KUVEMPU UNIVERSITY

BOARD OF STUDIES (BOS) IN PHYSICS
(UNDER GRADUATE PROGRAMME)

APPROVED SYLLABUS

(To be effective from the academic year 2022-23)

For

III AND IV SEMESTER PHYSICS PAPERS

of

B.SC./B.SC.(HONS.) DEGREE PROGRAMME

[Framed in according with the National Education policy (NEP-2020) &basedon ***Model Physics Syllabus***prepared byphysics expert committee, Karnataka State Higher Education Council, Bangalore]

Syllabus approved in the Board of Studies (BOS) meeting held on ***12-09-2022*** *at the Department* **of Post-Graduate in Physics and Research,Jnana Sahyadri, Shankaraghatta**

Curriculum Structure-Physics
(Core and Electives)

Semesters- III and IV SEM

SEM	DSC	Core Papers
Sem-3:	A3	Wave Motion and Optics
Sem -4:	A4	Thermal Physics and Electronics

Open Electives for 3rd and 4th Semesters

Sl.No.	3rd and 4th Semesters
1.	Optical Instruments (III semester)
2.	Astronomy (III semester)
3.	Climate Science (IV semester)
4.	Energy Sources (IV semester)

Syllabus for III and IV Semesters
Semester-III
Wave motion and Optics

Time: 4 Hrs. /week **Total Marks:52**

Content		Hrs
Unit – 1: Waves and Superposition of Harmonic Waves		
Chapter 1. Waves	Plane and Spherical Waves. Longitudinal and Transverse Waves. Characteristics of wave motion, Plane Progressive (Travelling) Wave and its equation, Wave Equation –Differential form (derivation). Particle and Wave Velocities: Relation between them (Derivation), Energy Transport – Expression for intensity of progressive wave (Derivation), Newton's Formula for Velocity of Sound with Laplace's Correction (Derivation). Problems.	05
	Text Book : 1-4	
Chapter 2. Superposition ofHarmonic Waves	Linearity and Superposition Principle. Superposition of two collinear oscillations having(1) equal frequencies and (2) different frequencies (Beats) – Analytical treatment. Applications of Beats. Superposition of two perpendicular Harmonic Oscillations: LissajousFigures with equal frequencies (Analytical treatment) and Unequal frequencies (Qualitative). Uses of Lissajous'figures. Harmonics in musical instruments (Qualitative). Problems.	08
	Text Book : 1-4	
	Suggested Activity	
	Study of Characteristics of loud speaker and microphone.	
Unit – 2: Standing Waves and Acoustics		
Chapter 3. Standing Waves	Velocity of transverse waves along a stretched string (derivation), Standing (Stationary)Waves in a String - Fixed and Free Ends (qualitative). Theory of Normal modes ofvibration in a stretched string, Energy density and energy transport of a transverse wavealong a stretched string (Derivation). Vibrations in rods – longitudinal and transverse modes(qualitative). Velocity of Longitudinal Waves in rods (derivation).Normal Modes of vibrations in Open and Closed Pipes – Qualitative treatment. Concept of Resonance- examples, Theory of Helmholtz resonator. Problems.	09
	Text Book : 1-4	
Chapter 4. Acoustics	Absorption coefficient, Reverberation and Reverberation time, Sabine's Reverberationformula (derivation), Factors affecting acoustics in buildings, Requisites for goodacoustics. Acoustic measurements – intensity and pressure levels.	03
	Text Book : 1-4	
	Suggested Activities	
	Visit to auditorium and preparation of report on materials / designs used for goodacoustics.	

