E.M.G. YADAVA WOMENS COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
(Re –accredited (3rd Cycle) with Grade A+ and CGPA 3.51 by NAAC)

DEPARTMENT OF PHYSICS –UG
TANSCHE – CBCS WITH OBE
COURSE STRUCTURE
(w.e.f. 2023– 2024 Batch onwards)

Semester	Part	Course Code	Course Title	Teaching HRS (Per Week)	Duration Of Exam (Hrs)	Marks Allotted			Credits
						CIA	SE	Total	
I	I	23OU1TA1/ 23OU1HIN1/ 23OU1FR1	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN1	General English -I	6	3	25	75	100	3
	III	23OUPH11	**Core Course1:** Properties of Matter and Acoustics	5	3	25	75	100	5
		23OUPH1P	**Core Course-2:** Practical – I: Properties of Matter	3	3	40	60	100	3
		23OUPHGEMA1	**GEC 1:** Allied Mathematics – I	6	3	25	75	100	5
	IV	23OUPHSECN1	**SEC 1 (NME):** Physics for Everyday life	2	3	25	75	100	2
		23OUPHFC1	**FC:** Introductory physics	2	3	25	75	100	2
II	I	23OU1TA2/ 23OU1HIN2/ 23OU1FR2	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN2	General English-II	6	3	25	75	100	3
	III	23OUPH21	**Core Course3:** Heat, Thermodynamics and Statistical Physics	5	3	25	75	100	5
		23OUPH2P	**Core Course4:** Practical – II: Heat, oscillations, waves & Sound	3	3	40	60	100	3
		23OUPHGEMA2	**GEC 2:** Allied Mathematics – II	6	3	25	75	100	5
	IV	23OUPHSECN2	**SEC 2 (NME):** Astrophysics	2	3	25	75	100	2
		23OUPHSEC3	**SEC 3:** Electricity	2	3	25	75	100	2
III	I	23OU1TA3/ 23OU1HIN3/ 23OU1FR3	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN3	General English- III	6	3	25	75	100	3
	III	23OUPH31	**Core Course-5:** Mechanics	5	3	25	75	100	5
		23OUPH3P	**Core Course-6:** Practical – III: Electricity	3	3	40	60	100	3
		23OUPHGECH3	**GEC 3:** Chemistry for Physical Science I	4	3	25	75	100	3

		23OUPHGECH3P	**GEC 3:** Chemistry Practical for Physical Science I	2	3	40	60	100	2
	IV	23OUPHSEC31	**SEC 4:** Energy Physics	2	3	25	75	100	2
		23OUPHSEC32	**SEC 5:** Astro Physics	1	3	25	75	100	1
			Environmental studies	1	-	-	-	-	-
IV	**I**	23OU1TA4/ 23OU1HIN4/ 23OU1FR4	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN4	General English-IV	6	3	25	75	100	3
	III	23OUPH41	**Core Course7:** Optics and Laser Physics	5	3	25	75	100	5
		23OUPH4P	**Core Course8:** Practical – IV: Light	3	3	40	60	100	3
		23OUPHGECH4	**GEC 4:** Chemistry for Physical Science II	3	3	25	75	100	3
		23OUPHGECH4P	**GEC 4:** Chemistry Practical for Physical Science II	2	3	40	60	100	2
	IV	23OUPHSEC41	**SEC 6:** Communication Physics	2	3	25	75	100	2
		23OUPHSEC42	**SEC 7:** Physics for everyday life	2	3	25	75	100	2
		23OU4EV4	Environmental studies	1	3	25	75	100	2
V	**III**	23OUPH51	**Core Course 9:** Electricity, Magnetism and Electromagnetism	5	3	25	75	100	4
		23OUPH52	**Core Course 10:** Atomic and Nuclear Physics	5	3	25	75	100	3
		23OUPH53	**Core Course 11:** Analog and Communication Electronics	5	3	25	75	100	3
		23OUPH5P	**Core Course 12:** Practical – V: General Physics	3	3	40	60	100	3
		23OUPHDSE5A	**DSEC I**	5	3	25	75	100	3
		23OUPHDSE5C	**DSEC II**	5	3	25	75	100	3
	IV	23OU4VE5	Value Education	2	3	25	75	100	2
		23OUPHIN5	Internship/Industrial Training	-					2
VI	**III**	23OUPH61	**Core Course 13:** Relativity and Quantum Mechanics	6	3	25	75	100	4
		23OUPH62	**Core Course 14:** Solid State Physics	6	3	25	75	100	4
		23OUPH63	**Core Course 15:** Digital Electronics and Microprocessor 8085	6	3	25	75	100	4
		23OUPH6P	**Core Course 16:** Practical – VI: Electronics	3	3	40	60	100	3
	IV	23OUPHDSE6A	**DSEC III**	4	3	25	75	100	3
		23OUPHDSEPR6	**DSEC IV**	3	3	20	80	100	3
		23OUPHSEC6	**SEC 8:** Physics of Medical Instruments	2	3	25	75	100	2
	V	23OU5PE6/23OU5NS6	Extension Activity-Physical Education/ NSS	-	-	-	-	-	1
		TOTAL		**180**					**140**

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DEPARTMENT OF PHYSICS –UG
TANSCHE – CBCS WITH OBE COURSE STRUCTURE
ALLIED PHYSICS FOR CHEMISTRY
(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Course Title	Teaching Hrs (Per Week)	Duration Of Exam (Hrs)	Marks Allotted			Credits
						CIA	SE	Total	
III	III	23OUCHGEPH3	**Allied 1:** Allied Physics – I	4	3	25	75	100	3
		23OUCHGEPH3P	**Allied Practical 1:** Allied Practicals-I	2	3	40	60	100	2
IV		23OUCHGEPH4	**Allied 2:** Allied Physics – II	3	3	25	75	100	3
		23OUCHGEPH4P	**Allied Practical 2:** Allied Practicals-II	2	3	40	60	100	2

DSEC: Discipline Specific Elective Course:

Semester V (DSEC I- Choose any one)

1. Numerical Methods and C Programming   - 23OUPHDSE5A

2. Material Science   - 23OUPHDSE5B

Semester V (DSEC II- Choose any one)

1. Mathematical Physics   - 23OUPHDSE5C

2. Digital Photography   -23OUPHDSE5D

Semester VI (DSEC III- Choose any one)

1. Laser and Fiber Optics   - 23OUPHDSE6A

2. Nano Science and Nano Technology   - 23OUPHDSE6B

DSEC IV - Project   - 23OUPHDSEPR6

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	Core Course 9	23OUPH51	Electricity, Magnetism and Electromagnetism	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To study the design, working and applications of Capacitors.

2. To comprehend the theory of Magnetic effects of current.

3. To understand the basic knowledge of Magnetism.

4. To understand the basics knowledge of Transient and alternating currents.

5. To study about Maxwells equations and their applications.

Course Content:

Unit I: CAPACITORS AND THERMO ELECTRICITY: Capacitor –Principle – Capacitance of spherical and cylindrical capacitors – capacitance of a parallel plate capacitor– effect of dielectric –Seebeck effect – laws of thermo emf – Peltier effect – Thomson effect – thermoelectric diagrams –uses of thermoelectric diagrams – thermodynamics of thermo couple -determination of Peltier and Thomson coefficients.

Unit II: MAGNETIC EFFECTS OF CURRENT: Biot and Savart's law – magnetic induction due to circular coil – magnetic induction due to solenoid –force on a current element by magnetic field – force between two infinitely long conductors – torque on a current loop in a field - moving coil galvanometer – damping correction.

Unit III: MAGNETISM AND ELCTROMAGNETIC INDUCTION: Magnetic induction B – magnetization M - relation between B, H and M – magnetic susceptibility – magnetic permeability – experiment to draw B-H curve – energy loss due to hysteresis - Importance of hysteresis curves – Faraday and Lenz laws – vector form – self- induction – coefficient of self-inductance of solenoid – Anderson's method – mutual induction – coefficient of mutual inductance between two coaxial solenoids.

Unit IV: TRANSIENT AND ALTERNATING CURRENTS: Growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit (expressions for charge only) – peak, average and rms values of ac -LCR series and parallel circuits.

Unit V: MAXWELLS EQUATIONS AND ELECTROMAGNETIC WAVES:

Maxwell's equations in vacuum, material media– physical significance of Maxwell's equations – displacement current – plane electromagnetic waves in free space – velocity of light – Poynting vector–electromagnetic waves in a linear homogenous media.

Books for Study:

Murugeshan. R. Electricity and Magnetism, 8thEdn, 2006, S.Chandand Co, New Delhi.

Books for Reference:

1. Brijlal and Subramanian, Electricity and Magnetism, 6th Edn.,Ratanand Prakash, Agra.

2. Brijlal, N.Subramanyan and JivanSeshan, Mechanics and Electrodynamics (2005),

3. Eurasia Publishing House (Pvt.) Ltd., New Delhi.

4. David J. Griffiths, Introduction to Electrodynamics, 2ndEdn. 1997, Prentice Hall of

5. India Pvt. Ltd., New Delhi

6. D. Halliday, R. Resnik and J. Walker - Fundamentals of Physics, 6thEdn., Wiley, NY, 2001.

Web resources/ E-Books:

1. https://web.njit.edu/~vitaly/121/notes121.pdf

2. https://ocw.mit.edu/courses/8-022-physics-ii-electricity-and-magnetism-fall-2004/pages/lecture-notes/

3. https://www.bdu.ac.in/cde/SLM/B.Sc.%20Physics/III%20Year/Electricity,%20Magnetism%20and%20Electromagnetism/B.Sc.%2C%20Physics%20-Electricity%20and%20magnetism.pdf

4. https://mggacmahe.ac.in/Content/elearning/202319/Magnetism%20Sandeep%20K%20V%202022.pdf

5. https://www.tutorialsduniya.com/notes/electricity-magnetism-notes/

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: This course will enable the students to comprehend the theory, concepts of Electricity and Magnetism.

