HAVERI UNIVERSITY, HAVERI

Four - Year B.Sc. (Hons.) Program

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SYLLABUS FOR SEM III & IV

COURSE: PHYSICS

SEMESTER - III:

DISCIPLINE SPECIFIC CORE COURSE (DSCC)

DSCC – 5: Physics (Theory) - V (Code:033PHY011)

DSCC – 6: Physics (Practical) –VI (Code: 033PHY012)

OEC- 3: Sports Science (Code: 003PHY051)

SEMESTER - IV:

DSCC – 7 : Physics (Theory) - VII (Code:034PHY011)

DSCC - 8 : Physics (Practical) -VIII (Code:034PHY012)

OEC- 4 : Medical Physics (Code:004PHY051)

Effective from 2022-23

AS PER N E P - 2020

Sem	Type of Course	Course Code	Instruction hour per week (hrs)	Total hours of Syllabus / Sem	Duration of Exam (hrs)	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC -5 Physics(Theory) –V	033PHY011	04	56	02	40	60	100	04
	DSCC -6 Physics (Practical) – VI	033PHY012	04	52	03	25	25	50	02
	OEC- 3 Sports Science	003PHY051	03	42	02	40	60	100	03
IV	DSCC -7 Physics (Theory) – VII	034PHY011	04	56	02	40	60	100	04
	DSCC -8 Physics (Practical) – VIII	034PHY012	04	52	03	25	25	50	02
	OEC- 4 Medical Physics	004PHY051	03	42	02	40	60	100	03
Details of the other Semesters will be given later									

Haveri University, Haveri

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in PHYSICS students will be able to:

PSO 1 : Culminate in depth knowledge of almost all basic branches of physics such as mechanics, properties of matter, relativity, electricity and magnetism, wave motion, optics, thermal physics, electronics, classical mechanics, quantum mechanics, spectroscopy, nuclear physics, condensed matter physics and also advanced areas like Nanoscience, energy science, astrophysics, instrumentation.

PSO 2 : Communicate effectively physics concepts with examples related to day to day life. Acquire ability of recognizing and distinguishing various aspects of physics found in real life.

PSO 3 : Learn, perform and design experiments in the laboratory to demonstrate the concepts principles, laws of physics, theories learnt in the class rooms.

PSO 4 : Acquire ability of critical thinking and logical reasoning in physics problems and their solutions. Develop ability to analyze physics problem including simple to thought provoking problems and apply the acquired knowledge to solve.

PSO 5 : Appreciate the importance of physics subjects and its application for pursuing interdisciplinary and multidisciplinary higher education and research in these areas.

PSO 6 : Understand the vast scope of physics as theoretical and experimental science with application in finding solution of problems in nature spanning from smallest dimension 10^{-15} m to highest dimension 10^{26} m in space, covering energy ranges from 10^{-10} eV to 10^{25} eV.

PSO 7 : Think independently and develop algorithm and program using programming techniques for solving real world physics problems.

PSO 8 : Develop ability of working independently and to make in-depth study of various notions of physics.

PSO 9 Develop ability to apply the knowledge and skill acquired through experiments of physics in laboratories to solve real life problems.

PSO 10 : Pursue advanced studies and research in varied areas of physical science.

B.Sc. Semester – III

DSCC-5 : Physics (Theory) V (Code: 033PHY011)

