12.	Determination of B_H using Helmholtz double coil galvanometer and potentiometer.
13	Variation of Xc with frequency and determination of Capacitance.
14.	Measurement of low resistance of a coil using potentiometer

(Minimum EIGHT experiments have to be carried out)

Formative Assessment	
Assessment Occasion	**Marks**
End of Unit-1 (Activity)/Test	10
End of Unit-2 (Test)	10
End of Unit-3 (Activity)/Test	10
End of Unit-2 (Test)	10
Total	40

Open Electives for 1st & 2nd Semesters

Sl.No.	1 & 2 Semester
1.	Energy Sources
2.	Climate Science
3.	Astronomy
4.	Medical Physics

ENERGY SOURCES

Duration: 3 hrs /week

		No. of lectures
Unit-I	**Non-Renewable energy sources**	
	Chapter-1: Introduction	
	Energy concept-sources in general, its significance & necessity. Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy, Based on Origin-Examples and limitations. Importance of Non-commercial energy resources.	**04**
	Chapter-2: Conventional energy sources	
	Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues& challenges. Overview of Indian & world energy scenario with latest statistics- consumption & necessity. Need of eco-friendly & green energy & their related technology.	**09**
	Total	**13**
Unit-II	**Renewable energy sources**	
	Chapter-1: Introduction:	
	Need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	**05**
	Chapter 2 : Solar energy:	
	Solar Energy-Key features, its importance, Merits & demerits of solar energy, Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell -brief discussion of each. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	**08**
	Total	**13**
Unit-III	**Chapter-3: Wind and Tidal Energy harvesting:**	
	Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy.	**07**
	Chapter-4 : Geothermal and hydro energy	
	Geothermal Resources, Geothermal Technologies.	**02**
	Hydropower resources, hydropower technologies, environmental impact of hydro power sources.	**03**
	Carbon captured technologies, cell, batteries, power consumption	**01**

	Total	**13**
	Reference Books: 1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi 2. Solar energy - M P Agarwal - S Chand and Co. Ltd. 3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd. 4. Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University. 5. Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009 6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA). 7. http://en.wikipedia.org/wiki/Renewable_energy	

Climate Science

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Duration : 3 hrs /week

Module 1:	**Atmosphere** Atmospheric Science (Meteorology) as a multidisciplinary science. Physical and dynamic meteorology, Some terminology, difference between weather and climate, weather and climate variables, composition of the present atmosphere: fixed and variable gases, volume mixing ratio (VMR), sources and sinks of gases in the atmosphere. Green house gases. Structure (layers) of the atmosphere. Temperature variation in the atmosphere, temperature lapse rate, mass, pressure and density variation in the atmosphere. Distribution of winds.	(13 hours)
Module 2:	**Climate Science** Overview of meteorological observations, measurement of : temperature, humidity, wind speed and direction and pressure. Surface weather stations, upper air observational network, satellite observation. Overview of clouds and precipitation, aerosol size and concentration, nucleation, droplet growth and condensation (qualitative description). Cloud seeding, lightning and discharge. Formation of trade winds, cyclones. Modelling of the atmosphere: General principles, Overview of General Circulation Models (GCM) for weather forecasting and prediction. Limitations of the models. R and D institutions in India and abroad dedicated to climate Science, NARL, IITM, CSIR Centre for Mathematical Modeling and Computer Simulation, and many more	(13 hours)

Module 3:	**Global Climate Change** Green house effect and global warming, Enhancement in concentration of carbon dioxide and other green house gases in the atmosphere, Conventional and non-conventional energy sources and their usage. EL Nino/LA Nino Southern oscillations. Causes for global warming: Deforestation, fossil fuel burning, industrialization. Manifestations of global warming: Sea level rise, melting of glaciers, variation in monsoon patterns, increase in frequency and intensity of cyclones, hurricanes, tornadoes. Geo-engineering as a tool to mitigate global warming? Schemes of geo-engineering.	(13 hours)
	References: 1. Basics of Atmospheric Science – A Chndrashekar, PHI Learning Private Ltd. New Delhi, 2010. 2. Fundamentals of Atmospheric Modelling- Mark Z Jacbson, Cambridge University Press, 2000.	