Activities to be given:

The knowledge of theory acquired by the students will enable them to do the lab experiments.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	Study the design, working and applications of Capacitors.	K1 to K3
CLO2	Comprehend the theory of Magnetic effects of current.	K1 to K3
CLO3	Understand the basics knowledge of Magnetism.	K1 to K4
CLO4	Understand the basics knowledge of Transient and alternating currents.	K1 to K3
CLO5	study about Maxwells equations and their applications.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS(75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**CAPACITORS AND THERMO ELECTRICITY:** Capacitor –Principle – Capacitance of spherical and cylindrical capacitors – capacitance of a parallel plate capacitor– effect of dielectric –Seebeck effect – laws of thermo emf – Peltier effect – Thomson effect – thermoelectric diagrams –uses of thermoelectric diagrams – thermodynamics of thermo couple - determination of Peltier and Thomson coefficients.	15	Chalk and Talk, PPT, group discussion
II	**MAGNETIC EFFECTS OF CURRENT:** Biot and Savart's law – magnetic induction due to circular coil – magnetic induction due to solenoid –force on a current element by magnetic field – force between two infinitely long conductors – torque on a current loop in a field - moving coil galvanometer – damping correction.	15	Chalk and Talk, PPT, group discussion
III	**MAGNETISM AND ELCTROMAGNETIC INDUCTION:** Magnetic induction B – magnetization M - relation between B, H and M – magnetic susceptibility – magnetic permeability – experiment to draw B-H curve – energy loss due to hysteresis - Importance of hysteresis curves – Faraday and Lenz laws –vector form – self- induction – coefficient of self-inductance of solenoid – Anderson's method – mutual induction – coefficient of mutual inductance between two coaxial solenoids.	15	Chalk and Talk, PPT, group discussion
IV	**TRANSIENT AND ALTERNATING CURRENTS:** Growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit (expressions for charge only) – peak, average and rms values of ac -LCR series and parallel circuits.	15	Chalk and Talk, PPT, group discussion.
V	**MAXWELLS EQUATIONS ANDELECTROMAGNETIC WAVES:** Maxwell's equations in vacuum, material media– physical significance of Maxwell's equations –displacement current – plane electromagnetic waves in free space – velocity of light – Poynting vector– electromagnetic waves in a linear homogenous media.	15	Chalk and Talk, PPT, group discussion ,

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	Core Course 10	23OUPH52	Atomic and Nuclear Physics	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain the knowledge about Vector atom model.

2. To get Adequate knowledge on the Atomic spectra.

3. To Understand the evolution of Radioactivity.

4. To learn about the Nuclear Reaction.

5. To provide an introductory about the Elementary Particles.

Course Content:

Unit I: VECTOR ATOM MODEL: Introduction to atom model – vector atom model – electron spin –spatial quantisation– quantum numbers associated with vector atom model – L-S and J-J coupling – Pauli's exclusion principle – magnetic dipole moment due to orbital motion and spin motion of the electron –Stern-Gerlach experiment.

Unit II: ATOMIC SPECTRA: Optical spectra – spectral terms - spectral notations - selection rules - intensity rule- Interval rule — fine structure of sodium D-lines –Zeeman effect – quantum theory of normal Zeeman effect – anomalous Zeeman effect – Lande g factor – anomalous pattern –Paschen-Back effect –Larmor's theorem.

Unit III: NUCLEUS AND RADIOACTIVITY: General properties of nucleus- binding energy – BE/A curve - Nuclear Force and its properties– liquid drop model – shell model -discovery of radioactivity –properties of alpha rays, beta rays and gamma rays – range of Alpha particles - Geiger-Nuttal law –Gammow's theory of alpha decay (qualitative study).

Unit IV: NUCLEAR REACTIONS: Nuclear reactions - conservation laws of nuclear reaction – Q-value of a nuclear reaction – threshold energy (definition)- Nuclear reaction kinematics - Nuclear fission –atom bomb - Four factor formula - Nuclear fusion - Hydrogen bomb - artificial radio activity– application of radio isotopes.

Unit V: ELEMENTARY PARTICLES: classification of elementary particles – fundamental interactions – elementary particle quantum numbers –isospin and strangeness quantum number – Conservation laws and symmetry – quark model (elementary ideas only) – discovery of cosmic rays –

latitude effect- altitude effect- primary and secondary cosmic rays.

Books for Study:

1. Modern Physics by R. Murugeshan, KiruthigaSivaprasath, S. Chand & Co., New Delhi(2008).

2. Atomic and Nuclear Physics by N. Subramanian and Brijlal, Revised by Jivan seshan, S Chand &Co., New Delhi (2010).

Books for Reference:

1. Modern Physics by J.H. Hamilton and Yang, McGraw-Hill Publication, (1996).

2. Concepts of Modern Physics by A. Beiser, Tata McGraw-Hill, New Delhi (1997).

3. Fundamentals of Physics by D.Halliday, R.Resnick and J. Walker, Wiley, 6thEdition, New York(2001).

4. Modern Physics by Kenneth S.Krane, John Willey & sons, Canada (1998).

Web Resources:

1. https://en.wikipedia.org/wiki/Atomic_physics

2. https://www.schoolphysics.co.uk/age16-19/Atomic%20physics/Atomic%20structure%20and%20ions/text/Positive_rays/inde x.html

3. https://en.wikipedia.org/wiki/Atomic_physics

4. E-Bohttps://www.nuclear-power.com/nuclear-power/nuclear-reactions/q-value- energetics-nuclear-reactions/ok

5. https://www.britannica.com/science/nuclear-fission

6. http://labman.phys.utk.edu/phys222core/modules/m12/nuclear_models.html

E-Book:

1. http://www.gammaexplorer.com/wp-content/uploads/2014/03/Atomic-Physics.pdf

2. https://users.physics.ox.ac.uk/~ewart/Atomic%20Physics%20lecture%20notes%20C%20port.pdf

3. https://www.bdu.ac.in/cde/SLM/M.Sc.%20Physics/II%20Year/Atomic%20%26%20Molecular%20physics%20%28Unit1%2C%20Unit2%29.pdf

4. https://ncert.nic.in/ncerts/l/leph204.pdf

5. https://campbelstudstore.myshopify.com/products/ebook-pdf-current-trends-in- atomic-physics-1st-edition

Pedagogy:

Chalk and Talk, PPT, group discussion , quiz, on the spot test and

Rationale for Nature of the course:

Knowledge and skill: The course is the learning and understanding the fundamental ideas of atomic physics

Activities to be given:

Enhancing the quality of students to understand fundamentals of various atomic models.

Course learning Outcomes (CLOs)

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (upto K level)
CLO1	To gain the knowledge about Vector atom model.	K1 to K3
CLO2	To get Adequate knowledge on the Atomic spectra.	K1 to K3
CLO3	To Understand the evolution of Radioactivity.	K1 to K4
CLO4	To learn about the Nuclear Reaction.	K1 to K3
CLO5	To provide an introductory about the Elementary Particles.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	3	3	3
CLO2	3	3	2	3	3	3
CLO3	2	3	3	3	3	3
CLO4	3	3	3	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**VECTOR ATOM MODEL:** Introduction to atom model – vector atom model – electron spin –spatial quantisation– quantum numbers associated with vector atom model – L-S and J-J coupling – Pauli's exclusion principle – magnetic dipole moment due to orbital motion and spin motion of the electron –Stern-Gerlach experiment.	15	Chalk and Talk, PPT, group discussion
II	**ATOMIC SPECTRA:** Optical spectra – spectral terms - spectral notations - selection rules - intensity rule- Interval rule — fine structure of sodium D-lines –Zeeman effect – quantum theory of normal Zeeman effect – anomalous Zeeman effect – Lande g factor – anomalous pattern –Paschen-Back effect –Larmor's theorem.	15	Chalk and Talk, PPT, group discussion
III	**NUCLEUS AND RADIOACTIVITY:** General properties of nucleus- binding energy – BE/A curve - Nuclear Force and its properties– liquid drop model – shell model -discovery of radioactivity –properties of alpha rays, beta rays and gamma rays – range of Alpha particles - Geiger-Nuttal law –Gammow's theory of alpha decay (qualitative study).	15	Chalk and Talk, PPT, group discussion
IV	**NUCLEAR REACTIONS:** Nuclear reactions - conservation laws of nuclear reaction – Q-value of a nuclear reaction – threshold energy (definition)- Nuclear reaction kinematics - Nuclear fission –atom bomb - Four factor formula - Nuclear fusion - Hydrogen bomb - artificial radio activity– application of radio isotopes.	15	Chalk and Talk, PPT, group discussion
V	**ELEMENTARY PARTICLES:** classification of elementary particles – fundamental interactions – elementary particle quantum numbers – isospin and strangeness quantum number – Conservation laws and symmetry – quark model (elementary ideas only) – discovery of cosmic rays – latitude effect- altitude effect- primary and secondary cosmic rays.	15	Chalk and Talk, PPT, group discussion

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	Core Course 11	23OUPH53	Analog and Communication Electronics	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To study the design, working and applications of semiconducting devices.

2. To comprehend the theory of Transistor amplifiers.

3. To understand the basics knowledge of Transistor oscillators.

4. To understand the basics knowledge of Operational Amplifier.

5. To study the basis of audio and video communication systems.

Course Content:

Unit I: DIODES: P-N junction diode – V-I characteristics – rectifiers - clipper circuits, clamping circuits - half wave rectifier - Center tap full wave rectifier– Ripple factor. DC power supply: Block diagram of a power supply - shunt capacitor filter - Zener diode as voltage regulator.

Unit II: TRANSISTOR AMPLIFIERS: Transistor configurations: CB, CE CC modes – I-V characteristics– DC load line – RC coupled CE amplifier –power amplifiers - classification of power amplifiers: A, B, C – push pull amplifiers - tuned amplifiers.

Unit III : FEEDBACK AND TRANSISTOR OSCILLATORS: Feedback amplifier - principle of feedback - positive and negative feedback of voltage and current gain - advantages of negative feedback - Barkhausen's criterion. Transistor oscillators: Hartely, Colpitt, Phase shift oscillators.

Unit IV: OPERATIONAL AMPLIFIERS: Differential amplifiers - operational amplifier – Systematic symbol - inverting and non-inverting amplifiers –voltage follower –CMRR- summing and difference amplifiers – differentiator and integrator.

Unit V: MODULATION AND DEMODULATION: Modulation - **A**mplitude modulation – modulation factor - frequency modulation –Theory of frequency modulation - comparison of AM and FM – demodulation: Essentials in demodulation - AM radio receiver - Super heterodyne receiver (block diagram).

Books for Study:

1. V.K.Mehta - Principles of Electronics, S.Chand and Co. Ltd., 2004.
2. B.L. Theraja - A Text Book of Electrical Technology.

Books for Reference:

1. B. Grob - Basic Electronics, 6th edition, McGraw Hill, NY, 1989.
2. Herbert Taub and Donald schilling - Digital Integrated Electronics, McGraw Hill, NY.
3. Ramakant Gaykward A. – Op amp principles and linear integrated circuits,
4. Bagde and S. P. Singh - Elements of Electronics.
5. Millman and Halkias- Integrated Electronics, Tata McGraw Hill.

Web resources/ E-Books:

1. https://www.queenmaryscollege.edu.in/eresources/undergraduat eprogram/py157
2. www.ocw.mit.edu>...> Circuits and Electronics
3. www.ocw.mit.edu>...> Introductory Analog Electronics Laboratory
4. https:// www.elprocus.com> semiconductor devices
5. https://www.britannica.com>technology

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: This course will enable the students to comprehend the theory, concepts of Electronics.