Course No.5 (Theory): Title of the Course (Theory): Wave Motion and Optics

Syllabus	Total Hrs: 56
Unit-I: Wave Motion	**14 hrs**
Wave Motion: Types of waves, Plane and spherical waves, Transverse and longitudinal wave. Displacement, velocity and pressure curve. Expression for a plane progressive wave, particle velocity. Relation between particle velocity and wave velocity. Differential equation of wave motion, mention of differential equation of three-dimensional wave. Derivation of energy density of a plane progressive wave. Distribution of energy in a plane progressive wave. Expression of intensity of progressive wave. Superposition of waves: Interference-Beats, theory of beats (analytical treatment). Super position of two perpendicular SHM: Lissajous figures with equal and unequal frequency- analytical treatment and use of Lissajous figures. Velocity of transverse wave along stretched string, wave equation for transverse wave in a string. Longitudinal (sound) waves in fluid medium -derivation of Newton's formula - Laplace's corrections for Newton's formula. Effect of pressure, temperature and humidity on the velocity of sound. Group velocity-its relationship with wave (or phase) velocity. Concept of resonance. Theory of Helmholtz resonator. **Suggested Activities: please refer foot note**	
Unit-II: Geometrical Optics	**14 hrs**
Fermat principle: Derivation of laws of reflection and refraction, sign convention, refraction at a spherical surface, derivation of Lagrange's law and Helmholtz relation, Abbe's sine condition derivation, aplanatic points of a spherical surface(qualitative). **Aberrations:** Spherical aberrations**:** methods to reduce spherical aberration (qualitative). Chromatic aberrations: Conditions for achromatism of two thin lenses in contact, two thin lenses separated by finite distance. **Cardinal points**: Cardinal points of a optical system. Equivalent focal length of two thin lenses separated by a distance. Location of cardinal points of a thick lens (derivation). Experimental determination of cardinal points of a lens system using Searle's Goniometer and Turn Table (Nodal slide). **Suggested Activities: please refer foot note**	
Unit-III: Interference	**14 hrs**
Interference due to division of wave front: Fresnel's biprism. Determination of wavelength of monochromatic light & thickness of a thin film using biprism. Lloyd's single mirror: Determination of wavelength using Lloyd's single mirror. **Interference due to division of amplitude:** Interference phenomenon with a plane parallel thin film: in case of reflected light and transmitted light (with derivation). Interference using wedge shaped film. Theory of Newton's rings. Determination of wavelength of monochromatic light by Newton's rings. Michelson interferometer: Principle, construction and working. Formation of circular & straight fringes (qualitative). Mention applications of Michelson's Interferometer. **Suggested Activities: please refer foot note**	

Unit-IV: Diffraction and Polarization	**14 hrs**
Introduction to diffraction and classification of diffraction phenomena. **Fresnel diffraction**: Fresnel's treatment of the wavefront and Fresnel assumptions. Theory of half period zones considering plane wave fronts. Zone plate: construction, theory and expression for focal length. Comparison between zone plate and convex lens. **Fraunhofer diffraction**: Fraunhofer diffraction at a single slit and at a double slit. Diffraction grating. Theory of Plane transmission grating. Dispersive power of grating. Comparison of grating and Prism spectra. **Polarization:** Review of basics of polarization. Malus law. Huygen's theory of double refraction. Positive and negative crystals. Wave plates: quarter wave plate and half wave plate. Optical activity, specific rotation. Laurent's Half Shade Polarimeter: Construction and working. **Suggested Activities: please refer foot note**	

Suggested Activities:

1. Preparation of report and presentation on harmonics in musical instruments.
2. Study of Characteristics of loud speaker and microphone.
3. Preparation of report and presentation on resonance phenomenon in natural and artificial systems.
4. Using CDs and DVDs as diffraction gratings.
5. What is the physics behind 3D movies? Group Discussion.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Course Outcomes	
At the end of the course Students will be able to:	
CO1	understand types of waves by their characteristics.
CO2	formulate a wave equation and obtain the expression for different parameters associated with waves. Explain and give an analytical treatment of the superposition of waves under different conditions, such as, equal or different frequencies.
CO3	analyse the formation of standing waves in the case of stretched string.
CO4	calculate velocity of sound at different conditions. Describe resonance in general and Helmholtz resonators in particular.
CO5	explain basics of laws of reflection and refraction.
CO6	describe different types of aberrations, cardinal points of optical instruments.
CO7	demonstrate interference of light due to division of wavefront and amplitude by Fresnel's biprism and Newton's rings experimental setup. Measurement of wavelength of light using experiments like Michelson interferometer.
CO8	explain diffraction due to different objects like single slit, two slits, diffraction of grating, oblique incidence, circular aperture and give the theory and experimental setup for the same.
CO9	explain the polarization of light and obtain how the polarization occurs due to quarter wave plates, half wave plates, and through the optical activity of a medium.

Books Recommended.