Unit – 3: Nature of light and Interference		
Chapter 5 Nature oflight	The corpuscular model of light- Limitations. The wave model-Maxwells electromagnetic waves.	1
	Text Book No 5; Sections 2.1 to 2.4 and 2.8	
Chapter 6 Interference of lightby division of wavefront	Huygen's theory-Concept of wave-front-Interference pattern produced on the surface ofwater-Coherence-Interference of light waves by division of wave-front- Young's doubleslit experiment- derivation of expression for fringe width-Fresnel Biprism- Interferencewith white light- Numerical Problems.	4
	Text Book No 5; Sections 12.1 to 12.2, 14.1 to 14.5, 14.7 to 14.9	
Chapter 7 Interference of lightby division ofamplitude	Interference by division of amplitude-Theory of Interference by a plane parallel film illuminated by a plane wave-Interference by a film with two non-parallel reflecting surfaces- color of thin films (Qualitative) —Newton's rings-(Reflected light)-Michelson Interferometer-Determination of wavelength of light* and difference in wavelengths. Theory of interference at an Air wedge. Problems.	9
	Text Book No 5; Sections 15.1 to 15.2, 15.8 to 15.11	
	Suggested Activities	
	Make Your Own Double Slit Experiment	
	Reference :(https://www.youtube.com/watch?v=kKdaRJ3vAmA)	
	Activity: What is the reason for the colors like rainbow which we see on ground whenoil/petrol spills during rainfall?	
	Reference :https://www.scientificamerican.com/article/why-do-beautiful-bands-of/	
Unit –4: Diffraction and Polarization		
Chapter 8 Fraunhofer diffraction	Introduction- Fraunhofer diffractions- Single slit diffraction pattern-position of Maximaand Minima (Qualitative arguments)- Two slit diffraction pattern-position of Maximaand minima- Theory of plane diffraction grating-Grating spectrum- normal andoblique incidence- Resolving power and dispersive power of a Diffraction grating (Qualitative). Problems.	6
	Text Book No 5; Sections 18.1 to 18.2, 18.6,18.8 to 18.9	
Chapter 9 Fresnel Diffraction	Fresnel Diffraction- Construction of Fresnel half period zones-Expression for radii (Derivation). Diffraction by a circular aperture and an opaque disc (Qualitative) -The zone plate (Construction) -comparison between zone plate and convex lens. Problems.	3
	Text Book No 5; Sections 20.1 to 20.3	
Chapter 10 Polarization	Introduction-Production of polarized light- Polaroid- Phenomenon of double refraction- properties of O and E-ray. Huygens' theory for uniaxial crystals. Theory of retardation plates - Quarter and half wave plates- Analysis of polarized light-optical activity. Problems.	4
	Text Book No 5; Sections 22.1, 22.3,22.4,22.6 to 22.8	

Suggested Activities	
	USING CDs AND DVDs AS DIFFRACTION Gratings
	Ref:https://www.nnin.org/sites/default/files/files/Karen_Rama_USING_CDs_AND_DVDs_AS_DIFFRACTION_GRATINGS_0.pdf
	1. What is the physics behind 3D movies? Group Discussion
	2. (https://www.slideserve.com/rae/physics-behind-3d-movies-powerpoint-ppt-presentation)

Text Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	The Physics of Waves and Oscillations,	N K Bajaj	Tata McGraw-Hill Publishing Company Ltd., Second Edition	1984
2	Waves and Oscillations	N Subramanyam and Brij Lal	Vikas Publishing House Pvt. Ltd., Second Revised Edition	2010
3	A Text Book of Sound	D R Khanna and R S Bedi	Atma Ram & Sons, Third Edition	1952
4	Oscillations and Waves	Satya Prakash	Pragathi Prakashan, Meerut, Second Edition	2003
5	Optics	Ajoy Ghatak	McGraw Hill Education (India) Pvt Ltd	2017
6	A text Book of Optics	Brij Lal, M N Avadhanulu & N Subrahmanyam	S. Chand Publishing	2012

References Books

Sl. no	Title of the Book	Authors Name	Publisher	Year of Publication
1	Berkeley Physics Course – Waves,	Frank S Crawford Jr.	Tata Mc Graw-Hill Publishing Company Ltd., Special Indian Edition,	2011
2	Optics	Eugene Hecht	Pearson Paperback	2019
3	Introduction To Optics	Pedrotti and Frank L	Pearson India	3rd Edition
4	Fundamentals of Optics	Francis Jenkins Harvey White	McGraw Hill Education	2017

List of Experiments to be performed in the Laboratory

Sl No	Experiment
1	Velocity of sound through a wire using Sonometer.
2	Frequency of AC using Sonometer

3	Study of Lissajous' Figures
4	To verify the laws of transverse vibration using Melde's apparatus
5	Helmholtz resonator using tuning fork.
6	Helmholtz resonator using electrical signal generator.
7	To determine refractive index of the Material of a prism using sodium source.
8	To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
9	To determine the wavelength of sodium source using Michelson's interferometer.
10	To determine wavelength of sodium light using Fresnel Biprism.
11	To determine wavelength of sodium light using Newton's Rings
12	To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film
13	To determine wavelength of (1) Na source or (2) spectral lines of Hg source using plane diffraction grating.
14	To determine dispersive power and resolving power of a plane diffraction grating

NOTE: Any other suitable and relevant experiment may be included, if required.