Activities to be given:

The knowledge of theory acquired by the students will enable them to do the lab experiments.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy (upto K level)
CLO1	Study the design, working and applications of semiconducting devices.	K1 to K3
CLO2	Comprehend the theory of Transistor amplifiers.	K1 to K3
CLO3	Understand the basics knowledge of Transistor oscillators.	K1 to K4
CLO4	Understand the basics knowledge of Operational Amplifier.	K1 to K3
CLO5	Study the basis of audio and video communication systems.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS(75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**DIODES:** P-N junction diode **–** V-I characteristics – rectifiers - clipper circuits, clamping circuits - half wave rectifier, Center tap fullwave rectifier– Ripple factor. DC power supply: Block diagram of a power supply, shunt capacitor filter, Zener diode as voltage regulator.	15	Chalk and Talk, PPT, group discussion
II	**TRANSISTOR AMPLIFIERS:** Transistor configurations: CB, CE CC modes – I-V characteristics– DC load line – RC coupled CE amplifier –power amplifiers - classification of power amplifiers: A, B, C – push pull amplifiers - tuned amplifiers.	15	Chalk and Talk, PPT, group discussion
III	**FEEDBACK AND TRANSISTOR OSCILLATORS:** Feedback amplifier - principle of feedback, positive and negative feedback of voltage and current gain, advantages of negative feedback - Barkhausen's criterion. Transistor oscillators: Hartely, Colpitt, Phase shift oscillators.	15	Chalk and Talk, PPT, group discussion
IV	**OPERATIONAL AMPLIFIERS:** Differential amplifiers - operational amplifier –Systematic symbol - inverting and non-inverting amplifiers –voltage follower –CMRR-summing and difference amplifiers – differentiator and integrator.	15	Chalk and Talk, PPT, group discussion.
V	**MODULATION AND DEMODULATION:** Modulation **- A**mplitude modulation – modulation factor - frequency modulation – Theory of frequency modulation - comparison of AM and FM – demodulation: Essentials in demodulation - AM radio receiver - Super heterodyne receiver (block diagram).	15	Chalk and Talk, PPT, group discussion ,

Department of Physics				Class: III B.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Core Course 12	23OUPH5P	Practical – V: General Physics	3	3	40	60	100

Minimum of Eight Experiments from the list:

1. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.

2. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.

3. Spectrometer – (i-d) curve.

4. Spectrometer – (i-i′) curve.

5. Spectrometer – Hartmann's Formula.

6. Diffraction grating Normal incidence.

7. Diffraction grating minimum deviation.

8. Diffraction at a wire.

9. Diffraction a straight edge.

10. AC circuits with L,C,R -Series resonance.

11. AC circuits with L,C,R - Parallel resonance.

12. C_1/C_2 – De Sauty's bridge.

13. e/m Thomson method

14. B.G. – Absolute capacity of condenser.

15. Potentiometer –Resistance and Specific resistance of the coil.

16. Potentiometer – E.M.F of a thermocouple.

17. Carey Foster's bridge - Temperature coefficient of resistance of the coil.

18. B.G – Figure of Merit – Charge Sensitivity

19. Impedance & power factor – LR circuit.

20. Comparison of mutual inductance of the coil- spot galvanometer.

21. Dispersive power of plane diffraction grating.

22. Program to perform Fibonacci series using C language.

23. Program to perform two dimensional sorting using C language.

24. Check odd or even number using inline function using C language.

25. Finding area of shapes using virtual function using C language.

26. Program for 2x2 matrix Multiplication.

27. Program for 2x2 matrix addition.

28. Program to sorting set of numbers in ascending and descending order.

Reference Books:

1. M.N.Srinivasan, S.Balasubramanian, R.Ranganathan(2007), A Text Book of Practical Physics, Sultan Chand & Sons.

2. Indu Prakash & Ramakrishna(2008), A Text Book of Practical Physics, Kitab Mahal Agencies

3. S.R. GovindaRajan, T. Murugaiyan, S. SundaraRajan(2006), Practical Physics, Rochouse & Sons

Web Resources:

1. http://www.tndte.gov.in/site/wp-content/uploads/2016/08/Engineering-physics.pdf

2. https://www.ugc.ac.in/pdfnews/5512002_B.SC.-PHYSICAL-SCIENCE_ PHYSICS, -CHEMISTRY,-MATHEMATICS_-CB.pdf

3. https://www.academia.edu/34783511/Practical_Physics_for_Degree_Students_Gias_Uddin_and_Shahabuddin

4. https://www.academia.edu/35371782/PHYSICS_LABORATORY_MANUAL_Course

5. I_and_II_Semester1.UG course OBE.docx

Pedagogy:

Demonstration and Practical sessions.

Lesson Plan:Teaching Hours (30 hrs)

UNIT	Topics to be Covered	Hours	Mode
I	1. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines. 2. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines. 3. Spectrometer – (i-d) curve. 4. Spectrometer – (i-i′) curve. 5. Spectrometer – Hartmann's Formula. 6. Diffraction grating Normal incidence	6	Demo & Practical Session
II	7. Diffraction grating minimum deviation. 8. Diffraction at a wire. 9. Diffraction a straight edge. 10. AC circuits with L,C,R -Series resonance. 11. AC circuits with L,C,R - Parallel resonance. 12. C1/C2 – De Sauty's bridge.	6	Demo & Practical Session
III	13. e/m Thomson method 14. B.G. – Absolute capacity of condenser. 15. Potentiometer –Resistance and Specific resistance of the coil. 16. Potentiometer – E.M.F of a thermocouple. 17. Carey Foster's bridge - Temperature coefficient of resistance of the coil. 18. B.G – Figure of Merit – Charge Sensitivity	6	Demo & Practical Session
IV	19. Impedance & power factor– LR circuit. 20. Comparison of mutual inductance of the coil- spot galvanometer. 21. Dispersive power of plane diffraction grating. 22. Program to perform Fibonacci series using C language. 23. Program to perform two dimensional sorting using C language. 24. Check odd or even number using inline function using C language.	6	Demo& Practical Session
V	25. Finding area of shapes using virtual function using C language. 26. Program for 2x2 matrix Multiplication. 27. Program for 2x2 matrix addition. 28. Program to sorting set of numbers in ascending and descending order.	6	Demo & Practical Session

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC I	23OUPHDSE5A	Numerical Methods and C Programming	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the methods in numerical differentiation and integration
2. to develop the problem solving skills of the student.
3. To Know the basics of operators and algorithm used in C Programs.
4. To introduce and explain the basic structure, rules of compiling and execution of C programming.
5. To study the basics of arrays and functions in C Programs.

Course Content:

Unit I: NUMERICAL SOLUTIONS: determination of zeros of polynomials – roots of linear and nonlinear algebraic and transcendental equations: bisection and Newton-Raphson methods – convergence and divergence of solutions

Unit II: NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING: Newton's forward and backward interpolation – Lagrange's interpolation – Newton-Raphson method to find square root and cube roots – principle of least squares – fitting a straight line and exponential curve – trapezoidal rule – Simpson's 1/3 and 1/8 rule

Unit III: ALGORITHM, FLOW CHART AND PROGRAM: development of algorithm – flow chart for solving simple problems– average of set of numbers – greatest, smallest – conversion of Fahrenheit to Celsius and Celsius to Kelvin – sorting set of numbers in ascending and descending order – square matrix, addition, subtraction and multiplication of order (2x2) using arrays.

Unit IV: INTRODUCTION TO C: Importance of C – basic structure of C programming – character set - C Tokens- key words and identifiers -constants- variables - data types — operators: arithmetic, relational, logical, assignment– conditional – Bitwise operators.

Unit V: CONTROL STRUCTURE: decision making with if, if-else, nested if – switch –go to – break – continue –while, do while, for statements – arrays, one dimensional and two dimensional – declaration and initialization.

Book for study:

1. Numerical methods S.Arumugam, A.somasundaram, A.thangapandi isaac, Scitech publication (India) pvt.ltd. 2002

2. Programming in C, Balagurusamy, TMG, ND, 2012

Books for Reference:

1. Schaum's outline series, Theory and Problems of programming in C, C.Byronand S. Gottfried, Tata McGraw Hill 2003

2. Numerical methods and C Programming, Veerarajan, 2015.

3. Numerical methods,Singaravelu,Meenakshipublication,4thEdn.,

   1999.

4. Numerical methodsP.Kandasamy, K.Thilagavathy, K. Gunavathi, S.Chand,2016

5. Numerical Analysis, B.D.Gupta, Konark Publishers, New Delhi, 2013

Web resources/ E-Books:

1. https://udghoshna.wordpress.com/wp-content/uploads/2013/06/numerical-methods.pdf

2. https://www.freecodecamp.org/news/learn-c-programming-classic-book-dr-chuck/

3. https://karadev.net/uroci/filespdf/files/a%20book%20on%20c.pdf

4. https://www.youtube.com/watch?v=KJgsSFOSQv0

5. https://www.scribd.com/doc/202122350/Computer-Oriented-Numerical-Methods-by- V-RajaRaman

6. https://www.scirp.org/(S(lz5mqp453edsnp55rrgjct55))/reference/referencespapers.aspx?referenceid=1682874

Pedagogy:

Chalk and Talk, PPT, group discussion , quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: The course enables the students with the understanding of basics of Numerical methods and programming language using C programs.

Activities to be given:

1. Enhancing the quality of students to understand the fundamentals of Numerical differentiation.

2. Enhancing the quality of students to understand the fundamentals of C programming language.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	To understand the methods in numerical differentiation and integration	K1 to K3
CLO2	To develop the problem solving skills of the student.	K1 to K3
CLO3	To Know the basics of operators and expressions used in C Programmes.	K1 to K4
CLO4	To introduce and explain the basic structure, rules of compiling and execution of C programming.	K1 to K3
CLO5	To study the basics of arrays and functions in C Programmes.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS(75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**NUMERICAL SOLUTIONS:** determination of zeros of polynomials – roots of linear and nonlinear algebraic and transcendental equations: bisection and Newton-Raphson methods – convergence and divergence of solutions	15	Chalk and Talk, PPT, group discussion
II	**NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING:** Newton's forward and backward interpolation – Lagrange's interpolation – Newton-Raphson method to find square root and cube roots – principle of least squares – fitting a straight line and exponential curve – trapezoidal rule – Simpson's 1/3 and 1/8 rule	15	Chalk and Talk, PPT, group discussion
III	**ALGORITHM, FLOW CHART AND PROGRAM:** development of algorithm – flow chart for solving simple problems– average of set of numbers – greatest, smallest – conversion of Fahrenheit to Celsius and Celsius to Kelvin – sorting set of numbers in ascending and descending order – square matrix, addition, subtraction and multiplication of order (2x2) using arrays.	15	Chalk and Talk, PPT, group discussion
IV	**INTRODUCTION TO C:** Importance of C – basic structure of C programming – character set - C Tokens- key words and identifiers -constants- variables - data types — operators: arithmetic, relational, logical, assignment– conditional – Bitwise operators.	15	Chalk and Talk, PPT, group discussion.
V	**CONTROL STRUCTURE:** decision making with if, if-else, nested if – switch –go to – break – continue –while, do while, for statements – arrays, one dimensional and two dimensional – declaration and initialization.	15	Chalk and Talk, PPT, group discussion ,

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC I	23OUPHDSE5B	Material Science	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To learn imperfections in crystals, deformation of materials and testing of materials.
2. To get knowledge on behavior of a material, under the action of light and their applications.
3. to analyze the behavior of materials under different conditions.
4. To know the applications of crystal defects.
5. To understand the different methods of mechanical testing.