1. The Physics of Waves and Oscillations by N. K.. Bajaj Tata McGraw-Hill., 1984.
2. Waves and Oscillations by N. Subramanyam and Brij Lal Vikas Publishing House Pvt. Ltd
3. A Text Book of Sound D R Khanna and RS Bedi Atma Ram & Sons, ThirdEdition 1952
4. Oscillations and Waves by Satya Prakash Pragathi Prakashan, Meerut, Second Edition 2003
5. Optics by Ajoy Ghatak McGraw Hill Education (India) Pvt Ltd 2017
6. A text Book of Optics by Brij Lal, M N Avadhanulu & N Subrahmanyam S. Chand Publishing 2012
7. Mechanics by D. S. Mathur P. S. Hemne S. Chand Publishing 2012
8. Berkeley Physics Course – Waves, Frank S Crawford Jr Tata Mc Graw-Hill 2011
9. Optics Eugene *Hecht* Pearson Paper back 2019
10. Introduction To Optics Pedrotti and Frank L Pearson India 3rd Edition
11. Fundamentals of Optics Francis Jenkins Harvey White McGraw Hill Education 2017
12. Geometrical Optics (I-Edition) – D. P. Acharya – Oxford & IBH Pub. Co., New-Delhi, 1970.
13. Geometrical Optics – A. Verstraeten. Publisher: Bombay Orient Longmans 1961
14. Optics & Spectroscopy (VI-Edition) Murugeshan, Kirutiga & Shivaprasath - S. Chand & Company.

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – III

DSCC-6: Physics (Practical) - VI Code: 033PHY012

Title of the Course (Practical): Wave Motion and Optics

List of the Experiments for 52 hrs / Semesters

1. Velocity of sound through wire using Sonometer.
2. Study of Lissajous Figures.
3. Helmholtz resonator using tuning fork/electrical signal generator.
4. Calibration of a spectrometer.
5. Dispersive curve and dispersive power of a prism.
6. Polarimeter: Determination of specific rotation of sugar solution
7. Study of elliptically polarized light/Verification of Malus law
8. Goniometer.
9. Turn table.
10. Newton's rings.
11. Resolving power of grating.
12. Determination of wavelength of monochromatic light using biprism/Lloyd's mirror.
13. Michelson interferometer: Determination of wavelength of monochromatic light.
14. Determination of wavelength of laser light by diffraction single slit method.
15. Determination of wavelength of laser light by Interference Young's Double slit method.

General instructions:

1. ***Minimum of eight experiments to be performed.***
2. ***Any new experiment may be added to the list with the prior approval from the BOS.***

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1 Basic formula,Units & Nature of graph, Circuit Diagram/RayDiagram/Schematic diagram	**- 05 Marks**
2 Tabular Columnwithquantities and unit mentioned, experimental skills.	**- 05 Marks**
3 Recording ofobservations, calculations and drawing graph, and accuracy of the result	**- 11 Marks**
4 Viva-voce	**- 02 Marks**
5 Completed & Certified Journal	**- 02 Marks**
	Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Course Outcomes	
At the end of the course Students will be able to:	
CO1	determine velocity of sound in different medium (solid/fluid).
CO2	observe different Lissajous figures when two SHM are acting Perpendicular to each other with different frequencies and able to calculate unknown frequency of a component.
CO3	set up a spectrometer experiment for the measurement of wavelength, dispersive power of a prism etc.
CO4	explain the calculation of specific rotation of a sugar solution by using half shade polarimeter.
CO5	calculate cardinal points of optical systems using goniometer and turn table experimental setup.
CO6	demonstrate interference of light due to division of wave front and amplitude in case of Fresnel's biprism/Lloyd mirror and Newton's rings experimental arrangements.
CO7	explain diffraction grating and hence calculation of resolving power.
CO8	measure wavelength of monochromatic light using Michelson interferometer. diffraction due to single slit and double slit experiments.
CO9	measure the wavelength of laser light using single/double slit experiment.

Books Recommended.

