B.Sc., PHYSICS

Course Structure and Syllabus

(For the candidates admitted from the academic
year 2025-2026 onwards)

CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS-LOCF)

THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Approved by NAAC, Affiliated to Bharathidasan University)

ELAMBALUR, PERAMBALUR – 621 220

Vision

To build a base for pre-eminence and strengthen the augmentation of the institutions as a primeInstitution by igniting and promoting impetuosity, interest in the study of Physics.

Mission

- To establish a platform for the dissemination and creation of knowledge through teaching and research in Physics at various levels.
- The study of physics promotes understanding of the basic workings of nature. It also extends that understanding beyond the realms of our everyday lives, from the scales of atomic nuclei to those of galaxies.
- It is essential for understanding the role of technology in society as well as important policy issues.

PROGRAMME OUTCOMES -POs

PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study

PO2: **Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3: **Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PROGRAMME SPECIFIC OUTCOMES-PSOs

PSO1: Placement:

To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.

PSO 2: Entrepreneur:

To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations

PSO3: Research and Development:

Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.

PSO4: Contribution to Business World:

To produce employable, ethical and innovative professionals to sustain in the dynamic business world.

PSO5: Contribution to the Society:

To contribute to the development of the society by collaborating with stakeholders for mutual benefit

Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur – 621 220.

B.Sc., Physics

Choice-Based Credit System – Learning Outcome-Based Curriculum Framework

(For the candidate admitted from the academic year 2025 -2026)

Semester	Part	Course Code	Title of the Course	Int. Hrs /Week	Credits	End Sem. Exam Hrs	Max. Marks		
							CIA	ESE	Total
I	I	25UT1/H1	Tamil Ilakiya Varalaru – I	6	3	3	25	75	100
	II	25UE1	English – I	6	3	3	25	75	100
	III	25UPH1CC1	Properties of Matter and Acoustics	6	5	3	25	75	100
		25UPH1CP1	Major Practical - I	3	3	3	40	60	100
		25UMA1AC1	Allied Mathematics - I	4	4	3	25	75	100
		25UMA2AC2	Allied Mathematics - II *	3	--	--	--	--	--
	IV	25UVE	Value Education	2	2	3	25	75	100
			Value Added Course*	--	2*	3	50	50	100*
Total				**30**	**20**	**-**	**-**	**-**	**600**
II	I	25UT2/H2	Tamil Ilakiya Varalaru-II	6	3	3	25	75	100
	II	25UE2	English – II	6	3	3	25	75	100
	III	25UPH2CC2	Heat, Thermodynamics and Statistical Mechanics	5	4	3	25	75	100
		25UPH2CP2	Major Practical - II	3	3	3	40	60	100
		25UMA2AC2	Allied Mathematics - II	3	3	3	25	75	100
		25UMA2AC3	Allied Mathematics - III	3	3	3	25	75	100
	IV	25UPH2NME1	Introductory Physics	2	2	3	25	75	100
		25UES	Environmental Studies	2	2	3	25	75	100
			Value Added Course*	--	2*	3	50	50	100*
Total				**30**	**23**	**-**	**-**	**-**	**800**
III	I	25UT3/H3	Tamilaga Varalarum Panpadum	6	3	3	25	75	100
	II	25UE3	English – III	6	3	3	25	75	100
	III	25UPH3CC3	Mechanics	4	4	3	25	75	100
		25UPH3CP3	Major Practical - III	3	3	3	40	60	100
		25UCH2AC3	Allied Chemistry - I	4	3	3	25	75	100
		25UCH4AP1	Allied Chemistry Practical - I	3	--	--	--	--	--
	IV	25UPH3NME2	Physics for Everyday Life	2	2	3	25	75	100
		25UPH2SE1	Consumer Electronics	2	2	3	25	75	100
			Value Added Course*	--	2*	3	50	50	100*
Total				**30**	**20**	**-**	**-**	**-**	**700**