Reference Book for Laboratory Experiments

Sl. No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Advanced Practical Physics for students	B.L. Flint and H.T. Worsnop	Asia Publishing House.	1971
2	A Text Book of Practical Physics	I. Prakash & Ramakrishna	Kitab Mahal, 11th Edition	2011
3	Advanced level Physics Practicals	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers, 4th Edition	1985
4	A Laboratory Manual of Physics for undergraduate classes	D.P.Khandelwal	Vani Publications.	1985

Semester-IV

THERMAL PHYSICS AND ELECTRONICS

Time: 4 Hrs. /week **Total Marks: 52**

Unit 1		**Laws of Thermodynamics**	**Hours**
	Chapter 1	Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics, Concept of Temperature, Concept of Work and Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes – PV diagrams, Applications of First Law: Equation of state for an adiabatic process, Work Done during Isothermal and Adiabatic Processes (Derivations), Compressibility and Expansion Co-efficient. Problems.	4
	Chapter 2	**Second Law of Thermodynamics**: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines: Carnot engine & efficiency (derivation). Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem – Statement and Proof. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale. Problems.	5
	Chapter 3	**Entropy**: Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a perfect gas. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Problems. **Third Law of Thermodynamics**. Unattainability of Absolute Zero.	4
	Activities	1. Make a dissertation on Laws of thermodynamics. 2. Make a write up of heat engines and refrigerators. 3. List the irreversible and irreversible processes which we may come across. 4. Three important concepts in the study of thermodynamics are, temperature, heat, and internal energy. Discuss the meaning of these three concepts being careful to distinguish between them. 5.http://www.physics.umd.edu/perg/abp/think/thermo/temper.html.	
Unit 2	**Chapter 4**	**Thermodynamic Potentials**	
		Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Magnetic Work - Cooling due to adiabatic demagnetization.	3

	Chapter 5	**Maxwell's Thermodynamic Relations**	
		Derivations and applications of Maxwell's Relations(1) First order Phase Transitions with examples, Clausius-Clapeyron Equation (2) Value of C_p-C_v (3)Joule-Thomson Effect and JTcoefficient(Derivation) for Vander Walls gas.	4
	Chapter 6	**Kinetic Theory of Gases**	
		Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas: Mean, RMS and Most Probable Speeds. Degrees of Freedom, Law of Equipartition of Energy (no derivation). Specific heats of Gases.	2
	Chapter 7	**Radiation**	
		Blackbody radiation, spectral distribution, concept of energy density and pressure of radiation (no derivation). Derivation of Planck's law, deduction of Stefan-Boltzmann law and Wien's displacement law from Planck's law. Problems.	4
	Activities	1. Measuring the Solar Constant Materials: Simple flat sided Jar and Thermometer. Activity: Bottle containing water is exposed to solar radiation. The raise in the temperature and time taken are noted. Calculate the heat absorbed by water and relate it to the output of Sun. 2. Thermo-emf Materials: Suitable two dissimilar metal wires, voltage measuring device. Activity: In this experiment student will assemble the thermocouple and study the three effects namely, Seebeck, Peltier, and Thompson. 3. Inverse square law of radiation Materials: A cardboard with grid, a cardboard with a hole, supporting clips, ruler, candle 4. Activity: Students set the device. They count the lighted squares on the cardboard with the grid by varying the distance. And make necessary measurements and calculations to arrive at inverse square law of radiation. 5. Activity Based Physics Thinking Problems in Thermodynamics: Kinetic Theory 6. http://www.physics.umd.edu/perg/abp/think/thermo/kt.ht m	
Unit -3	**Chapter-8**	**Semiconductor device**	
		Introduction, p-n junction diode, Characteristics and Parameters, Diode approximations, Construction and working of Half-wave and Fullwave rectifier – Ripple factor and efficiency (no derivation), Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator. Numerical examples as applicable. **Junction Transistors**: Basics of BJT, BJT operation, Common Base, Common Emitter and Common Collector Characteristics, BJT amplification (CE mode), voltage divider biasing – DC load line and Q-point. Problems.	07 hours