1 Physics for Degree Students B. Sc. Second Year, by C. L. Arora and P. S. Hemne S. Chand &Co.

2 Electronics Instrumentation by H. S. Kalasi.

3 B.Sc. Practical Physics – C.L. Arora.

4 Advanced Practical Physics – Samir Kumar Ghosh.

5 Advanced Practical Physics – Worshnop and Flint.

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B. Sc. Semester – III

OEC- 3: Sports Science (Code: 003PHY051)

Syllabus	Total Hrs: 42
Unit-I: Measurements, Newton's Laws and Projectile Motion	**14 hrs**
Measurement: Physical quantities. Standards and Units. International system of Units. Standards of time, length and mass. Precision and significant figures. **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. **Projectile motion**: Shooting a falling target, Physics behind Shooting, Javelin throw and Discus throw. **Topics for self - Study (if any):** **https://www.real-world-physics-problems.com/physics-of-sports.html**	
Unit-II: Conservation Laws and Gravitation	**14 hrs**
Conservation Laws: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing). **Centre of mass**: Physics behind Cycling, rock climbing, Skating, **Gravitation**: Origin, Newton's law of gravitation. Archimedes principle, Buoyancy (Physics behind swimming) **Topics for self-study (if any)** Archimedes' Principle: Made EASY | Physics in You tube	
Unit-III: Food and Nutrition, Energy and Physics Exercises	**14 hrs**
Food and Nutrition: Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins. **Energy:** Different forms of Energy, Conservation of mass-energy. **Physical exercises:** Walking, Jogging and Running, Weight management. **Topics for self - Study (if any):** 10 Best Exercises for Everyone – Healthline	
Suggested Activities: *1.* Identify the methods of measurement of time, length and mass from ancient time and build models for them. Reference : History of measurement - Wikipedia*https://en.wikipedia.org › wiki › History_of_measurement.* **2.** Identify Physics principles behind various Sports activities. **https://www.real-world-physics-problems.com/physics-of-sports.html** 3. List the difficulties experienced in Gymnastics, Cycling and weight lifting 4. List the difficulties experienced in swimming.	

Course Outcomes	
At the end of the course Students will be able to:	
CO1	use different types of units in day today life.
CO2	explain various fundamental terms like mass, weight, velocity, speed, force, etc.
CO3	apply the knowledge of projectile motion in the field of sports like Javelin, Disc and Hammer throw.

CO4	describe and apply conservation laws, centre of mass of a system, angular momentum, Archimedes principle, Buoyancy and freefall under gravity in various events of sports.
CO5	realise and aware about importance of nutritious food.
CO6	incorporate good life style by practicing walking, jogging, running and exercise.

Books Recommended:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics for Entertainment	Yakov Perelman	Createspace Independent Pub.	
2	Physics Everywhere	Yakov Perelman	Prodinnova	2014
3	Mechanics for Entertainment	Yakov Perelman	Prodinnova	2014
4	Handbook of Food and Nutrition	M Swaminathan	Bangalore Press 2012	2012
5	Food Science	B. Srilakshmi	New Age International Pub	2015
6	Physics	Resnick, Halliday and Krane, Vol 1	Wiley Student Edition.	
7	For the love of Physics	Walter Lewin	Taxman Publications Private Limited	2012
8	An Introduction to the Physics of Sports	VassiliosMcInnesSpathopoulos	Create Space Independent Publishing Platform	2013

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/

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	------	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme: 2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05 marks each. Answer any 04 questions : 20 marks

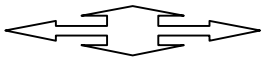
Part-C

3. Question number 12-15 carries 10 marks each. Answer any 03 questions : 30 marks

   (Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – IV

DSCC-7: Physics (Theory): VII (Code: 034PHY011)