Astronomy

Duration: 3 hrs /week

Content		Hrs
Unit – 1 -History and Introduction		
Chapter 1	Ancient Astronomy Greek Observations, Sumerian Observations,Mayan Observations, Arabic Observations ,Chinese Observations	2
Chapter 2	Indian Astronomy Vedic Astronomy, Ancient Astronomy – Aryabhata, Varahamihira, Bhaskara Astronomy in Indian Scriptures, Precession of the Equinox,Celebrations of Equinox	2
Chapter 3	Medieval & Modern Astronomy Invention of Telescopes, Models of the Solar System & Universe, Observations by Tycho Brahe, Kepler, Galileo, Herschel and Other,Modern Astronomy	2
Chapter 4	Optical tools for Astronomy Pin Hole, Binoculars, Telescopes & Imaging.	1
Chapter 5	Mathematical Methods of Observations Angular Measurement, Trigonometric functions, Stellar Parallax	1
Chapter 6	Observational Terminologies Cardinal Directions, Azimuth, Altitude, Measurements using Compass and Hand. Equatorial Co-ordinates, Light years, Magnitude, Colors etc.	2
Unit 2: Observations of the Solar System		

Chapter 7.	The Sun Ecliptic and the Orientation of the Earth, Seasons - Solstices and Equinox, Observations of the Sun from Earth during seasons. Eclipses, Zero-shadow day, Sunspots	1
Chapter 8	The Moon Earth-Moon system – Phases, Lunar Eclipses, Ecliptic and Lunar Orbital Plane – Nodes, Lunar Month, Full Moon Names	1
Chapter 9.	Inner Planets: Mercury & Venus Observational History, Observational Windows, Appearance, Apparitions, Elongations, Superior Conjunctions, Inferior Conjunctions, Transits.	2
Chapter 10	**Outer Planets** **Outer Planets: Mars, Jupiter & Saturn** Observational History.Observational Windows, Appearance, Frequency of Oppositions Oppositions, Conjunctions, Moons Eclipses.Galilean Moons, Saturn's Rings	2
Unit III Major Astronomy Observations		
Chapter 11	March to June Prominent Stars and Constellations Visible during this period, Methods of Spotting.	2
Chapter 12	June to September Prominent Stars and Constellations Visible during this period, Methods of Spotting.	2
Chapter 13	September to December Prominent Stars and Constellations Visible during this period, Methods of Spotting.	2
Chapter 14	December to March **Pr**ominent Stars and Constellations Visible during this period, Methods of Spotting.	2

Reference Books:

1.The Stargazer's Guide - How to Read Our Night Sky by Emily Winterburn
2. A guide to the Night Sky – Beginner's handbook by P.N. Shankar
3. The Complete Idiot's guide to Astronomy by Christopher De Pree and Alan Axelrod

Text Books

1. P. N. SHANKAR A GUIDE TO THE NIGHT SKY
https://www.arvindguptatoys.com/arvindgupta/nightskyshankar.pdf
2. BimanBasu , Joy of Star Watching , National Book Trust of India 2013

References Books

Christopher De Pree :The Complete Idiot's Guide to Astronomy, Penguin USA, 2008
Emily Winterburn ,The Stargazer's Guide: How to Read Our Night Sky, Constable and Robinson, 2008