Semester	Part	Course Code	Title of the Course	Int. Hrs /Week	Credits	End Sem. Exam Hrs	Max. Marks		
							CIA	ESE	Total
IV	I	25UT4/H4	Tamilum Ariviyalum	6	3	3	25	75	100
	II	25UE4	English - IV	6	3	3	25	75	100
	III	25UPH4CC4	Electricity, Magnetism and Electromagnetism	5	**4**	3	25	75	100
		25UPH4CP4	Major Practical - IV	3	**3**	3	40	60	100
		25UCH4AP1	Allied Chemistry Practical - I	4	**3**	3	25	75	100
		25UCH4AC4	Allied Chemistry - II	3	**2**	3	25	75	100
	IV	25UPH4SE2	Entrepreneurial Electronics	2	2	3	25	75	100
		25UHW	Health and Welleness	1	1	--	--	--	100
			Value Added Course*	--	2*	3	50	50	100*
Total				**30**	**21**	**-**	**-**	**-**	**800**
V	III	25UPH5CC5	Advanced Optics & Spectroscopy	6	**5**	3	25	75	100
		25UPH5CC6	Analog Electronics	6	**5**	3	25	75	100
		25UPH5CC7	Atomic Physics	5	**5**	3	25	75	100
		25UPH5CP5	Major Practical - V	3	**3**	3	40	60	100
		25UPH5DE11 25UPH5DE12	Solid State Physics Laser and Fiber optics	4	**4**	3	25	75	100
		25UPH5DE21 25UPH5DE22	Relativity and Quantum Mechanics History of Physics	4	**4**	3	25	75	100
	IV	25USS	Soft Skills	2	2	3	25	75	100
		25UPH5S1	Summer Internship	--	2*	3	--	--	100
			Value Added Course*	--	2*	3	50	50	100*
Total				**30**	**28**	**-**	**-**	**-**	**800**
VI	III	25UPH6CC8	Nuclear & Particle Physics	6	**5**	3	25	75	100
		25UPH6CC9	Digital Electronics & Microprocessor	6	**5**	3	25	75	100
		25UPH6CC10	Laser and Medical Physics	6	**5**	3	25	75	100
		25UPH6DE31 25UPH6DE32	Numerical Methods Communication Physics	4	**4**	3	25	75	100
		25UPH6DE41 25UPH6DE42	Nanoscience & Nanotechnology Energy Physics	4	**4**	3	25	75	100
		25UPH6PW	Project With Viva Voce	3	**3**	3	20	80	100
	V	25UGS	Gender Studies	1	1	3	25	75	100
	V		Extension Activity	--	1	--	--	--	--
			Value Added Course*	--	2*	3	50	50	100*
Total				**30**	**28**	**-**	**-**	**-**	**700**
Total				**180**	**140**				**4400**

Extra Credit Courses which will not be included in the total CGPA

- Summer Internship after 5th semester during summer vacation -30 Hours
- Value added course (Outside Instruction hours: 30 hours)

Course details:	No. of Courses & Credits	Total Credits
Part I		
Tamil	6 * 3	12
Part II		
English	6 * 3	12
Part III		
Core Course	10 * 5 + 3*3	59
Core Course: Project with Viva-Voce	1 * 3	3
Allied Course	4 * 4	16
Discipline Elective	4 * 4 (4)	16
Part IV		
Gender Studies	1 * 1	1
Environmental Studies	2 * 2	4
Value Education	2 * 2	4
Part V		
Extension Activity	1 (Credit Only)	1

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for Semester Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for Semester Examinations shall be 40% out of 60 marks [i.e. 24 marks]

- Project : 100 Marks (The Project will be evaluated by an Internal and an External Examiner)
  Dissertation- 80 Marks
  Viva Voce - 20 Marks

List of Core Courses

CC1 - Properties of Matter and Acoustics
CP1- Major Practical -I
CC2 - Heat, Thermodynamics and Statistical Mechanics
CP2 - Major Practical-II
CC3- Mechanics
CP3- Major Practical-III
CC4 – Electricity,Magnetism and Electromagnetism

CP4 - Major Practical-IV
CC5 - Advanced optics and spectroscopy
CC6 - Analogy Electronics
CC7 – Atomic Physics
CP5 - Major Practical-V
CC8 – Nuclear And Particle Physics
CC9 – Digital electronics and Microprocessor
CC10 – Laser and Medical Physics
6PW- Project Work

List of Allied Courses: (Offered as allied subject to B.Sc. Mathematics, Chemistry)

AC1- Properties of Matter, Thermal Physics and Optics
AC2- Electricity, Electronics, Atomic and Nuclear Physics
AP1- Allied Physics Practical

(Offered as allied subject to B.Sc. Computer Science)

AC3- Electricity, Digital Electronics
AC4- Analog, Optoelectronics Devices
AP1- Allied Physics Practical

Skill Enhancement Courses

SE1 – Consumer Electronics
SE2 – Entrepreneurial Electronics

Question Paper Pattern

<table>
<tr><td colspan="3" align="center">UG Programme</td></tr>
<tr><td colspan="2">Maximum Marks : 75</td><td>Duration: 3 Hours</td></tr>
<tr><td rowspan="3">Section - A</td><td>i) a- (5 Questions for Multiple Choice)
One question from each unit</td><td>5 x 1 = 5 Marks</td></tr>
<tr><td>b- (5 Questions for Fill in the Blanks)
One question from each unit</td><td>5 x 1 = 5 Marks</td></tr>
<tr><td>ii) (5 short answer questions)
One question from each unit</td><td>5 x 2 = 10 Marks</td></tr>
<tr><td>Section - B</td><td>5 Questions (Internal Choice: Either or)
One set of questions from each unit</td><td>5 x 5 = 25 Marks</td></tr>
<tr><td>Section - C</td><td>3 Questions (Answer any 3 out of 5 Questions)
One question from each unit</td><td>3 x10 = 30 Marks</td></tr>
</table>

Sem.	Course Code	Credits	Title of the Course	CC / AC/ DE / SE / GS / EVS/ VE / VAC	Category			Sem. Exam	Max. Marks		
					Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UPH1CC1	5	Properties of Matter and Acoustics	CC	5	1	0	3 Hrs.	25	75	100

Pre-Requisite:

Course Objectives: The purpose of learning this course is:

1. To know the basics of elasticity and its importance in beams, girders.
2. To inform about the internal forces which act between the constituent parts of the substance.
3. To understand the concepts of viscosity, surface tension and the various methods to determine the parameters experimentally.
4. To provide students an insight of the principles of waves and oscillation and their characteristics.
5. To understand the physics of sound and its applications.