Title of the Course (Theory): Thermal Physics and Electronics

Syllabus	Total Hrs: 56
Unit-I: Thermodynamics-I	**14 hrs**
Second Law of Thermodynamics: Review of basics of thermodynamics. Statements of second law of thermodynamics, Carnot theorem: statement and proof. Steam engine, Otto engine (Internal combustion engine) and expression for efficiency. Diesel engine and expression for efficiency. **Entropy:** Concept of entropy, change in entropy, physical concept of entropy, change of entropy in reversible cycle, principle of increase of entropy, change of entropy in irreversible process with examples. Temperature- entropy diagram, physical significance of entropy, entropy of a perfect gas. Second law of thermodynamics in terms of entropy. Entropy of the Universe. Third law of thermodynamics: Nernst's heat theorem statement. ***Suggested Activities: please refer foot note***	
Unit-II: Thermodynamics-II	**14 hrs**
Maxwell's Thermodynamic Relations: Thermodynamic variables, extensive and intensive variables. Derivation of Maxwell's thermodynamical relations (general relationship). Applications: specific heat equation for Van der Waals gas, Joule-Thomson-cooling and Joule-Thomson coefficient for perfect and Van der Waal gas. Clausius - Clapeyron's equation (first latent heat equation). **Thermodynamic Potentials:** Internal energy, Enthalpy, Helmholtz free energy, Gibbs free energy. Significance of thermodynamic potentials. Relations of thermodynamical potentials with their variables. First and second order phase transitions. ***Suggested Activities: please refer foot note***	
Unit-III: Electronics - I	**14 hrs**
Current and voltage sources and Network Theorems: Concept of voltage source: ideal and practical voltage source. Concept of current source: ideal and practical current source. Thevenin's and Norton's Theorems: statement and proof. **Power supply**: Power supply with filters (LC and π- section), IC regulated power supply (78XX). **Bipolar Junction Transistor:** BJT characteristics in CE mode, Operating point. Biasing of BJT: Mention different types of biasing, analysis of voltage divider biasing, derivation of I_C and V_{CE}. DC *h*-parameters and their determination using low frequency transistor model. Single stage RC coupled CE amplifier, Expression for current gain and voltage gain, input impedance and output impedance, frequency response. Brief explanation of positive and negative feedback. Transistor as an oscillator: Hartley, Colpitts and Phase shift oscillators (qualitative only). **Junction Field Effect Transistor:** Types, characteristics and parameters of JFET. ***Suggested Activities: please refer foot note***	

Unit-IV: Electronics - II	14 hrs
Integrated Circuits (ICs): Introduction of ICs, Types of ICs, IC555 internal configuration, IC555 timer as astable multivibrator. **Operational Amplifier (Op-Amp):** Ideal Op-Amp and its characteristics, practical Op-Amp, concept of virtual ground, Op-Amp parameters, Op-Amp with negative feedback, Inverting Op-amp: close loop voltage gain expression, input and output impedance. Non-inverting Op-Amp: close loop voltage gain expression. Op-Amp as adder, subtractor, voltage follower, integrator and differentiator. **Digital Electronics:** Positive and negative logic levels, logic operations, NOT, OR, AND operations, construction of truth table. Digital logic gates: NOT, OR, AND, NOR, NAND, XOR, XNOR gates. Input-output timing diagram for NAND and NOR gates. Boolean theorems, De Morgan's theorems using truth table, using gates. Design of basic gates using NAND and NOR. Simplification of Boolean expressions. ***Suggested Activities: please refer foot note***	

Suggested Activities:

1. Make a dissertation on Laws of thermodynamics.
2. Make a write up of heat engines and refrigerators.
3. List the reversible 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. 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
6. In the case of power transistors, learn how to fix a heat sink for the transistor.
7. Understand the concept of virtual ground of an Op-Amp.
8. Learn the different types of Op-Amps used for different applications.
9. What is a buffer? Prepare a report on the application of buffers in instrumentation electronics.
10. Learn how to implement logic functions (AND, OR) using just diodes, resistors and transistors.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may kindly be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Course Learning Outcomes	
At the end of the course, the students will be able to:	
CO1.	apply the laws of thermodynamics and analyze the thermal system and compare the efficiency and working of steam, Otto and Diesel engine.
CO2.	analyze the temperature entropy-diagram with physical significance.
CO3.	study the Maxwell's thermodynamical relations with different applications.
CO4.	analyze the significance of thermodynamic potentials and develop the relation between thermodynamical potential with their variables.
CO5.	distinguish the current and voltage source and construct the power supply with different filter circuits and its importance in real life.
CO6.	use the concept of semiconductor to describe BJT, FET etc and explain their functions and applications.
CO7.	describe the construction of IC-555 and its use in the astable multivibrator to generate rectangular waveform.
CO8.	explain the functioning of op-Amp and use them as the building blocks of applications. use of logic gates with different theorems of Boolean algebra followed by logics circuits.