	Chapter-9	**Operational amplifier**	
		Introduction to Operational Amplifiers: Characteristics of ideal OP-AMP, Inverting and Non-inverting OP-AMP circuits – concept of virtual ground - Expression for voltage gain (Derivations) OP-AMP applications: voltage follower, addition, subtraction. Integrator and Differentiator circuits with explanation.	06 hours
	Activities	a. Activity: Wire a DC power supply on a bread board or groove board to give a regulated output voltage of + 5 V; +15 V; Dual power output : ± 5 V; Dual power output : ± 15 V b. b. Use: 3-pin regulators c. Learn to identify the terminals of different types (packages) of BJTs. d. In the case of power transistors, learn how to fix a heat sink for the transistor. e. Understand the concept of virtual ground of an OPAMP. f. Learn the different types of op-amps used for different applications. What is a buffer? Prepare a report on the application of buffers in instrumentation electronics.	
Unit-4	**Chapter-10**	**Digital Electronics**	
		Introduction, Switching and Logic Levels, Digital Waveform. Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary. Problems.	06 hours
	Chapter-11	**Boolean Algebra Theorems**	
		De Morgan's theorem. Digital Circuits: Logic gates – truth tables: NOT, AND, OR, NAND and NOR Gates – circuits with discrete components and working. Algebraic simplification, Implementation of basic gates using NAND and NOR gates.	07 hours
	Activities	1. Learn how to implement logic functions (AND and OR) using just diodes and resistors	

Reference Books:

• Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
• Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
• A Treatise on Heat, Meghnad Saha, and B.N.Srivastava, 1958, Indian Press
• Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer.
• Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger. 1988, Narosa.
• An Introduction to Thermal Physics, Daniel V Schroeder, 2020, Oxford University Press

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Electronic Devices and Circuits	David A. Bell	PHI, New Delhi	2004
2	Integrated Electronics	Jacob Millman and CC Halkias		
3	Digital Fundamentals	Floyd	PHI, New Delhi	2001

Lab Experiments List:

1. Mechanical Equivalent of Heat by Callender and Barne's method
2. Coefficient of thermal conductivity of copper by Searle's apparatus
3. Coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method
4. Value of Stefan's constant
5. Verification of Stefan's law
6. Variation of thermo-emf across two junctions of a thermocouple with temperature
7. Verification of Clasius –Clapeyron equation and determination of specific enthalpy

Sl.No.	Experiments on electronics
8	V-I Characteristics of Silicon & Germanium PN Junction diodes (FB & RB)/ V-I Characteristics of Zener Diode and voltage regulator
9	Characteristics of BJT in Common Emitter Configuration/ Frequency response of CE Amplifier/ Frequency response of CC Amplifier (Emitter Follower).
10	Half Wave and Full Wave Rectifier with and Without Filter.
11	Non-inverting and Inverting op-amp circuits -Gain and frequency response/ Voltage follower, Adder and Subtractor circuits.
12	Truth table verification of logic gates using TTL 74 series ICs./ Transfer characteristics of a TTL gate using CRO./ Logic Gates; Combinational Circuits; Sequential Circuits.

NOTE: Any other suitable and relevant experiment may be included, if required.

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	**Basic Electronics Lab (P242) Manual 2015-16**		**National Institute of Science Education and Research Bhubaneswar**	**2015**

Suggested Readings:

1. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962, 9e.
2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015, 1e

Student seminars

Student (4 to 5 students in a group) groups may be assigned to give a seminar on a topic. They need to make a detailed study on the topic and prepare power point slides for the presentation. One student out of the group may be called randomly to present the certain portion of the topic. Similarly, other students may be called randomly to present remaining portion of the topic, so that each student must study whole topic. In a class 2 to 3 groups may present their topic.

Model Seminar Topics

1. Calorimetry
2. Thermometry
3. Kinetic theory of matter
4. Behavior of real gases
5. Transmission of heat
6. Transport phenomena in gases
7. Radiation laws
8. Laws of thermodynamics
9. Thermodynamical relationships
10. Heat engines
11. Production of low temperatures
12. Air conditioning systems
13. Entropy
14. Global warming
15. Classical and quantum statistics

SYLLABUS FOR OPEN ELECTIVES

THIRD SEMESTER

Astronomy

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

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: 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 Prominent 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

Activities

Sl No	Experiment
1	Measuring Seasons using Sun's Position.
2	Measuring Distance using Parallax
3	Estimation of the Stellar Diameter using Pin Hole
4	Measuring Height of an Object Using Clinometer.
5	Star spotting using constellation maps
6	Constellation spotting using Skymaps
7	Estimation of 'Suitable Periods' to observe deep sky objects using Planisphere.
8	Estimation of the Size of the Solar System in using Light Years.
9	Identification of Lunar Phases across a year.
10	Measuring Constellation of the Sun using Night Skymaps or Planispheres.