Course Outcomes:

CO1: Identify the materials suitable for construction of buildings, based on the moduli of elasticity.

CO2: Understand the concepts of bending of beam and determination.

CO3: Understand the concepts of viscosity and the various methods to determine the parameters experimentally.

CO4: Principles of waves and oscillations and the methods for their determination.

CO5: determine different physical constants of matter, estimate velocity of sound in different media.

Unit-I	ELASTICITY	15 Hrs.

Elasticity and Plasticity – definition – Hooke's law – stress-strain diagram – elastic Plastic limit – Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses).

Unit-II	BENDING OF BEAMS	15 Hrs.

Definition of bending of beam – Cantilever – expression for Bending moment – expression for depression at the loaded end of the cantilever – oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope.

Unit-III	FLUID DYNAMICS	15 Hrs.

Surface tension: definition - co-efficient of viscosity of liquid – molecular forces – excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method – variation of surface tension with temperature.

Viscosity: definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature – applications of viscosity.

Unit-IV	WAVES AND OSCILLATIONS	15 Hrs.

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures – free, damped, forced vibrations –resonance and sharpness of resonance-fourier's theorem-applications of saw tooth wave and square wave.

Laws of transverse vibration in strings – sonometer – verification of laws – determination of AC frequency using sonometer.

Unit-V	ACOUSTICS OF BUILDINGS AND ULTRASONICS	15 Hrs.

Intensity of sound – decibel – loudness of sound – reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.
Ultrasonic waves: production of ultrasonic waves – Piezoelectric crystal method –magnetostriction effect – properties – deduction – attenuation – diffraction – application of ultrasonic waves – medical,industrial and scientific-classifications of ultrasonic testing-pulse echo method.

Text Book(s):

1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand and Co.
2. Brijlal and N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co.
3. D.R.Khanna and R.S.Bedi, 1969, Textbook of Sound, AtmaRam and sons
4. Brijlal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition, Vikas Publishing House.
5. R.Murugesan, 2012, Properties of Matter, S.Chandand Co.

Reference Book(s):

1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers
2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition,R. Chand and Co.
3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.

Web Resources:

1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3. https://www.youtube.com/watch?v=gT8Nth9NWPM
4. https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s
5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7. http://www.sound-physics.com/
8. http://nptel.ac.in/courses/112104026/

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	3	3	3	2	2	3	3	2	2	2	3
CO2	3	2	3	3	3	3	2	3	3	2	3	3	2
CO3	3	1	3	3	3	3	1	3	3	2	3	3	2
CO4	3	2	3	3	3	3	2	3	3	2	3	2	3
CO5	3	2	3	3	3	3	2	3	3	3	3	3	3
	Overall CO – PO Mapping index = 2.675								**Overall CO – PSO Mapping index = 2.64**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	CC	Category			Sem. Exam	Max. Marks		
			Major Practical- I		Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UPH1CP1	3			0	1	3	3 Hrs.	40	60	100

Pre-Requisite:
Course Outcomes:
CO1:Carry out the experimental determination of moduli of elasticity, rigidity modulus, coefficients of viscosity, surface tension of liquids, focal length of convex lens
CO2:Analyse the relationship between various types of experiments
CO3:verify the laws of transverse vibrations as well as the laws of propagation of light
CO4:Analyse the relationship between various types of experiments
CO5:Study the elastic behaviour of materials

Unit-I	Properties of Matter	24 Hrs.

Minimum of Eight Experiments from the list:

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Verification of parallel axes theorem on moment of inertia.
4. Verification of perpendicular axes theorem on moment of inertia.
5. Determination of Young’s modulus by stretching of wire with known masses.
6. Verification of Hook’s law by stretching of wire method.
7. Determination of Young’s modulus by uniform bending – load depression graph.
8. Determination of Young’s modulus by non-uniform bending – scale and telescope.
9. Determination of Young’s modulus by cantilever – load depression graph.
10. Determination of Young’s modulus by Koenig’s method – (or unknown load)
11. Determination of rigidity modulus by static torsion.
12. Determination of surface tension and interfacial surface tension by drop weight method.
13. Determination of co-efficient of viscosity by Stokes’ method – terminal velocity.
14. Determination of radius of capillary tube by mercury pellet method.
15. Determination of g using compound pendulum.

Text Book(s):
1. Practical Physics, Gupta and Kumar, PragatiPrakasan.
2. Kit Developed for doing experiments in Physics-Instruction
3. Electronic Laboratory Primer a design approach, S.Poornachandra, B.Sasikala, Wheeler Publishing, New Delhi.
4. Electronic lab manual Vol I, K ANavas, Rajath Publishing.
5. Electronic lab manual Vol II, K ANavas, PHI eastern Economy Edition.