Books Recommended.

1. Heat & Thermodynamics and Statistical Physics by Brijlal Subramanyam & Hemne - S Chand., Delhi
2. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
4. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1958, Indian Press
5. Heat and Thermodynamics (I-Edition) – D.S. Mathur - S. Chand & Company Ltd., New-Delhi, 1991.
6. A text book of heat - J. B. Rajam S. Chand and Co.
7. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springe
8. An Introduction to Thermal Physics, Daniel V Schroeder, 2020, Oxford University Press
9. Electronic Devices and Circuits by David A. Bell PHI, New Delhi 2004.
10. Integrated Electronics by Jacob Millman and CC Halkias.
11. Digital Fundamentals by Floyd PHI, New Delhi 2001.
12. Principle of Electronics by V. K. Mehta and Rakshit.
13. Basic electronics and solid state physics- B. L. Theraja- S. Chand Publication, New Delhi
14. Basic Electronics- B. L. Theraja- S. Chand Publication,New Delhi.
15. Integrated Electronics- Millmans And Halkias-McGraw Hill, New Delhi.
16. Electronic devices and circuits- Allan Mottersed-.McGraw Hill, New Delhi.
17. Basic Electronics and Linear Circuits- TTTI- Bhargav & Others. McGraw Hill Education (1983)
18. A text book Thermodynamics by Y. V. C. Rao, Universities Press (Ind.) Hyderabad.
19. A text book of heat by G. R. Noakes, London Macmillan and Co. Ltd.
20. Berkely Physics, Vol. No. I – ABC Publications, Bangalore & New-Delhi.
21. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004

Pedagogy: Problem solving, seminar, presentation, activities, group discussion, field visit etc.,

B.Sc. Semester – IV

DSCC-8: Physics (Practical) - VIII Code : 034PHY012

Title of the Course (Practical): Thermal Physics and Electronics

List of the Experiments for 52 hrs / Semesters

1. Thermal conductivity of a bad conductor by Lee's and Charlton's method.
2. Thermal conductivity of copper by Searle's apparatus / Angstrom's method.
3. Verification of Clausius – Clapeyron equation and determination of specific enthalpy.
4. Mechanical equivalent of heat Callender and Barnes method.
5. To find the ratio of specific heats at constant pressure and constant volume for air using Clement and Desorme's apparatus.
6. Specific Heat by cooling.
7. Norton's and Thevenin's theorem using unbalanced Wheatstone network.
8. Power supply using π- section filter and study of IC regulator 78XX
9. Astable multivibrator using IC 555
10. Hybrid parameters of BJT in CE mode
11. Single stage RC coupled CE amplifier
12. JFET characteristics
13. Hartley /Colpitt's oscillator using BJT / Phase shift Oscillator using OP-Amp
14. Op-Amp as Inverting and non-inverting amplifier
15. Basic gates using IC-7400./ Verification of D' Morgan's theorem and Boolean expressions.

General instructions:

1. Minimum of Eight experiments to be performed.

2. Any new experiment may be added to the list with the prior approval from the BOS

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Basic formula,Units&Natureofgraph, CircuitDiagram/RayDiagram/Schematicdiagram	**- 05 Marks**
2. Tabular Columnwithquantities and unitmentioned, experimental skills.	**- 05 Marks**
3. Recording ofobservations, calculations and drawing graph, and accuracyof the result	**- 11 Marks**
4. Viva-voce	**- 02 Marks**
5. Completed & Certified Journal	**- 02 Marks**
	Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination.

Course Outcomes	
At the end of the course Students will be able to:	
CO1	determine the thermal conductivity of bad conductor by Lee's and Charlton method. Compare the result with theoretical value.
CO2	determine of thermal conductivity of conductor like copper using different methods such as Searle's, Angstrom methods.
CO3	verification of Clausius- Clapeyron equation experimentally Determine the specific heat ratio for air using Clement and Desormes apparatus.
CO4	learn how to apply Thevenin's and Norton's theorem to given network. Also they will learn basics of voltage/current power supply.
CO5	study in depth about transistor/JFET by performing many experiments using them
CO6	learn about very popular versatile device such as Operational amplifier and its applications
CO7	learn how to implement logic function using IC-7400/any other IC's

Books Recommended:

1. Physics for Degree Students B. Sc. Second Year, by C. L. Arora & P. S. Hemne S. Chand &Co.
2. Electronics Instrumentation by H. S. Kalasi.
3. B.Sc. practical Physics – C.L. Arora.
4. Advanced practical Physics – Samir Kumar Ghosh.
5. Advanced practical Physics – Worshnop and Flint.