Course Content:

Unit I: CRYSTAL IMPERFECTIONS: Introduction – point defects: vacancies(*problems*), interstitials, impurities, electronic defects – equilibrium concentration of point imperfections (*problems*)– application of point defects –line defects: edge dislocation(*problems*), screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt and twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections.

Unit II: MATERIAL DEFORMATION: Introduction – elastic behavior of materials – atomic model of elastic behavior –modulus as a parameter in design – rubber like elasticity – inelastic behavior of materials –relaxation process – viscoelastic behavior of materials – spring -Dash pot models of viscoelastic behavior of materials.

Unit III: PERMANENT DEFORMATION AND STRENGTHING METHODS OF MATERIALS: Introduction –plastic deformation: tensile stress-strain curve – plastic deformation by slip – creep: mechanism of creep – creep resistant materials – strengthening methods: strain hardening, grain refinement – solid solution strengthening – precipitation strengthening.

Unit IV: OPTICAL MATERIALS: Introduction – optical absorption in metals, semiconductors and insulators – NLO materials and their applications–display devices and display materials:fluorescence and phosphorescence – light emitting diodes –liquid crystal displays.

Unit V : MECHANICAL TESTING: Destructive testing: tensile test, compression test, hardness test – nondestructive testing (NDT): radiographic methods, ultrasonic methods – thermal methods of NDT: thermography – equipment used for NDT: metallurgical microscope

Book for study:

1. Material science, Dr.M.Arumugam, Anuradha Publications, Reprint 2010.

2. Material science and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition, 2015

3. Materials science, V. Rajendran, McGraw Hill publications 2011

Books for Reference:

1. William D. Callister, Jr., Material Science and Engineering – An Introduction, 8th Edition, John Wiley and Sons, Inc., 2007

2. W. Bolton, "Engineering materials technology", 3rd Edition, Butterworth and Heinemann, 2001.

3. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", 5th Edition, Thomson Learning, First Indian Reprint, 2007.

4. William F. Smith, "Structure and Properties of Engineering Alloys", Mc-Graw-Hill Inc., U.S.A, 2nd edition, 1993.

Web Resources:

1. https://pdfcoffee.com/qdownload/material-science-and-engineering-v-raghavanpdf-pdf-free.html

2. https://mrcet.com/downloads/digital_notes/ME/II%20year/MATERIAL%20SCIENCE.pdf

3. https://ftp.idu.ac.id/wpcontent/uploads/ebook/tdg/TEKNOLOGI%20REKAYASA%20MATERIAL%20PERTAHANAN/Materials%20Science%20and%20Engineering%20An%20Introduction%20by%20William%20D.%20Callister,%20Jr.,%20David%20G.%20Rethwish%20(z-lib.org).pdf

4. https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/060-Introduction-to-Materials-Science-for-Engineers-James-F.-Shackelford-Edisi-8-2015.pdf

5. https://students.aiu.edu/submissions/profiles/resources/onlineBook/g8K6V5_Materials_Science_for_Engineers.pdf

E-books:

1. https://gateformme.wordpress.com/wp-content/uploads/2017/04/material-science-kakani.pdf

2. https://anupturnedworld.wordpress.com/wp-content/uploads/2016/06/callister-materials-science-and-engineering.pdf

3. https://www.freebookcentre.net/chemistry-books-download/E-Book-on-Materials-Science-and-Engineering.html

4. https://www.wiley.com/enus/Materials+Science+and+Engineering%3A+An+Introduction%2C+10th+Edition-p-9781119405498

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for Nature of the course:

Knowledge and skill: To prepare students for careers in materials engineering, research, and industry by providing a strong foundation in the fundamental principles of materials science and engineering.

Activities to be given:

1. Enhancing students with topics like structure-property relationships, phase diagrams, and material behavior.

2. Engage students in a demonstration illustrating the different classes of materials and their behavior.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (upto K level)
CLO1	Learn imperfections in crystals, deformation of materials and testing of materials.	K1 to K2
CLO2	Get knowledge on behavior of a material, under the action of light and their applications.	K1 to K2
CLO3	Know the applications of crystal defects.	K1 to K3
CLO4	Analyze the behavior of materials under different conditions	K1 to K3
CLO5	Understand the different methods of mechanical testing	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	3	3	3
CLO2	3	3	2	3	3	3
CLO3	2	3	3	3	3	3
CLO4	3	3	3	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS (60HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**CRYSTAL IMPERFECTIONS:** introduction – point defects: vacancies(*problems*), interstitials, impurities, electronic defects – equilibrium concentration of point imperfections (*problems*)– application of point defects –line defects: edge dislocation(*problems*), screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt and twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections.	15	Chalk and Talk, PPT, group discussion
II	**MATERIAL DEFORMATION:** introduction – elastic behavior of materials – atomic model of elastic behavior –modulus as a parameter in design – rubber like elasticity – inelastic behavior of materials –relaxation process – viscoelastic behavior of materials – spring -Dash pot models of viscoelastic behavior of materials.	15	Chalk and Talk, PPT, group discussion
III	**PERMANENT DEFORMATION AND STRENGTHING METHODS OF MATERIALS:** introduction –plastic deformation: tensile stress-strain curve – plastic deformation by slip – creep: mechanism of creep – creep resistant materials – strengthening methods: strain hardening, grain refinement – solid solution strengthening – precipitation strengthening.	15	Chalk and Talk, PPT, group discussion
IV	**OPTICAL MATERIALS:** introduction – optical absorption in metals, semiconductors and insulators – NLO materials and their applications– displaydevices and display materials: fluorescence and phosphorescence – light emitting diodes –liquid crystal displays.	15	Chalk and Talk, PPT, group discussion.
V	**MECHANICALTESTING:** destructive testing: tensile test, compression test, hardness test – nondestructive testing (NDT): radiographic methods, ultrasonic methods – thermal methods of NDT: thermography – equipment used for NDT: metallurgical microscope.	15	Chalk and Talk, PPT, group discussion ,

	Department of Physics				Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC II	23OUPHDSE5C	Mathematical Physics	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the basics of Matrices and its types.
2. Understand use of vector notation and explain the meaning of complete vector calculus set of basis vectors
3. To study the basics of Fourier Transform.
4. To analyze the Laplace transformations using various function.
5. To find the applications of Partial differential equations.

Course Content:

Unit I: MATRICES: Types of matrices – square, identity, Null, diagonal, symmetric, antisymmetric Hermitian, unitary and orthogonal matrices– characteristic equation of a matrix – Eigen values and Eigen vectors of a matrix – Cayley-Hamilton theorem - similarity transformations – diagonalization of matrices.

Unit II: VECTOR CALCULUS: Differentiation of vectors – gradient of a scalar field, divergence, curl of a vector function and its Physical significance – important vector identities – line, surface and volume integrals – Gauss's divergence theorem: statement and proof.

Unit III: COMPLEX VARIABLES: Introduction- definitions- operation of fundamental laws of algebra on complex numbers- complex conjugate- Cauchy's integral theorem- Cauchy's integral formula- Cauchy's residue theorem.

Unit IV: FOURIER TRANSFORMS and LAPLACE TRANSFORM: Introduction – Fourier transform - Infinite Fourier sine and cosine transforms – Properties: Addition theorem- similarity theorem- shifting property – modulation theorem- **Laplace transform** (statement) – Properties: Linearity – change of scale-shifting - Second translational property - Derivative of Laplace transform- Laplace Transform of Dirac Delta function.

Unit V: PARTIAL DIFFERENTIAL EQUATIONS (PDE): Introduction – Partial differential equations in physics – Laplace's equation in three dimensions: Rectangular coordinates – Cylindrical

coordinates – Spherical polar coordinates – Application: Equation of Heat flow.

Books for Study:

1. Satya Prakash, Mathematical Physics, Sultan Chand and sons Educational Publishers, New Delhi, First Edition, Reprint 2009.
2. S.L.Kakani, C.Hemrajani, Mathematical Physics, CBS publishers, Second edition, New Delhi, Reprint 2010.

Books for Reference:

1. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
2. Engineering Mathematics III- B, M. K. Venkataraman,
3. Applied Mathematics for Scientists and Engineers, Bruce R. Kusseand Erik A. Westwig, 2nd Ed, WILEY-VCH Verlag, 2006.
4. Vector space and Matrices – J. C. Jain, Narosa Publishing House Pvt. Ltd.
5. Mathematical Physics – P. K. Chattopadhyay, New Age International Publishers.

Web resources/ E-Books:

1. www.khanacademy.org
2. https://youtu.be/LZnRlOA1_2I
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hmat.html#hmath
4. https://www.youtube.com/watch?v=_2jymuM7OUU&list=PLhkiT_RYTEU27vS_SlED56g NjVJGO2qaZ
5. https://archive.nptel.ac.in/courses/115/106/115106086/

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and Skill: Equip students with the mathematical techniques needed for understanding theoretical treatment in different courses taught in their program.

Activities to be given:

1. Enhancing the students with their manipulative skills to apply mathematical techniques in their fields
2. Train the students to apply mathematics in solving problems of Physics.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	To understand the basics of Matrices and its types.	K1 to K3
CLO2	Understand use of vector notation and explain the meaning of complete vector calculus set of basis vectors	K1 to K3
CLO3	To study the basics of Fourier Transform.	K1 to K4
CLO4	To analyze the Laplace transformations using various function.	K1 to K3
CLO5	To find the applications of Partial differential equations.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS(75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**MATRICES:** Types of matrices – square, identity, Null, diagonal, symmetric, antisymmetric Hermitian, unitary and orthogonal matrices– characteristic equation of a matrix – Eigen values and Eigen vectors of a matrix – Cayley-Hamilton theorem - similarity transformations – diagonalization of matrices.	15	Chalk and Talk, PPT, group discussion
II	**VECTOR CALCULUS:** Differentiation of vectors – gradient of a scalar field, divergence, curl of a vector function and its Physical significance – important vector identities – line, surface and volume integrals – Gauss's divergence theorem: statement and proof.	15	Chalk and Talk, PPT, group discussion
III	**COMPLEX VARIABLES:** Introduction- definitions- operation of fundamental laws of algebra on complex numbers- complex conjugate-Cauchy's integral theorem- Cauchy's integral formula- Cauchy's residue theorem.	15	Chalk and Talk, PPT, group discussion
IV	**FOURIER TRANSFORMS and LAPLACE TRANSFORM**: Introduction – Fourier transform - Infinite Fourier sine and cosine transforms – Properties: Addition theorem- similarity theorem- shifting property – modulation theorem- **Laplace transform** (statement) – Properties: Linearity – change of scale-shifting - Second translational property - Derivative of Laplace transform-Laplace Transform of Dirac Delta function.	15	Chalk and Talk, PPT, group discussion.
V	**PARTIAL DIFFERENTIAL EQUATIONS (PDE):** Introduction – Partial differential equations in physics – Laplace's equation in three dimensions: Rectangular coordinates – Cylindrical coordinates – Spherical polar coordinates – Application: Equation of Heat flow.	15	Chalk and Talk, PPT, group discussion ,

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
V	DSEC II	23OUPHDSE5D	Digital Photography	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the principles of photography and image formation and the science and arts behind it.
2. To understand the essential components of conventional and digital cameras and also the different image processing techniques.
3. To gain the knowledge about the lens with its properties.
4. To learn about the digital camera with its types.
5. To know more about the adobe Photoshop.