Reference Book(s):
1. Advanced Practical Physics, S.P Singh, PragatiPrakasan.
2. An advanced course in Practical Physics, Chattopadhyay, C.R Rakshit, New Central Book AgencyPvt. Ltd
3. Op-Amp and linear integrated circuit, Ramakanth A Gaikwad, Eastern Economy Edition.
4. A course on experiment with He-Ne Laser, R.S. Sirohi, John Wiley & Sons (Asia) Pvt. Ltd.
5. Electronic lab manual Vol II, Kuriachan T.D, Syam Mohan, Ayodhya Publishing.

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	3	3	3	3	2	3	3	2	3	2	3
CO2	3	2	3	3	3	3	2	3	3	2	3	2	2
CO3	3	1	3	3	3	2	1	3	3	1	2	2	2
CO4	3	2	3	3	3	3	2	3	3	2	3	2	3
CO5	3	1	3	2	3	2	1	3	2	1	2	2	2
	Overall CO – PO Mapping index = 2.575								**Overall CO – PSO Mapping index = 2.28**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

<table>
<tr><th rowspan="2">Sem.</th><th rowspan="2">Course Code</th><th rowspan="2">Credits</th><th>Title of the Course</th><th rowspan="3">CC</th><th colspan="3">Category</th><th rowspan="2">Sem. Exam</th><th colspan="3">Max. Marks</th></tr>
<tr><th rowspan="2">HEAT, THERMODYNAMICS AND STATISTICAL MECHANICS</th><th>Lect. Hrs.</th><th>Tutorial Hrs.</th><th>Lab. Hrs.</th><th>CIA</th><th>ESE</th><th>Total.</th></tr>
<tr><td>II</td><td>25UPH2CC2</td><td>4</td><td>5</td><td>1</td><td>0</td><td>3 Hrs.</td><td>25</td><td>75</td><td>100</td></tr>
</table>

Pre-Requisite:

Course Objectives: The purpose of learning this course is:

1. To brief out the ideas of low temperature Physics and Radiation laws.
2. To study the fundamental laws of thermodynamics and concept of entropy.
3. To outline the concept of specific heat of liquids by theories.
4. To provide students an insight of the principles of heat transfer.
5. To understand the concept of statistical mechanics.

Course Outcomes:

CO1: To learn about the specific heat of matter and about low temperature physics.

CO2: Understand the laws of thermodynamics and their applications.

CO3: Analyse Maxwell's Thermo dynamical relations and their applications.

CO4: Understand the nature of calorimetric by specific heat of solids and law of thermodynamics and entropy.

CO5: Understanding the statistical methods

Unit-I	CALORIMETRY	15 Hrs.

Specific heat capacity Substance(Solid &Liquid)–Ratio of specific heat capacity- specific heat capacity of gases C_P and C_V– Meyer's relation – Joly's method for determination of C_V –Calculation of universal gas constant R from the gas equation PV=RT- Regnault's method for determination of C_P.

Low temperature physics: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.

Unit-II	THERMODYNAMICS-I	15 Hrs.

Zeroth law and first law of thermodynamics – statement – isothermal and adiabatic changes – explanation-thermodynamic potential(U,S,G,H) – P-V diagram – heat engine – efficiency of heat engine – carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.

Unit-III	THERMODYNAMICS-II	15 Hrs.

Second law of thermodynamics –Kelvin and Clausius Statement and Kelvin's-Kelvin statement– entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram – thermo dynamical scale of temperature – Maxwell's thermo dynamical relations – Clasius- Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.

Unit-IV	HEAT TRANSFER	15 Hrs.

Concept of heat and temperature – Modes of heat transfer: conduction, convection and radiation. ***Conduction***: Thermal conductivity – Co-efficient of thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method.

Radiation: Properties of thermal radiation – black body radiation (Ferry's method) – application of black body radiation – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law – Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.

Unit-V	STATISTICAL MECHANICS	15 Hrs.

Definition of phase-space – micro and macro states – ensembles – different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics – expression for distribution function – comparison of three statistics.

Text Book(s):

1. Brijlal and N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand and Co.
2. Narayanamoorthy and Krishna Rao, 1969,Heat,Triveni Publishers, Chennai.
3. V.R.Khanna and R.S.Bedi, 1998 1^{st} Edition, Text book of Sound, Kedharnaath Publish and Co, Meerut
4. Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi.
5. Ghosh, 1996, Text Book of Sound, S.Chand and Co.

Reference Book(s):

1. J.B.Rajam and C.L.Arora, 1976, Heat and Thermodynamics, 8^{th} edition, S.Chand and Co. Ltd.
2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand and Sons.
3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand and Co.
4. Resnick, HallidayandWalker,2010, Fundamentals of Physics, 6th Edition.
5. Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.

Web Resources:

1. https://youtu.be/M_5KYncYNyc
2. https://www.youtube.com/watch?v=4M72kQulGKkandvl=en
3. Lecture 1: Thermodynamics Part 1 | Video Lectures | Statistical Mechanics I: Statistical Mechanics of Particles | Physics | MIT Open Course Ware
4. http://www.freebookcentre.net/Physics/Physics-Books-Online.html.