B.Sc. Semester – IV

OEC- 4: Medical Physics (Code: 004PHY051)

Syllabus	Total Hrs: 42
Unit-I: Human Anatomy and Physiology	**14 hrs**
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 endocrine system and nervous system.	
Unit-II: Physics of Medical Diagnostics	**14 hrs**
Principle of production of X-rays. Use of X-rays in medical diagnosis, X-ray imagingsystems. Computed Tomography (CT): principle and generation of CT. Magnetic Resonance Imaging (MRI): basic principle and image characteristics. Ultrasound Imaging: production of ultrasound, transducers, Interaction of sound waves with body tissues, , acoustic coupling, image formation, modes of image display and color Doppler.	
Unit-III: Radiation Physics	**14 hrs**
Radiation units, exposure, absorbed dose, units: Rad, gray. Relative biological electiveness, effective dose, inverse square law. Interaction of radiation with matter: Compton and Photoelectric effect, Rem and Sievert, linear attenuation coefficient. Radiation detectors: Thimble Chamber, Condenser Chambers, Geiger Muller counter, Scintillation counters and solid state detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.	
Class Room Activities Unit I: Students can demonstrate the shape, size, positions and functions of different organs in the body with the help of models. Unit II: The use of X-rays in the diagnosis of the fractured bone can be demonstrated with the help of a gamma source and a gamma ray survey meter. As the density of materials between the source and the detector changes the reading on the meter (or intensity of the beefing sound) changes. Unit III: (i) Students can be asked to list out different type of cancers and possible causative factors. They can be asked to list out the healthy practices to reduce the risk of cancers. (ii) As there will be students from different disciplines in the OE course, group discussion can be arranged to discuss about their programme and outcome. This willbe an opportunity for the students to know about other disciplines. **Other related activities/projects:**	

1. Visit to nearby hospitals/diagnostic centers to study the working of X-ray machines.

2. Visit to ultrasound diagnostic centers to study the principle and use of ultrasound in diagnosis.

3. Project on principle and use of X-ray films in imaging.

4. Visit to radiotherapy centers to study the modalities of radiotherapy.

Text Books

1. C. H. Best and N. B. Taylor. A Test in Applied Physiology. Williams and WilkinsCompany, 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 EasyWay. 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. Coke. Principles of Radiological Physics. ChurchillLivingstone, 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, 2000.

Course Outcomes	
At the end of the course Students will be able to:	
CO1	understand human body anatomy and its physiological properties of the circulatory system, digestive system, respiratory system endocrine system and nervous system.
CO2	understand physics behind. medical equipment's such as X-rays, CT and MRI and sonography.
CO3	apply the principle of radiation physics, learn more about nuclear radiation detectors and how these radiation principles are used in radiation therapy.
CO4	know real time applications of this course by visiting diagnostic canters. Etc.

Note:

1. Total teaching hours are inclusive of solving numerical problems on all the topics.
2. Preference may be given to solve maximum number of numerical problems and thought-provoking problems are to be solved wherever necessary.
3. Questions should not be framed on review of basic aspects in the semester end examination as it is revision of topics in the lower class.
4. Guide/Students are permitted to do any relevant and thought provoking activity, which gives in depth understanding of physics concepts and their application in a specific chapter.
5. Guide/students are also permitted to take up any innovative project work/field work/ problem solving activity, so that students get clear understanding of underlying principles of physics/concepts of physics in a particular topic/area of physics.
6. Teacher should encourage students to think out of the box and take up activity beyond the syllabus.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	------	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme: 2022-23

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05 marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 marks each. Answer any 03 questions : 30 marks

   (Minimum 1 question from each unit and 10 marks question may have sub question for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.