	Medical Physics **Duration: 3 hrs /week**	
Unit I:	**Human Anatomy and Physiology** Overview of human anatomy - cells, cell structure, type of cells and their functions, tissues, organs, and their functions. Different systems in the human body, their structure and function, physiological properties of the circulatory system, digestive system, respiratory system, reproductive system, excretory system, endocrine system and nervous system	(13 hours)
Unit II:	**Physics of Medical Diagnostics** Principle of production of X-rays. Use of X-rays in medical diagnosis, X-ray imaging systems. Computed Tomography (CT): principle and generation of CT. Magnetic Resonance Imaging (MRI): basic principle and image characteristics. Ultrasound Imaging: Interaction of sound waves with body tissues, production of ultrasound, transducers, acoustic coupling, image formation, modes of image display and color Doppler.	(13 hours)
Unit III:	**Physics of Radiotherapy** Clinical aspects of radiation therapy: Biological basis of radiotherapy, radiation sources, radiation dose, time dose fractionation. External beam radiation therapy, radiation therapy modalities, production of radioisotopes, use of radioisotopes in therapy, particle and ion beam radiotherapy. Brachytherapy - principle of brachytherapy and classification of brachytherapy techniques.	(13 hours)
	Text Books 1. C. H. Best and N. B. Taylor. A Test in Applied Physiology. Williams and Wilkins Company, Baltimore, 1999. 2. C. K. Warrick. Anatomy and Physiology for Radiographers. Oxford University Press, 2001. 3. Jerrold T. Bushberg. The Essential Physics for Medical Imaging (2nd Edition). Lippincott Williams & Wilkins, 2002. 4. Jean A. Pope. Medical Physics: Imaging. Heinemann Publishers, 2012. 5. Faiz M. Khan and Roger A. Potish. Treatment Planning in Radiation Oncology. Williams and Wilkins, USA, 2003. 6. D. Baltas. The physics of modern brachytherapy for oncology. Taylor and Francis, 2007. **Reference Books** 1. J. R. Brobek. Physiological Basis of Medical Practice. Williams and Wilkins, London, 1995. 2. Edward Alcamo, Barbara Krumhardt. Barron's Anatomy and Physiology the Easy Way. Barron's Educational Series, 2004. 3. Lippincott, Anatomy and Physiology. Lippincott Williams & Wilkins, 2002. 4. W. E. Arnould Taylor. A textbook of anatomy and physiology, Nelson Thornes, 1998. 5. G. S. Pant. Advances in Diagnositc Medical Physics. Himalaya Publishing	

House, 2006.

6. Sabbahaga, Diagnositc Ultrasound applied to OBG. Maryland, 1980.

7. Faiz M Khan. The Physics of Radiation Therapy (3rd edition). Lippincott Williams & Wilkins, USA, 2003.

8. Jatinder R. Palta and T. Rockwell Mackie. Intensity Modulation Radiation Therapy. Medical Physics publishing, Madison, Wisconsin, 2003.

9. AAPM Report No. 72. Basic Applications of Multileaf collimators, AAPM, USA, 2001.

10. AAPM Report No. 91. Management of Respiratory motion in radiation oncology, 2006.

11. CA Joslin, A. Flynn, E. J. hall. Principles and Practice of Brachytherapy. Arnold publications, 2001.

12. Peter Hoskin, Catherine Coyle. Radiotherapy in Practice. Oxford University Press, 2011.

13. W. R. Handee. Medical Radiation Physics. Year Book Medical Publishers Inc., London, 2003.

14. Donald T. Graham, Paul J. Cloke. Principles of Radiological Physics. Churchill Livingstone, 2003.

15. Thomas S. Curry. Christensen',s Physics of Diagnostic Radiology (4th Edition). Lippincott Williams & Wilkins, 1990.

16. Madison. MRI – Perry Sprawls – Medical Physics Publishing. Wisconsin,

Question Paper Pattern (DSE & OE)

I SEMESTER to II SEMESTER
THEORY

Maximum marks: 60 **Time: 3Hrs**

PART- A

I Answer any FOUR questions **4x10=40**

(SIX questions has to be set and FOUR question to be answered)

PART - B

II Answer any THREE questions: **3x4=12**

(FOUR questions has to be set and THREE questions to be answered)
(Problems/APPLICATION ORIENTED QUESTIONS)

PART – C

III Answer any FOUR questions: **4x2=08**

(SIX questions has to be set and FOUR questions to be answered)