Course Content:

Unit I: PHOTOGRAPHY AND BASIC PRINCIPLE OF IMAGE FORMATION: Principle – chemical route and digital route –light, wavelengths, colours – shadows – light intensity and distance – making light form images –pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole – focal length and image size – imaging of closer subjects.

Unit II: LENSES – CONTROLLING THE IMAGES: Photographic lens – focal length and angle of view (*problems*) – focusing movement – aperture and f-numbers (*problems*) – depth of field– depth of focus – image stabilization – lenses for digital cameras – lens and camera care

Unit III: CAMERA USING FILMS AND ITS TYPES: camera and its essential components– shutter – aperture – light measurement – film housing – camera types: view camera– view finder camera – Reflex camera– single lens reflex (SLR) camera.

Unit IV: DIGITAL CAMERAS PRINCIPLE AND TYPES: Principle of digital image capturing –comparison of digital and analog picture information – megapixel – grain, noise and pixel density – optical and digital zooming – image stabilizer – bit depth – white balance – colour modes – file formats (TIFF, RAW and JPEG) – storage cards and types – digital cameras: camera phones – compact camera – hybrid camera –digital SLR.

Unit V: THE DIGITAL IMAGE – POST PRODUCTION: Hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness and contrast – colour balance – hue/saturation – dodge/burn – cloning and retouching – removing an element in an image –advanced editing: histogram/levels – curves – selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer –lambda/light jet printers.

Books for Study:

1. Michel J.Langford , Anna Fox and Richard Sawdon Smith, Basic photography, 9ᵗʰ Edition, , 2010-NL, Focal press, London

2. Henry Carroll, Read this if you want to take great photographs of

people, Laurence King Publishing

Books for Reference:

1. Mark Galer, Digital Photography in Available Light essential skills, 2006, Focal press, London
2. Paul Harcourt Davies, The Photographer's practical handbook,2005, UK PRESS

Web resources/ E-Books:

1. **https://digital-photography-school.com/df**
2. https://photography.tutsplus.com/articles/10-best-photography-websites-courses-resources-to-learn-photography--cms-108514
3. https://sites.google.com/site/marclevoylectures/home
4. https://www.format.com/magazine/resources/photography/free-photography-courses
5. https://depts.washington.edu/trio/trioquest/resources/images/links.php

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: This course develops a good understanding to use the clone tool to repair and manipulate the image in digital camera and to filters to change the image in artistic and unreal ways.

Activities to be given:

1. Enhance the students to use the clone tool to repair and manipulate the image in digital camera.
2. Train the students how to use filters to change the image in artistic and unreal ways.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	Understand the principles of photography and image formation and the science and arts behind it.	K1 to K3
CLO2	Understand the essential components of conventional and digital cameras and also the different image processing techniques.	K1 to K3
CLO3	Gain the knowledge about the lens with its properties.	K1 to K4
CLO4	Learn about the digital camera with its types.	K1 to K3
CLO5	Know more about the adobe Photoshop.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	2	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS (75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**PHOTOGRAPHY AND BASIC PRINCIPLE OF IMAGE FORMATION:** principle –chemical route and digital route –light, wavelengths, colours – shadows – light intensity and distance – making light form images –pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole – focal length and image size – imaging of closer subjects.	15	Chalk and Talk, PPT, group discussion
II	**LENSES – CONTROLLING THE IMAGES:** photographic lens – focal length and angle of view (*problems*) – focusing movement – aperture and f-numbers (*problems*) – depth of field– depth of focus – image stabilization – lenses for digital cameras – lens and camera care.	15	Chalk and Talk, PPT, group discussion
III	**CAMERA USING FILMS AND ITS TYPES:** camera and its essential components– shutter – aperture – light measurement – film housing – camera types: view camera– view finder camera – Reflex camera– single lens reflex (SLR) camera.	15	Chalk and Talk, PPT, group discussion
IV	**DIGITAL CAMERAS PRINCIPLE AND TYPES:** principle of digital image capturing –comparison of digital and analog picture information – megapixel – grain, noise and pixel density – optical and digital zooming – image stabilizer – bit depth – white balance – colour modes – file formats (TIFF, RAW and JPEG) – storage cards and types – digital cameras: camera phones – compact camera – hybrid camera –digital SLR.	15	Chalk and Talk, PPT, group discussion.
V	**THE DIGITAL IMAGE – POST PRODUCTION:** hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness and contrast – colourbalance – hue/saturation – dodge/burn – cloning andretouching – removing an element in an image –advanced editing: histogram/levels – curves – selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer –lambda/light jet printers.	15	Chalk and Talk, PPT, group discussion ,

Department of Physics				Class: III B.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Core Course 13	23OUPH61	Relativity and Quantum Mechanics	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain knowledge in the concepts of special and theory of relativity.

2. To evolve ideas about dual nature of matter.

3. To recognize basic terms in quantum mechanics and different. Operator mechanism.

4. To apply of schrödinger's equation to micro system.

5. To learn the basic concepts of angular momentum and operators in quantum mechanics.

Course Content:

Unit I: RELATIVITY: Introduction - Frames of reference - Galilean transformation - Michelson - Morley experiment -Postulates of special theory of relativity - Lorentz transformation - length Contraction – time dilation - Relativity of simultaneity - addition of velocities - variation of mass with velocity– Mass energy relation - Elementary ideas of general relativity.

Unit II: WAVE NATURE OF MATTER: Inadequacy of classical mechanics – Matter Waves - expression of De Brogile's wave length - Wave Packet - Phase and group velocity - Davisson and Germer's experiment - G.P.Thomson's experiment - Heisenberg's uncertainty principle and its consequences.

Unit III: SCHRODINGER EQUATION: Basic postulates of quantum mechanics - Schrodinger equation – Time dependent equation – Time independent equation - Eigenvalues and eigen functions - Properties of wave function – Orthogonal wave function – Normalised wave function – Orthonormal function – Requirement of wave function-Probability density.

Unit IV: SOLUTIONS OF SCHRODINGER EQUATION: Free particle solution - Particle in a box - Potential well of finite depth (one dimension) - linear harmonic oscillator - rigid rotator.

Unit V: OPERATORS IN QUANTUM MECHANICS: Operator for momentum – Kinetic energy – Total energy - Orbital angular momentum operators – Commutation rules for the components of Orbital angular momentum - separation of three dimensional Schrodinger equation into radial and angular parts - spin – Pauli's spin matrices for electron.

Books for Study:

1. Modern Physics by R. Murugeshan, KiruthigaSivaprasath, S. Chand & Co., New Delhi (2008).

2. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2ndedition (37th Reprint),Tata McGraw-Hill, New Delhi, 2010.

Books for Reference:

1. Modern Physics by J.H. Hamilton and Yang, McGraw-Hill Publication, (1996).

2. Concepts of Modern Physics by A. Beiser, Tata McGraw-Hill, New Delhi (1997).

3. Fundamentals of Physics by D.Halliday, R.Resnick and J. Walker, Wiley,6th Edition, New York(2001).

4. Modern Physics by Kenneth S.Krane, John Willey & sons, Canada (1998).

Web Resources:

1. https://www.classcentral.com/course/youtube-physics-quantum-mechanics-and- application-47583

2. https://www.researchgate.net/publication/328339041_Quantum_mechanics_teachin g_resources_from_the_Institute_of_Physics

3. https://www.classcentral.com/course/foundations-quantum-mechanics-56039

4. https://www.classcentral.com/course/edx-quantum-mechanics-for-scientists-and- engineers-1-21196

5. https://quantummechanics.ucsd.edu/ph130a/130_notes/node45.htm

Web resources/ E-Books:

1. Quantum-Mechanics-Lokanathan-Ajoy-Ghatak/dp/9351382966

2. Quantum-Mechanics-Fundamentals-S-Rajasekar-ebook/dp/B07L6VG856

3. Textbook-Quantum-Mechanics-K-Saxena-ebook/dp/B07SJZKSM4

4. http://www.freebookcentre.net/Physics/Quantum-Mechanics-Books.html

5. https://www.amazon.in/Quantum-Mechanics-Development-Language-Processing-ebook/dp/B00YTLQ7QM

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test and

Rationale for Nature of the course:

Knowledge and skill:

The course will help to learn the fundamental ideas about quantum mechanics.

Activities to be given:

1. Enhancing the quality of students to understand fundamentals of quantum mechanics.
2. Train the students to solve quantum mechanical problems.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (upto K level)
CLO1	Gain knowledge in the concepts of special and theory of relativity.	K1 to K2
CLO2	Evolve ideas about dual nature of matter.	K1 to K2
CLO3	Recognize basic terms in quantum mechanics and different operator mechanism.	K1 to K3
CLO4	Apply of schrödinger's equation to micro system.	K1 to K3
CLO5	Learn the basic concepts of angular momentum and operators in quantum mechanics.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	3	3	3
CLO2	3	3	2	3	3	3
CLO3	2	3	3	3	3	3
CLO4	3	3	3	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: (90 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Relativity : Introduction - Frames of reference - Galilean transformation - Michelson - Morley experiment -Postulates of special theory of relativity - Lorentz transformation - length Contraction – time dilation - Relativity of simultaneity - addition of velocities - variation of mass with velocity– Mass energy relation - Elementary ideas of general relativity.	18	Chalk and Talk, PPT, group discussion.
II	Wave Nature of Matter : Inadequacy of classical mechanics – Matter Waves - expression of De Brogile's wave length - Wave Packet - Phase and group velocity - Davisson and Germer's experiment - G.P.Thomson's experiment - Heisenberg's uncertainty principle and its consequences.	18	Chalk and Talk, PPT, group discussion.
III	Schrodinger Equation: Basic postulates of quantum mechanics - Schrodinger equation – Time dependent equation – Time independent equation - Eigenvalues and eigen functions - Properties of wave function – Orthogonal wave function – Normalised wave function – Orthonormal function – Requirement of wave function-Probability density.	18	Chalk and Talk, PPT, group discussion.
IV	Solutions of Schrodinger Equation: Free particle solution - Particle in a box - Potential well of finite depth (one dimension) - linear harmonic oscillator - rigid rotator.	18	Chalk and Talk, PPT, group discussion.
V	Operators in Quantum Mechanics: Operator for momentum – Kinetic energy – Total energy - Orbital angular momentum operators – Commutation rules for the components of Orbital angular momentum - separation of three dimensional Schrodinger equation into radial and angular parts - spin – Pauli's spin matrices for electron.	18	Chalk and Talk, PPT, group discussion.

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	Core Course 14	23OUPH62	Solid State Physics	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand constituents, properties and models of crystal structure.
2. To learn about lattice dynamics and their properties.
3. To learn about the classification of magnetic materials.
4. To acquire knowledge of dielectric properties of materials and their applications.
5. To know the superconducting properties of materials.