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	2	2	2	1	2	1	1	2	1	1
CO2	3	2	3	3	2	2	1	3	1	2	2	2	1
CO3	3	2	3	3	3	2	1	3	1	2	3	2	1
CO4	3	2	3	2	2	2	1	3	1	2	2	2	1
CO5	3	2	3	3	3	2	1	3	1	2	3	2	2
	Overall CO – PO Mapping index = 2.38								**Overall CO – PSO Mapping index = 1.8**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HOD

Sem.	Course Code	Credits	Title of the Course	CC	Category			Sem. Exam	Max. Marks		
					Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UPH2CP2	3	**Major Practical- II**		0	1	3	3 Hrs.	40	60	100

Pre-Requisite:

Course Outcomes:

CO1:Carry out the experimental determination of moduli of elasticity, rigidity modulus, coefficients of viscosity, surface tension of liquids, focal length of convex lens
CO2:Analyse the relationship between various types of experiments
CO3:verify the laws of transverse vibrations as well as the laws of propagation of light
CO4:Analyse the relationship between various types of experiments
CO5:Study the elastic behaviour of materials

Unit-I	Properties of Matter	24 Hrs.

Minimum of Eight Experiments from the list:

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of bad conductor by Lee’s disc method.
3. Coefficient of viscosity of highly viscous liquid.
4. Determination of specific heat capacity of solid.
5. Emissive power of a surface – Spherical calorimeter.
6. Spectrometer – Grating - Normal incidence.
7. Determination of Stefan’s constant for Black body radiation.
8. Surface tension of a liquid – Capillary rise method
9. Determination of thermal conductivity of rubber tube.
10. Velocity of sound through a wire using Sonometer.
11. Meter Bridge – Specific Resistance of a material of a wire.
12. Determination of frequency of an electrically maintained tuning fork
13. To verify the laws of transverse vibration using sonometer.
14. To compare the mass per unit length of two strings using Melde’s apparatus.
15. Frequency of AC by using sonometer.

Text Book(s):
1. Practical Physics, Gupta and Kumar, PragatiPrakasan.
2. Kit Developed for doing experiments in Physics-Instruction
3. Electronic Laboratory Primer a design approach, S.Poornachandra, B.Sasikala, Wheeler Publishing, New Delhi.
4. Electronic lab manual Vol I, K ANavas, Rajath Publishing.
5. Electronic lab manual Vol II, K ANavas, PHI eastern Economy Edition.

Reference Book(s):
1. Advanced Practical Physics, S.P Singh, PragatiPrakasan.
2. An advanced course in Practical Physics, Chattopadhyay, C.R Rakshit, New Central Book Agency Pvt. Ltd
3. Op-Amp and linear integrated circuit, Ramakanth A Gaikwad, Eastern Economy Edition.
4. A course on experiment with He-Ne Laser, R.S. Sirohi, John Wiley & Sons (Asia) Pvt. Ltd.
5. Electronic lab manual Vol II, Kuriachan T.D, Syam Mohan, Ayodhya Publishing.

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	3	3	3	3	2	3	3	2	3	2	3
CO2	3	2	3	3	3	3	2	3	3	2	3	2	2
CO3	3	1	3	3	3	2	1	3	3	1	2	2	2
CO4	3	2	3	3	3	3	2	3	3	2	3	2	3
CO5	3	1	3	2	3	2	1	3	2	1	2	2	2
	Overall CO – PO Mapping index = 2.575								**Overall CO – PSO Mapping index = 2.28**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HOD

Sem.	Course Code	Credits	Title of the Course		Category			Sem. Exam	Max. Marks		
				CC	Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UPH2NME1	2	**INTRODUCTORY PHYSICS**		5	1	0	2 Hrs.	25	75	100

Pre-Requisite:

Course Objectives: The purpose of learning this course is:

1. To help students get an overview of Physics before learning their core courses
2. To serve as a bridge between the school curriculum and the degree programme
3. To know the basics of vectors and types of forces
4. To understand the concepts of momentum, energy conservation and the dynamics of various systems
5. To know the foundations of properties of matter

Course Outcomes:

CO1: Recall and relate various concepts of elementary physics.

CO2: Summarize and translate statics and dynamics phenomena in physics and bridge the introduction from school physics to a graduate level.

CO3: Apply the concept of all the above mentioned and develop various other concept of physics in matter and nature. Also

CO4: On the successful completion of the course, student will be able to dynamics concepts.

CO5: Recall and relate various concepts of elementary physics.

Unit-I	**INTRODUCTION TO VECTORS**	15 Hrs.

Vectors, scalars -examples for scalars and vectors from physical quantities - addition, subtraction of vectors - resolution and resultant of vectors - units and dimensions- standard physics constants.

Unit-II	**TYPES OF FORCES**	15 Hrs.

Types of forces-gravitational, electrostatic, magnetic, electromagnetic, nuclear -mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces .

Unit-III	**MOMENTUM AND ENERGY CONSERVATION**	15 Hrs.