SYLLABUS FOR OPEN ELECTIVES

FOURTH SEMESTER

Climate Science

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

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)
	Activities to be carried out on Climate Science: 1. Try to find answer to the following questions: (a) Imagine you are going in a aircraft at an altitude greaten than 100 km. The air temperature at that altitude will be greater than 200°C. If you put your hands out of the window of the aircraft, you will not feel hot. (b) What would have happened if ozone is not present in the stratosphere. 2. Visit a nearby weather Station and learn about their activities. 3. Design your own rain gauge for rainfall measurement at your place.	

	4. Learn to determine atmospheric humidity using wet bulb and dry bulb thermometers. 5. Visit the website of Indian Institute of Tropical Meteorology (IITM), and keep track of occurrence and land fall of cyclone prediction. 6. Learn about ozone layer and its depletion and ozone hole. 7. Keep track of melting of glaciers in the Arctic and Atlantic region through data base available over several decades. 8. Watch documentary films on global warming and related issues (produced by amateur film makers and promoted by British Council and BBC).	
	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.	

SYLLABUS FOR OPEN ELECTIVE

ENERGY SOURCES

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

		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.	08
	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

KUVEMPU UNIVERSITY
NEP-2020

Pattern of continuous Evaluation and Semester End Examination

Assessment should be a combination of continuous formative evaluation and an end-point summative evaluation as per the Guidelines provided by Karnataka state Higher education Council.

Total marks for each course shall be based on continuous assessments and semester-end examinations as per the uniform pattern of 40: 60 for IA and Semester End theory examinations respectively and 50: 50 for IA and Semester End practical examinations respectively, in all the Universities, their Affiliated and Autonomous Colleges.

Total Marks for each course = 100

Continuous assessment (C1) = 20 marks
Continuous assessment (C2) = 20 marks
Semester End Examination (C3) = 60 marks

i. Formative evaluation process (Internal Assessment).

a. The first component (C1) of assessment is for 20 marks. This shall be based on tests, assignments, seminars, case studies, fieldwork, project work etc. This assessment and score process should be completed after completing 50% of the syllabus of the course/s and within 45 working days of the semester program.
b. The second component (C2) of assessment is for 20 marks. This shall be based on the test, assignment, seminar, case study, fieldwork, internship / industrial practicum/project work etc. This assessment and score process should be based on the completion of the remaining 50 per cent of the syllabus of the courses of the semester.

Activities	C1	C2	Total Marks
Session Test	10 marks	10 marks	20 marks
Seminars/Presentations/Activity	10 marks	-	10 marks
Case study/Assignment/Fieldwork/Project work etc.		10 marks	10 marks
	20 marks	20 marks	40 Marks

ii. Summative evaluation process (Semester End theory Examination).

During the 17th – 19th week of the semester, a semester-end examination shall be conducted by the University for each course. This forms the third and final component of assessment (C3) and the maximum marks for the final component will be 60 marks.

iii. Practical Examination: For the practical course of full credits, marks shall be for **50 marks** awarded as follows

Internal Assessment for 25 Marks: 15 Marks for maintaining Practical record and 10 marks for practical test. Test shall be conducted after the completion of Practical Classes.

End Semester Practical Examination: End Semester Practical examination shall be conducted for **25 marks.**

QUESTION PAPER PATTERN FOR DEGREE COURSES
(DSC, OE and Languages)

First Semester ……. Degree Examination, April/May 2022

(CBCS NEP Scheme)

Paper: DSC- ……..

Time: 02 Hours **Max. Marks: 60**

I. Select the most appropriate answer from the options provided: 10 x 1= 10

1)…….

a) b) c) d)

2)…….

a) b) c) d)

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.

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10)…….

a) b) c) d)

II. Answer/Write short notes on any **FIVE** of the following: 05 x 03 = 15

1)
2)
3)
4)
5)
6)
7)
8)

III. Answer any **THREE** questions from the following: 03 x 05 = 15

1)
2)
3)
4)
5)

IV. Answer the following* 02 x 10 = 20

1) ----------

OR

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2) ----------

OR

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*May have sub questions if required