Course Content:

Unit I: BONDING IN SOLIDS: Types of bonding –ionic bonding – bond energy of NaCl molecule- Calculation of Lattice energy of Ionic crystal- The Born –Haber cycle –Properties of Ionic solids –Examples of Ionic solids –covalent bonding – metallic bonding – hydrogen bonding.

Unit II: CRYSTAL STRUCTURE: Crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais' lattices – Miller indices – Interplanar spacing –Simple crystal structure: SC, BCC, FCC, Nacl and Diamond - reciprocal lattice –Brillouin zones – X-rays – Bragg's law.

Unit III: MAGNETIC PROPERTIES OF SOLIDS: Classification of magnetic materials – properties of dia, para, ferro, ferri and antiferromagnetism –Langevin'stheory of diamagnetism – Langevin's theory of paramagnetism – Curie-Weiss law – Weiss theory of ferromagnetism (qualitative only) –domains –hysteresis and energy loss.

Unit IV: DIELECTRIC PROPERTIES OF MATERIALS: Polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – Source of polarizability: electronic polarization– ionic, dipolar polarizability– Clausius-Mosotti relation – frequency dependence of dielectric constant –dielectric loss –dielectric breakdown: intrinsic and discharge breakdown.

Unit V: SUPERCONDUCTING PROPERTIES OF MATERIALS: Superconductivity: experimental results –critical temperature –critical magnetic field – Meissner effect –Type-I and type-II superconductors – London's equation and penetration depth — idea of BCS theory (no

derivation) - Thermodynamic and Optical properties: entropy-specific heat - energy gap and isotope effect.

Book for study:

1. Pillai S.O, *Solid state physics*, New Age international (p) Limited, New Delhi, Sixth Edition, 2012.

2. V.K Puri, R.K Babbar, *Solid state physics*, S. Chand publications, New Delhi, First Edition, 2010.

Books for Reference:

1. Introduction to Solid State Physics,Kittel, Willey Eastern Ltd (2003).

2. Solid state Physics, Rita John,1st edition, TataMcGraw Hill publishers (2014).

3. Solid State Physics , R L Singhal, Kedarnath Ram Nathand Co., Meerut (2003)

4. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India

5. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill

6. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning

7. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer

Web Resources:

1. http://metal.elte.hu/~groma/Anyagtudomany/kittel.pdf

2. http://www.issp.ac.ru/ebooks/books/open/Introduction%20to%20Modern%20Solid%20State%20Phys.pdf

3. https://www.eng.uc.edu/~beaucag/Classes/AdvancedMaterialsThermodynamics/Heat%20Capacity%20Books/Charles%20Kittel%20%20Introduction%20to%20Solid%20State%20Physics-Wiley%20(2005).pdf

4. https://books.google.com.et/books?id=9LIit9IXbxoC&printsec=frontcover&source=g bs_atb

5. https://www.e-booksdirectory.com/listing.php?category=403

E-books:

1. Azaroff - Introduction to solids, TMH

2. S. O. Pillai - Solid State Physics, Narosa publication

3. A.J. Dekker - Solid State Physics, McMillan India Ltd.

4. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India.

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for Nature of the course:

Knowledge and skill: The students will understand the quantum theory of solids which us used to describe the thermal and electrical properties of a solids.

Activities to be given:

1. Enhancing the quality of students to understand the atomic crystal structure of the soilds
2. Students will be able to determine the crystal structure by analysis of XRD data.
3. Students will be able to evaluate and analyze the electrical and optical properties of solids

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (upto K level)
CLO1	understand constituents, properties and models of crystal structure.	K1 to K2
CLO2	learn about lattice dynamics and their properties.	K1 to K2
CLO3	learn about the classification of magnetic materials.	K1 to K3
CLO4	acquire knowledge of dielectric properties of materials and their applications.	K1 to K3
CLO5	know the superconducting properties of materials.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	3	3	3
CLO2	3	3	2	3	3	3
CLO3	2	3	3	3	3	3
CLO4	3	3	3	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS (90 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**BONDING IN SOLIDS:** Types of bonding –ionic bonding – bond energy of NaCl molecule- Calculation of Lattice energy of Ionic crystal- The Born –Haber cycle – Properties of Ionic solids –Examples of Ionic solids –covalent bonding – metallic bonding – hydrogen bonding.	18	Chalk and Talk, PPT, group discussion
II	**Unit II: CRYSTAL STRUCTURE:** Crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais' lattices – Miller indices – Interplanar spacing –Simple crystal structure: SC, BCC,FCC, Nacl and Diamond - reciprocal lattice –Brillouin zones – X-rays – Bragg's law.	18	Chalk and Talk, PPT, group discussion
III	**Unit III: MAGNETIC PROPERTIES OF SOLIDS:** Classification of magnetic materials – properties of dia, para, ferro, ferri and antiferromagnetism – Langevin'stheory of diamagnetism – Langevin's theory of paramagnetism – Curie-Weiss law – Weiss theory of ferromagnetism (qualitative only) –domains – hysteresis and energy loss.	18	Chalk and Talk, PPT, group discussion
IV	**Unit IV: DIELECTRIC PROPERTIES OF MATERIALS:** Polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – Source of polarizability: electronic polarization– ionic, dipolar polarizability– Clausius-Mosotti relation – frequency dependence of dielectric constant –dielectric loss –dielectric breakdown: intrinsic and discharge breakdown.	18	Chalk and Talk, PPT, group discussion.
V	**Unit V: SUPERCONDUCTING PROPERTIES OF MATERIALS:** Superconductivity: experimental results –critical temperature –critical magnetic field – Meissner effect –Type-I and type-II superconductors – London's equation and penetration depth — idea of BCS theory (no derivation) - Thermodynamic and Optical properties: entropy-specific heat - energy gap and isotope effect.	18	Chalk and Talk, PPT, group discussion ,

	Department of Physics				Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	Core Course 15	23OUPH63	Digital electronics and Microprocessor 8085	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To Learn about number systems, Boolean algebra, logical operation and logic gates.
2. To Understand the working of adder, subtractors, multiplexers and demultiplexers.
3. To Get knowledge on flip-flops and storage devices.
4. To Gain inputs on architecture of microprocessor 8085.
5. To Develop program writing skills on microprocessor 8085.

Course Content:

Unit I: Decimal, binary, octal, hexadecimal numbers systems and their conversions – Binary-coded Decimal code (BCD code) - complements (1's, 2's) –binary addition, binary subtraction using 1's and 2's complement methods – Boolean theorem – De-Morgan's theorem –basic logic gates (AND, OR, NOT) -universal logic gates (NAND and NOR).

Unit II: Adders: half and full adder –subtractors: half and full subtractor – parallel binary adder – Multiplexers (4:1) and Demultiplexers (1:4), Encoder: Decimal- to- BCD encoder- Decoders: BCD-to-decimal decoder – BCD to seven segment decoder.

Unit III: Flip-flops: R-S Flip-flop- T and D type flip-flops, J-K Flip-flop, master-slave JK flip-flop, truth tables, registers: - serial in serial out and parallel in and parallel out – counters asynchronous: -mod-4, synchronous - 4-bit and ring counter.

Unit IV: 8085 Microprocessor: Introduction to microprocessor – INTEL 8085 architecture – Initiated operations and 8085 bus organization –pin configuration of 8085 – the 8085 interrupts– Program Status Word (PSW) –instruction set of 8085 –addressing modes of 8085 –assembly language programming using 8085.

Unit V: Programmes for addition, subtraction, multiplication (8- Bit), division (8- Bit)- Digital to Analog converter and Analog to Digital converter – Binary to BCD and BCD to binary - Traffic Signal.

Books for Study:

1. V.K. Puri, 2008, Digital electronics circuits and systems, RevisedEdition, Tata McGraw-hill publishing company, New Delhi.

2. Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing, Mumbai. - Ramesh S.Gaonakar

Books for Reference:

1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" . McGraw Hill. 1985.

2. S.K. Bose. "Digital Systems". 2/e. New Age International.1992.

3. D.K. Anvekar and B.S. Sonade. "Electronic Data Converters: Fundamentals andApplications". TMH.1994.

4. Malvino and Leach. "Digital Principles and Applications". TMG HillEdition

5. Microprocessors and Interfacing – Douglas V.Hall

Web resources/ E-Books:

1. **https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SEC1310.pdf**

2. https://www.geeksforgeeks.org/data-transfer-instructions-8085-microprocessor/

3. https://youtu.be/-paFaxtTCkI

4. https://youtu.be/s1DSZEaCX_g

5. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.ht m

6. https://www.geeksforgeeks.org/architecture-of-8085-microprocessor/

7. https://littleflowercollege.edu.in/upload/e_contents/files/1d029a4415491f528f634cce5 71c2dba.pdf

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: This course develops a good understanding of electronics with its principles and the operation of the microprocessor, it also explores the working of Microsoft program for several laboratory purposes.

Activities to be given:

1. Composing the microprocessor program to raise the caliber of the students.

2. Train the students to execute microprocessor program.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	Learn about number systems, Boolean algebra, logical operation and logic gates	K1 to K3
CLO2	Understand the working of adder, subractors, multiplexers and demultiplexers.	K1 to K3
CLO3	Get knowledge on flip-flops and storage devices.	K1 to K4
CLO4	Gain inputs on architecture of microprocessor 8085.	K1 to K3
CLO5	Develop program writing skills on microprocessor 8085.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	2	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS (90HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Decimal, binary, octal, hexadecimal numbers systems and their conversions – codes: BCD, gray and excess-3 codes –code conversions –complements (1's, 2's, 9's and 10's) –binary addition, binary subtraction using 1's and 2's complement methods – Boolean laws – De-Morgan's theorem –basic logic gates -universal logic gates (NAND and NOR).	18	Chalk and Talk, PPT, group discussion
II	Adders, half and full adder –subtractors, half and full subtractor – parallel binary adder – magnitude comparator – multiplexers (4:1) and demultiplexers (1:4), encoder (8-line-to-3- line) and decoder (3- line-to-8-line), BCD to seven segment decoder.	18	Chalk and Talk, PPT, group discussion
III	Flip-flops: S-R Flip-flop , J-K Flip-flop, T and D type flip-flops, master-slave flip-flop, truth tables, registers:- serial in serial out and parallel in and parallel out – counters asynchronous:-mod-8, mod-10, synchronous - 4-bit and ring counter – general memory operations, ROM, RAM (static and dynamic), PROM, EPROM, EEPROM, EAROM. IC – logic families: RTL, DTL, logic, CMOS NAND and NOR Gates.	18	Chalk and Talk, PPT, group discussion
IV	8085 Microprocessor: introduction to microprocessor – INTEL 8085 architecture –Initiated operations and 8085 bus organization –pin configuration of 8085 – the 8085 interrupts– Program Status Word (PSW) – instruction set of 8085 –addressing modes of 8085 –assembly language programming using 8085 –Programmes for addition , subtraction, multiplication (8- Bit), division (8- Bit) – BCD to ASCII and ASCII to BCD.	18	Chalk and Talk, PPT, group discussion.
V	I/O Interfaces: programmable peripheral interface (8255-PPI) – programmable interval timers (8253) – keyboard and display (8279), DMA controller (8237).	18	Chalk and Talk, PPT, group discussion

	Department of Physics			Class: III B.Sc				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/ Week**	**CIA**	**SE**	**Total**
VI	Core Course 16	23OUPH6P	Practical – VI: Electronics	3	3	40	60	100

Minimum of Eight Experiments from the list:

1. Zener diode – Voltage regulation.

2. Bride rectifier using diodes

3. Clipping and clamping circuits using diodes.

4. Characteristics of a transistor – (CE mode)

5. Characteristics of a transistor – (CB mode).

6. Voltage doubler.

7. Transistor Emitter follower.

8. Colpitt's oscillator -transistor.

9. Hartley oscillator - transistor.

10. Monostable multivibrator – IC 555 / Transistor.

11. Astable multivibrator – IC 555 / Transistor.

12. FET - characteristics.

13. FET - amplifier (common drain)

14. UJT –characteristics

15. Operational amplifier - inverting amplifier and summing.

16. Operational amplifier - non-inverting amplifier and summing.

17. Operational amplifier – differential amplifier

18. Op-amp-IC741 – Differentiator and Integrator.

19. Operational amplifier - D/A converter by binary weighted method.

20. 5V, IC 7805- Regulated power supply.