Different forms of energy - conservation laws of momentum, energy - types of collisions - angular momentum- alternate energy sources-real life examples.

Unit-IV	**DYNAMICS**	15 Hrs.

Types of motion - linear, projectile, circular, angular, simple harmonic motions - satellite motion - banking of a curved roads - stream line and turbulent mot ions - wave motion - comparison of light and sound waves - free, forced, damped oscillations.

Unit-V	**PROPERTIES OF MATTER**	15 Hrs.

Surface tension - shape of liquid drop - angle of contact - viscosity -lubricants - capillary flow - diffusion - real life examples- properties and types of materials in daily use- conductors, insulators - thermal and electric.

Text Book(s):

1. Verma, H. C. (2021). *Concepts of physics.* Vol 1 and 1st Edition, Bharati Bhawan (Publishers & Distributors).
2. Mathur, D. S. (2007). *Elements of properties of matter,* (1st Ed.). S. Chand & Company.
3. Brij, L., & Subrahmanyam, N. (2003). *Properties of matter,* (1st Ed.). S. Chand & Company.

Reference Book(s):

1. Gulati, H. R. (1977). *Fundamental of general properties of matter,* (5th Ed.). S. Chand & Company.
2. Young, H. D., Freedman, R. A., & Ford, A. L. (2021). *University physics with modern physics,* (15th Ed.). Pearsons Education.
3. Halliday, D., Resnick, R., & Walker, J. (2010). *Fundamentals of physics,* (9th Ed.). Wiley.

Web Resources:

. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html

2. https://science.nasa.gov/ems/

3. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	1	1	1	1	1	2	1	1	1	1	1
CO2	3	2	2	2	2	1	1	2	1	1	1	2	1
CO3	3	2	3	3	2	2	1	3	2	2	2	2	2
CO4	3	2	3	3	3	2	1	3	2	2	2	2	2
CO5	3	2	1	1	1	1	1	2	1	1	1	1	1
	Overall CO – PO Mapping index = 2.28								**Overall CO – PSO Mapping index = 1.84**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

B.Sc., PHYSICS & B. Sc., CHEMISTRY

(For the candidates admitted from the academic year 2025-26 onwards)

Sem.	Course Code	Credits	Title of the Course	CC / AC/ DE SE / GS / EVS VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UMA1AC11	3	**Algebra and Trigonometry**	AC	5		-	3 Hrs.	25	75	100

Pre-Requisite:

Course Objectives: The purpose of learning this course is:

1. To understand the concept of reciprocal equations and identify their standard forms.
2. To understand the Binomial Theorem, Exponential Series, and Logarithmic Series
3. To identify different types of series and techniques used for summing them.
4. To expand **cos(nθ)** and **sin(nθ)** using trigonometric identities.
5. To define and understand the basic hyperbolic functions (sinh, cosh, tanh, etc.).

Course Outcomes: Students will be able to

CO1: Classify and Solve reciprocal equations.

CO2: Find the sum of Binomial, Exponential and Logarithmic series.

CO3: Find Inverse of Matrix, Eigen values, Eigen vectors and verify Cayley Hamilton theorem a given matrix.

CO4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine.

CO5: Determine relationship between circular and hyperbolic functions.

Unit-I	**Reciprocal Equations**	15 Hrs.

Reciprocal Equations - Standard Form Reciprocal Equations – A reciprocal equation of the standard form can always be depressed to another of half the dimension - Increasing or decreasing the roots of a given equation by a given quantity - Removal of terms - Horner's method – related problems.

Unit-II	**Binomial, Exponential & Logarithmic series:**	15 Hrs.

Binomial: Application of the Binomial Theory to the summation of series.
Exponential & Logarithmic series: Summation - Series which can sum up by the logarithmic series - The application of the exponential and logarithmic series to limits and approximations (Theorems without proof) - Related Problems.

Unit-III	**Summation of Series**	14 Hrs.

Summation of Series: Applications of Partial fractions – The Product of successive terms – general term of reciprocal – sum to n terms of the series.

Unit-IV	**Expansions of cosnθ and sinnθ**	14 Hrs.

Expansions of cosnθ and sinnθ – Expansion of tannθ in powers of tanθ - Expansion of tan (A+B+C …….) - Powers of sines and cosines of θ in terms of functions of multiples of θ - Expansion of *sinθ cosθ* and *tanθ* in a series ascending powers of θ - Related problems.

Unit-V	**Hyperbolic functions**	14 Hrs.

Hyperbolic functions – Relation between circular and hyperbolic functions - Inverse hyperbolic functions.

Text Books:

1. T.K. Manicavasagom Pillai, S. Natarajan and Ganapathy, "Algebra" Volume – I 2006. (ISBN: 978-81-87156-17-8)
2. S. Narayanan, T.K. Manichavasagam Pillai,"Trigonometry", S.Viswanathan (Printers & Publishers, Pvt Limited, 2010. (ISBN: 978-81-87156-16-1)

UNIT – I	Chapter – 6	Section 16,16.1,17,19,30 of [1]
UNIT – II	Chapter – 3	Section 10 of [1]
	Chapter – 4	Section 3,9,11 of [1]
UNIT – III	Chapter – 5	Section 1 to 5 of [1]
UNIT – IV	Chapter – 3	Section 1 to 5 of [2]
UNIT – V	Chapter – 4	Section1 to 2 of [2]

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005
2. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003
3. J. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012.