21. BCD to Seven segment display.

22. NAND as universal building block.

23. IC-Logic Gates-Truth table of all fundamental gates Verification (AND, OR, NOT, NAND, NOR).

24. De Morgan's Theorems-using IC's (AND, OR, NOT)

25. NOR as universal building block.

26. Half adder / Half subtractor using basic logic gate ICs

27. Microprocessor Programming for Addition.

28. Microprocessor Programming for Subtraction.

29. Microprocessor Programming for Multiplication.

30. Microprocessor 8085 – division (8 bit only)

31. Microprocessor 8085 – square (8 bit only)

32. Microprocessor 8085 – square root (8 bit only)

33. Microprocessor 8085 – largest/smallest of numbers (8 bit only)

34. Microprocessor 8085 –ascending/descending order

35. Microprocessor 8085 – Fibonacci series

Reference Books:

1. M.N.Srinivasan, S.Balasubramanian, R.Ranganathan(2007), A Text Book of Practical Physics, Sultan Chand & Sons.

2. Indu Prakash & Ramakrishna(2008), A Text Book of Practical Physics, Kitab Mahal Agencies

3. S.R. GovindaRajan, T. Murugaiyan, S. SundaraRajan(2006), Practical Physics, Rochouse & Sons.

Web Resources:

1. http://www.tndte.gov.in/site/wp-content/uploads/2016/08/Engineering-physics.pdf

2. https://www.academia.edu/34783511/Practical_Physics_for_Degree_Students_Gias_Uddin _and_Shahabuddin

3. https://www.academia.edu/35371782/PHYSICS_LABORATORY_MANUAL_UG_Course s_I_and_II_Semester1.UG course OBE.docx

Pedagogy:

Demonstration and Practical sessions.

Lesson Plan:Teaching Hours (30hrs)

UNIT	Topics to be Covered	Hours	Mode
I	1. Zener diode – Voltage regulation. 2. Bride rectifier using diodes 3. Clipping and clamping circuits using diodes. 4. Characteristics of a transistor – (CE mode) 5. Characteristics of a transistor – (CB mode). 6. Voltage doubler. 7. Transistor Emitter follower.	6	Demo & Practical Session
II	8. Colpitt's oscillator -transistor. 9. Hartley oscillator - transistor. 10. Monostable multivibrator – IC 555 / Transistor. 11. Astable multivibrator – IC 555 / Transistor. 12. FET - characteristics. 13. FET - amplifier (common drain) 14. UJT –characteristics	6	Demo & Practical Session
III	15. Operational amplifier - inverting amplifier and summing. 16. Operational amplifier - non-inverting amplifier and summing. 17. Operational amplifier – differential amplifier 18. Op-amp-IC741 – Differentiator and Integrator. 19. Operational amplifier - D/A converter by binary weighted method.	6	Demo & Practical Session
IV	20. 5V, IC 7805- Regulated power supply. 21. BCD to Seven segment display. 22. NAND as universal building block. 23. IC-Logic Gates-Truth table of all fundamental gates Verification (AND, OR, NOT, NAND, NOR). 24. De Morgan's Theorems-using IC's (AND, OR, NOT) 25. NOR as universal building block. 26. Half adder / Half subtractor using basic logic gate ICs 27. Microprocessor Programming for Addition.	6	Demo& Practical Session
V	28. Microprocessor Programming for Subtraction. 29. Microprocessor Programming for Multiplication. 30. Microprocessor 8085 – division (8 bit only) 31. Microprocessor 8085 – square (8 bit only) 32. Microprocessor 8085 – square root (8 bit only) 33. Microprocessor 8085 – largest/smallest of numbers (8 bit only) 34. Microprocessor 8085 –ascending/descending order 35. Microprocessor 8085 – Fibonacci series	6	Demo & Practical Session

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	DSEC III	23OUPHDSE6A	Lasers and Fiber Optics	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. The students will learn the fundamentals, types of lasers, laser instrumentation and their applications also the interconnect between optics with lasers.

2. To understanding concepts like total internal reflection and mode propagation.

3. To understanding their use in telecommunications, data transmission, and various other fields.

4. To Learn about the basic characteristics of optical fiber, classification of fibers and fabrication techniques of fibers to solve problems.

5. To study the basics of fiber materials and characteristics.

Course Content:

Unit I: FUNDAMENTALS OF LASER: Basic principles: spontaneous and stimulated emission – Einstein's coefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two level laser system –quality factor – threshold condition – concept of Q switching– Theory of mode locking–Cavity dumping.

Unit II: TYPES OF LASER: Solid state laser: ruby laser, Nd:YAG laser, – Homojunction Semiconductor laser – Heterojunction Semiconductor laser - Liquid Laser : dye laser -Gas laser: He-Ne laser- CO_2 laser.

Unit III: APPLICATIONS OF LASER: Application of laser in metrology – optical communication – material processing: laser instrumentation of material processing, powder feeder, laser heating, laser welding, laser melting – medical application – Laser instrumentation for surgeries– laser in astronomy

Unit IV: FIBER OPTICS: Basic components of optical fiber communication – principles of light propagation through fiber – total internal reflection – optical fiber – coherent bundle – numerical aperture and skew mode – phase shift and attenuation during total internal reflection.

Unit V: APPLICATION OF FIBER OPTICS: Fiber Fabrication - Types of fiber: single mode and multi-mode fiber – step index and graded index fiber – Losses in optical fiber- Light sources for fiber optics – LED - Laser diode -Photodetectors – Fiber optic sensors – Applications of Optical Fibers.

Book for study:

1. B.B. Laud - Laser and Non-linear Optics, New Age International Publications Third Edition, New Delhi.

2. An Introduction to laser, theory and applications by Avadhunulu, M.N.S.,Chand and Co, New Delhi

3. J. Wilson and J.F.B. Hawkes. 'Introduction to Opto Electronics', Pearson Education, 2018.

Books for Reference:

1. A. Sennaroglu, "Photonics and Laser Engineering: Principles, Devices and Applications" Mc Graw-Hill Education, 2010.

2. K.R. Nambiar, "Lasers: Principles, Types and Applications", New Age International, 2004.

3. Optic, Ajoy Ghatak, McGraw-Hill Education (India) Pvt, Ltd, 6th Edn., 2017.

4. Opto Electronic Devices, Advanced stimulation and analysis – Joachim piprek editor

Web resources/ E-Books:

1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SIC1605.pdf

2. https://pgslogan.weebly.com/uploads/2/4/7/0/24706722/unit-i.pdf

3. https://www.youtube.com/watch?v=a_3qQDi_5LI

4. https://www.kngac.ac.in/elearningportal/ec/admin/contents/2_18K3P04_2020101605284113.pdf

5. https://www.jsscacs.edu.in/sites/default/files/Department%20Files/LASERS%20%281%29.pdf

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: The course enables the students with the understanding of basics of Laser and fibre optics.

Activities to be given:

1. Enhancing the quality of students to understand the fundamentals of Lasers.

2. Enhancing the quality of students to understand the fundamentals fibre optics.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	learn the fundamentals, types of lasers, laser instrumentation and their applications also the interconnect between optics with lasers.	K1 to K3
CLO2	understanding concepts like total internal reflection and mode propagation.	K1 to K3
CLO3	understanding their use in telecommunications, data transmission, and various other fields.	K1 to K4
CLO4	Learn about the basic characteristics of optical fiber, classification of fibers and fabrication techniques of fibers to solve problems.	K1 to K3
CLO5	study the basics of arrays and functions in C Programs.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS(60HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Unit I: FUNDAMENTALS OF LASER:** Basic principles: spontaneous and stimulated emission – Einstein's coefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two level laser system – quality factor – threshold condition – concept of Q switching–Theory of mode locking–Cavity dumping.	12	Chalk and Talk, PPT, group discussion
II	**Unit II: TYPES OF LASER: S**olid state laser: ruby laser, Nd:YAG laser, – Homojunction Semiconductor laser – Heterojunction Semiconductor laser - Liquid Laser : dye laser -Gas laser: He-Ne laser- CO_2 laser.	12	Chalk and Talk, PPT, group discussion
III	**Unit III: APPLICATIONS OF LASER:** Application of laser in metrology – optical communication – material processing: laser instrumentation of material processing, powder feeder, laser heating, laser welding, laser melting – medical application – Laser instrumentation for surgeries– laser in astronomy	12	Chalk and Talk, PPT, group discussion
IV	**Unit IV: FIBER OPTICS:** Basic components of optical fiber communication – principles of light propagation through fiber – total internal reflection – optical fiber – coherent bundle – numerical aperture and skew mode – phase shift and attenuation during total internal reflection.	12	Chalk and Talk, PPT, group discussion.
V	**Unit V: APPLICATION OF FIBER OPTICS:** Fiber Fabrication - Types of fiber: single mode and multi-mode fiber – step index and graded index fiber – Losses in optical fiber- Light sources for fiber optics – LED - Laser diode - Photodetectors – Fiber optic sensors – Applications of Optical Fibers.	12	Chalk and Talk, PPT, group discussion.

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	DSEC III	23OUPHDSE6B	Nanoscience and Nano Technology	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To learn about basic nanostructures and its types.
2. To analyze the properties of Nanomaterials.
3. to analyze the various fabrication methods of nanomaterials.
4. To understand the different characterization techniques.
5. To know the applications of nanomaterials.

Course Content:

Unit I: NANOSCIENCE AND NANOTECHNOLOGY: Nanoscale– nature and nanostructures – nanostructures: 0D, 1D,2D– surface to volume ratio– size effect – excitons – quantum confinement– metal based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT.

UNIT-II: PROPERTIES OF NANOMATERIALS: Introduction –mechanical behavior –elastic properties – hardness and strength – ductility and toughness –superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties –magnetic properties – super paramagnetism – electrochemical properties – properties of CNTs.

UNIT-III: FABRICATION METHODS AND VACUUM TECHNIQUES: Top-

down and bottom-up approaches – electrochemical method – chemical and physical vapour depositions (CVD and PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – lithography: photolithography – e-beam lithography – sol-gel methods – synthesis of CNT.

UNIT-IV: CHARACTERIZATION TECHNIQUES: Scanning probe microscopy – scanning tunneling microscopy – atomic force microscopy – scanning electron microscopy – transmission electron microscopy – powder XRD method: determination of structure and grain size analysis– UV-visible and photoluminescence spectroscopy.

UNIT-V: APPLICATIONS OF NANOMATERIALS: Medicine: drug delivery – photodynamic therapy – molecular motors –energy: fuel cells – rechargeable batteries – supercapacitors– photovoltaics. sensors: nanosensors based on optical and physical properties – electrochemical sensors – nanobiosensors. nanoelectronics: CNTFET – display screens– GMR read/write heads – nanorobots –applications of CNTs.

Books for Study:

1. K.K.Chattopadhyay and A.N.Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd.,

2. M.A. Shah, Tokeer Ahmad (2010), Principles of Nanoscience and Nanotechnology, Narosa Publishing House Pvt Ltd.

3. Mick Wilson, et al (2005) Nanotechnology, Overseas Press.

Books for Reference:

1. Richard Booker and Earl Boysen, (2005) Nanotechnology, Wiley Publishing Inc. USA

2. J.H.Fendler (2007) Nano particles and nano structured films; Preparation, Characterization and Applications, John Wiley and Sons

3. B.S.Murty, et al (2012) Textbook of Nanoscience and Nanotechnology, Universities Press.

Web resources/ E-Books:

1. https://www.nanowerk.com/what_are_synthetic_nanoparticles.php
2. https://www.youtube.com/watch?v=-mp8AtaaYp4
3. https://www.youtube.com/watch?v=Z51R49OOqAA
4. https://www.frontiersin.org/articles/10.3389/fchem.2022.845363/full
5. https://pubs.rsc.org/en/content/articlehtml/2021/ma/d0ma00807a

E-Book:
1. https://web.pdx.edu/~pmoeck/phy381/intro-nanotech.pdf
2. https://www.agc.ac.in/resources/Introduction_to_Nanomaterials_and_Nanotechnology.pdf
3. https://maken.wikiwijs.nl/bestanden/427519/Lesson_7_APPENDIX-2_Article2.pdf
4. http://www.ciando.com/img/books/extract/364220595X_lp.pdf
5. https://onlinelibrary.wiley.com/doi/pdf/10.1002/9783527673919.oth1

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for Nature of the course:

      The course will provide an overview of nanoscience and it will also show the unique properties of Nano particles and its structures.

Activities to be given:

      1.Enhancing the quality of students to research about the nano science.

      2.Train the students to analyze the Nano particles.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	learn about basic nanostructures and its types.	K1 to K3
CLO2	analyze the properties of Nanomaterials.	K1 to K3
CLO3	analyze the various fabrication methods of nanomaterials.	K1 to K4
CLO4	understand the different characterization techniques.	K1 to K3
CLO5	know the applications of nanomaterials.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	2	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS (60HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**NANOSCIENCE AND NANOTECHNOLOGY:** Nanoscale– nature and nanostructures – nanostructures: 0D, 1D,2D– surface to volume ratio– size effect – excitons – quantum confinement– metal based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT	12	Chalk and Talk, PPT, group discussion
II	**PROPERTIES OF NANOMATERIALS:** introduction –mechanical behavior –elastic properties – hardness and strength – ductility and toughness –superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties – magnetic properties – super paramagnetism – electrochemical properties – properties of CNTs.	12	Chalk and Talk, PPT, group discussion
III	**FABRICATION METHODS AND VACUUM TECHNIQUES:** Top-down and bottom-up approaches – electrochemical method – chemical and physical vapour depositions (CVD and PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – lithography: photolithography – e-beam lithography – sol-gel methods – synthesis of CNT.	12	Chalk and Talk, PPT, group discussion
IV	**CHARACTERIZATION TECHNIQUES:** Scanning probe microscopy – scanning tunneling microscopy – atomic force microscopy – scanning electron microscopy – transmission electron microscopy – powder XRD method: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy.	12	Chalk and Talk, PPT, group discussion.
V	**APPLICATIONS OF NANOMATERIALS:** Medicine: drug delivery – photodynamic therapy – molecular motors –energy: fuel cells – rechargeable batteries – supercapacitors– photovoltaics. sensors: nanosensors based on optical and physical properties – electrochemical sensors – nanobiosensors. nanoelectronics: CNTFET – display screens – GMR read/write heads – nanorobots –applications of CNTs	12	Chalk and Talk, PPT, group discussion

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	DSEC IV	23OUPHDSEPR6	Project	3	3	20	80	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
	✓	

Course Objectives:

1. To develop a thorough understanding of a specific topic in Physics.
2. To improve problem-solving and critical thinking abilities.
3. To promote the use of modern technologies and software tools.
4. To encourage independent learning and teamwork.
5. To contribute to scientific knowledge or local problem-solving.

Course Outcome:

1. Design experimental setups, simulations, or models to address scientific questions, ensuring safety, accuracy, and precision.
2. Identify, formulate, and analyze scientific problems using principles of physics and appropriate mathematical tools.
3. Demonstrate effective project management skills, including time management, resource allocation, and teamwork in carrying out a physics project.
4. Communicate effectively on scientific activities with the physics community and society through reports, presentations, and documentation.
5. Recognize the need for and engage in independent and life-long learning in the broadest context of scientific and technological changes.

Course Pattern:

Students have to carry out Project Works under the guidance of the members of the Physics Department during VI semester 3 hours per week. PROJECT Work may be chosen in any field in Physics. Each batch will complete the project work in the month of February and submit their report in March. It will be duly signed by the project guide and the HOD of Physics. It will be evaluated 80 marks for external examiner and 20 marks for internal examiner. The viva on project work will be conducted during the Practical Examination at the end of VI semester. The viva on project will be conducted jointly by Guide, External Examiner HOD and the members of staff.

Department of Physics					Class: III B.Sc			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
VI	SEC 8	23OUPHSEC6	Physics of Medical Instruments	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
	✓	

Course Objectives:

1. To provide background of the Physics principles in medical instrumentation technologies through theoretical and practical learning.

2. To understand the essential components of instruments like ECG, EEG, EMG, medical imaging, diagnostic specialties, operation theater.

3. To gain the knowledge about its safety which will kindle interest to specialize in instrument servicing.

4. To Know the importance of medical physics in diagnosis and treatment.

5. To Learn about treatment by understanding the physics of the devices used.

Course Content:

Unit I: BIO-POTENTIALS AND ELECTRODES: Transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode – the pH electrode.

Unit II: Bio-potential based Instrumentation: Electrocardiography (ECG) – origin of cardiac action potential - ECG lead configuration –block diagram of ECG recording set up (qualitative) – Electroencephalography (EEG) – origin of EEG – action and evoked potentials - brain waves – block diagram of modern EEG set up.

Unit III: OPERATION THEATRE AND SAFETY: Diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy ventilators – servo controlled systems.

Unit IV: MEDICAL IMAGING: Nuclear imaging technique –computer tomography (CT) – principle – mathematical basis of image construction –block diagram of CT scanner.

Unit V: LASER IN MEDICINE: laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation (qualitative).

Books for Study:

1. Biomedical Instrumentation and measurement, Leslie Cromwell, PHI, 2015

2. Medical Instrumentation, M. Arumugam, Anuradha agencies, 1992

Books for Reference:

1. Medical Electronics, M.J.Kumar Doss, Prathibha Publishers, 1987.

2. Medical Physics, John R. Cameron and James G. Skofronick, Thrift books, Atlanta, 1985.

3. Electronic Instruments and Instrumentation Technology, M. M.M.Anand, PHI, 2015.

4. John Webster (2004) Bioinstrumentation John Wiley and Sons, Singapore.

5. John Enderle, Susan Blanchard, Joseph Bronzino (2005) Introduction to Biomedical Engineering, 2nd ed. Elsevier, San Deigo

6. William Hendee, Geoffrey Ibbott, Eric Hendee (2005) Radiation therapy Physics 3^{rd}ed. Wiley-Liss, New Jersey

Web resources/ E-Books:

1. https://rlmc.edu.pk/themes/images/gallery/library/books/Surgery/Medical%20Instruments.pdf

2. https://www.akinik.com/edited-book-pdf/fundamentals-of-medical-physics-principles-and-applications.pdf?srsltid=AfmBOooQprN3UzNo2Lw1Y6JV9q_N6Mb5qSCm1tsIPiUyUDhDx0aqmm7

3. http://ijlalhaider.pbworks.com/w/file/fetch/70354430/IP447_BIB.pdf

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, on the spot test.

Rationale for nature of Course

Knowledge and skill: The course delves into the physics behind various medical instruments, including X-ray machines, MRI scanners, ultrasound devices, and lasers used in surgery. The course provides them with the foundational knowledge and skills needed for these roles.

Activities to be given:

1. Enhance the Students can design a simple medical device or improve an existing one, incorporating physics principles into their design.

2. Use concept inventories to assess student understanding of key medical physics concepts, like radiation safety and imaging principles.

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to:

CLO	Course Learning Outcomes	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	Provide background of the Physics principles in medical instrumentation technologies through theoretical and practical learning.	K1 to K3
CLO2	Understand the essential components of instruments like ECG, EEG, EMG, medical imaging, diagnostic specialties, operation theater.	K1 to K3
CLO3	Gain the knowledge about its safety which will kindle interest to specialize in instrument servicing.	K1 to K3
CLO4	The importance of medical physics in diagnosis and treatment.	K1 to K3
CLO5	Learn about treatment by understanding the physics of the devices used.	K1 to K3

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	2	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN : TOTAL HOURS (30HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**BIO-POTENTIALS AND ELECTRODES:** Transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode – the pH electrode.	6	Chalk and Talk, PPT, group discussion
II	**Bio-potential based Instrumentation:** Electrocardiography (ECG) – origin of cardiac action potential - ECG lead configuration –block diagram of ECG recording set up (qualitative) – Electroencephalography (EEG) – origin of EEG – action and evoked potentials - brain waves – block diagram of modern EEG set up.	6	Chalk and Talk, PPT, group discussion
III	**OPERATION THEATRE AND SAFETY:** Diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy ventilators – servo controlled systems.	6	Chalk and Talk, PPT, group discussion
IV	**MEDICAL IMAGING:** Nuclear imaging technique –computer tomography (CT) – principle – mathematical basis of image construction –block diagram of CT scanner.	6	Chalk and Talk, PPT, group discussion.
V	**LASER IN MEDICINE:** laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation (qualitative).	6	Chalk and Talk, PPT, group discussion ,