Web Resources:

1. https://lib.alfaisal.edu/pdf/AlgebraAndTrigonometry-LR.pdf
2. https://home.cs.colorado.edu/~alko5368/lecturesCSCI2820/mathbook.pdf
3. https://www.gacwrmd.in/learning/Maths/Algebra%20and%20trignometry%20Unit%20I%20to%20V.pdf
4. https://www.govst.edu/uploadedFiles/Academics/Colleges_and_Programs/CAS/Trigonometry_Short_Course_Tutorial_Lauren_Johnson.pdf
5. https://www.msuniv.ac.in/images/distance%20education/learning%20materials/ug%20pg%202023/ug%202021/Bsc%20mathematics%202023/JMMA11%20-%20I%20Sem%20-%20Algebra%20&%20Trigonometry.pdf

Course Outcomes (COs)	Program Outcomes (**POs**)								Programme Specific Outcomes (**PSOs**)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	1	2	1	2	1	3	3	1	1	3
CO2	3	3	3	1	2	1	2	1	3	3	2	1	3
CO3	3	3	3	2	2	1	3	3	3	3	3	1	3
CO4	3	3	2	1	1	1	2	1	3	3	1	1	3
CO5	3	3	2	1	1	1	2	1	3	3	1	2	3
Total	15	15	13	6	8	5	11	7	15	15	8	6	15
	Overall CO – PO Mapping index = 2								Overall CO – PSO Mapping index = 2.36				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

B.Sc., PHYSICS & B. Sc., CHEMISTRY

(For the candidates admitted from the academic year 2025-26 onwards)

Sem.	Course Code	Credits	Title of the Course	CC / AC/ DE / SE / GS / EV VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo Hrs.	Tutoria Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UMA2AC21	3	**ODE, PDE AND LAPLACE TRANSFORMS**	AC	4	1	-	3 Hrs.	25	75	100

Pre-Requisite:		
Course Objectives: The purpose of learning this course is:		
1. To Understand and solve **first-order linear differential equations.**		
2. Learn how to form partial differential equations (PDEs) by eliminating arbitrary constants and functions.		
3. Use Laplace Transforms to evaluate definite integrals.		
4. Solve problems involving inverse transforms in applied contexts.		
5. Use Laplace Transforms to solve ordinary differential equations (ODEs) with constant coefficients.		
Course Outcomes: Students will be able to		
CO1: Equations solvable for dy/dx, x and y.		
CO2: Discuss and demonstrate the Linear Equations with constant coefficients, Complementary function and Particular integrals.		
CO3: Understand Laplace transforms and discuss the Properties of Laplace transforms		
CO4: Define and illustrate the inverse Laplace transforms.		
CO5: Discuss the Application of Laplace transforms.		
Unit-I	**Ordinary Differential Equations**	15 Hrs.
Linear Equations - Bernoulli's equation-First order higher degree equations-solvable for x, y, p -clairaut's form.		
Unit-II	**Partial Differential Equations**	15 Hrs.
Formation of equations by elimination of arbitrary constants and function -Definition of general, particular and complete solutions- solving standard forms (i) $f(p,q) = 0$ (ii) $f(x,p,q) = 0, f(y,p,q) = 0, f(z, p,q)=0$ - Lagrange's Differential equations $Pp+Qq = R$- Charpit's Method.		
Unit-III	**Laplace Transforms**	14 Hrs.
Sufficient condition for the existence of the Laplace Transforms –Properties of Laplace Transforms – Laplace Transform of periodic functions – Some general Theorems - Evaluation of Integrals.		
Unit-IV	**Laplace Transforms (Continued)**	14 Hrs.
Inverse Laplace Transforms- Inverse Transforms of functions– Related problems.		
Unit-V	**Laplace Transforms (Continued)**	14 Hrs.
Application of Laplace Transforms-Solution of ODE with constant coefficients –Solution of Systems of Differential Equations - Solution of differential Equations with variable coefficients.		

Text Books:

1. S. Narayanan and T. K. Manicavachagam Pillai, Differential Equations and its Applications,S. Viswanathan Publishers Pvt. Ltd., 2011.(ISBN: 9788187156048)

UNIT – I	Chapter – 4	Sections 1 to 3
UNIT – II	Chapter – 12	Sections 1 to 6
UNIT – III	Chapter – 9	Sections 1 to 5
UNIT – IV	Chapter – 9	Sections 6 &7
UNIT – V	Chapter – 9	Sections 8 to 10

Reference Books:

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. 2010.
2. Murray R. Spiegel, Schaum's Outline of Theory and Problems of Laplace Transforms, McGraw Hill, 1965

Web Resources:

1. https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/3/UG_B.Sc._Mathematics_11333-Differential%20Equations%20&%20its%20Applications%20.pdf
2. https://sciences.uodiyala.edu.iq/wp-content/uploads/2023/09/1-MAT-102UNIT12.pdf
3. https://www.mmmut.ac.in/News_content/43114dep-notice_04262020.pdf
4. https://www.hansrajcollege.ac.in/hCPanel/uploads/elearning/elearning_document/Laplace2_HRC.pdf
5. https://pages.jh.edu/mzhong5/courses/EN_560_601_S17/homeworks/560_601_HW8.pdf

Course Outcomes (COs)	Program Outcomes (**POs**)								Programme Specific Outcomes (**PSOs**)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	1	2	1	2	1	3	3	2	1	3
CO2	3	3	3	1	2	1	2	1	3	3	2	1	3
CO3	3	3	3	1	2	1	3	3	3	3	3	1	3
CO4	3	3	3	1	2	1	3	3	3	3	3	2	3
CO5	3	3	3	2	2	2	3	3	3	3	3	3	3
Total	15	15	15	6	10	6	13	11	15	15	13	8	15
	Overall CO – PO Mapping index = 2.275								Overall CO – PSO Mapping index = 2.64				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

B.Sc., PHYSICS & B. Sc., CHEMISTRY

(For the candidates admitted from the academic year 2025-26 onwards)

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS/ GS / NME /SE / VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo Hrs.	Tutoria Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UMA2AC31	3	**Analytical Geometry of Three Dimensions**	CC	4			**3 Hrs.**	**25**	**75**	**100**
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. To compute the distance between two points in 3D geometry.
2. To derive the equation of a plane through the line of intersection of two given planes.
3. To derive and apply the symmetrical form of a line’s equation.
4. To understand and derive the standard and general equations of a sphere.
5. To study and derive the general equation of a quadric surface.

Course Outcomes: Students will be able to

CO1: Compute distances, angles, and projections between points and lines using Cartesian coordinates.

CO2: Calculate angles between planes and determine the length of perpendiculars from points to planes.

CO3: Analyze the spatial relationships between lines and planes, including angle, coplanarity, intersection, and shortest distance.

CO4: Determine plane sections, circles on spheres, and tangent planes.

CO5: Understand and derive equations for central quadric surfaces including cones and cylinders.

Unit-I Rectangular Cartesian co-ordinates Direction cosines of a line 9 Hrs.

Coordinates – Distance between two points - Angle between two lines – Projections-Direction Cosines-Direction Ratios-Conditions for perpendicularity and parallelism**.**

Unit-II The Planes 9 Hrs.

System of Planes – Direction cosines of the lines which is perpendicular to a plane – Angle between the planes – Equation of a plane through the line of intersection of two given planes - Length of the perpendicular.

Unit-III The Straight Lines 9 Hrs.

A straight line may be determined as the intersection of two planes – Symmetrical form of the equations of a line – Equation of a straight line passing through two given points.

The plane and the straight line: Angle between the line and the plane – Coplanar lines – shortest distance between two given lines –The intersection of three planes.

Unit-IV The Sphere 9 Hrs.

Equation of a sphere –The general equation – The plane section of a sphere is a circle - Equation of the circle on a sphere –The equation of a tangent plane.

Unit-V The Central Quadrics and Cone 9 Hrs.

The equation of a surface -Cone - Right circular cone - Intersection of a straight line and a quadric cone - Tangent plane and normal - Condition that the cone has three mutually perpendicular generators - Cylinder - Enveloping Cylinder.

Text Books:

1. T.K. Manickavachagom Pillai and T. Natarajan. A Text Book of Analytical Geometry (Part II-Three Dimensions) Viswanathan (Printers & Publishers) Pvt. Ltd.(ISBN: 9788187156031)

Reference Books:

1. S. L. Loney, Co-ordinate Geometry.
2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions.
3. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016.
4. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.
5. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961.
6. Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010.
7. William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006.

Web Resources:

1. https://ia800504.us.archive.org/11/items/elementsofcoordi00lone/elementsofcoordi00lone.pdf
2. https://www.forgottenbooks.com/en/download/An_Elementary_Treatise_on_Coordinate_Geometry_of_Three_Dimensions_1000038010.pdf
3. https://nptel.ac.in
4. https://oms.bdu.ac.in/ec-colleges/admin/contents/175_16SACMM2_20200519051345 87.pdf
5. https://www.msuniv.ac.in/images/distance%20education/learning%20materials/ug%20pg/ug//bsc_maths/JSMA22_II_Sem_LaTeX.pdf

Course Outcomes (COs)	Program Outcomes (**POs**)								Programme Specific Outcomes (**PSOs**)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	2		1		1		3	2	2	1	2
CO2	3	3	2		1		1		3	2	2	1	2
CO3	3	3	2	1	1	1	2	1	3	3	2	2	3
CO4	3	2	2		1		1		3	2	2	2	3
CO5	3	3	2	1	1	1	2	2	3	2	2	2	3
Total	15	14	12	4	8	6	9	4	15	11	10	8	13
	Overall CO – PO Mapping index = 1.8								Overall CO – PSO Mapping index = 2.28				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation