PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

B.SC., PHYSICS

SYLLABUS

FROM THE ACADEMIC YEAR
2023-2024

REGULATION 2023

Preamble

Physics is one of the basic and fundamental sciences. The curriculum for the undergraduate programme in Physics is revised as per the UGC guidelines on Learning Outcome based Course Framework. The learner-centric courses let the student progressively develop a deeper understanding of various aspects of physics.

The new curriculum offer courses in the core areas of mechanics, acoustics, optics and spectroscopy, electricity and magnetism, atomic and nuclear physics, solid state, electronicsand other fields. The courses will train students with sound theoretical and experimental knowledge that suits the need of academics and industry.In addition to the theoretical course work, the students also learn physics laboratory methods for different branches of physics, specialized measurement techniques, analysis of observational data, including error estimation and etc. The students will have deeper understanding of laws of nature through the subjects like classical mechanics, quantum mechanics, statistical physics etc. The problem solving ability of students will be enhanced. The students can apply principles in physics to real life problems. The courses like integrated electronics and microprocessors will enhance the logical skills as well as employability skills. The numerical methods and mathematical physics provide analytical thinking and provides a better platform for higher level physics for research.

The restructured courses with well-defined objectives and learning outcomes, provide guidance to prospective students in choosing the elective courses to broaden their skills not only in the field of physics but also in interdisciplinary areas.The elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astrophysics, medical physics, etc.

TANSCHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION	
Programme	**B.Sc., Physics**
Programme Code	113
Duration	**3 years [UG]**
Programme Outcomes: (These are mereguidelines. Faculty can create POs based on their curriculum or adopt from UGC or the	**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:**

University for their Programme)	Capability to apply the analytic thought to a body of knowledge; analyse and evaluate the proofs, arguments, claims, beliefs on the basis of empirical evidences; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach.
	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.
	PO9: Reflective thinking:
	Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.
	PO10 Information/digital literacy:
	Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
	PO 11 Self-directed learning:
	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.
	PO 12 Multicultural competence:
	Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

	PO 13: Moral and ethical awareness/reasoning:
	Ability toembrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.
	PO 14: Leadership readiness/qualities:
	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.
	PO 15: Lifelong learning:
	Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes: **(These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or University for their Programme)**	**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. **PSO 5: Contribution to the Society:** To contribute to the development of the society by collaborating with stakeholders for mutual benefit

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF PHYSICS

B.Sc., PHYSICS - 2023 – REGULATION

SEMESTER - I					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23110AEC11	Tamil-I	3	1	0	3
23111AEC11	Advanced English-I				
23132AEC11	Hindi-I				
23135AEC11	French-I				
23111AEC12	English-I	3	1	0	3
23113AEC13	Properties of Matter and Sound	4	1	0	3
23112GEC14	Allied Mathematics - I	3	1	0	3
23112GEC15	Allied Mathematics - II	3	1	0	3
Practical					
23113SEC16L	Physics Practical - I	0	0	3	3
Skill Enhancement Course					
23113SEC17	Physics for Everyday Life	2	0	0	2
23113SEC18	Introductory Physics	2	0	0	2
Ability Enhancement Compulsory Course					
231AECCINC	Indian Constitution	2	0	0	2
231LSCUV	Universal Human Values	0	0	0	1
	Total	**22**	**5**	**3**	**25**

SEMESTER - II		L	T	P	C
Course Code	Course Title	L	T	P	C
Theory					
23110AEC21	Tamil-II	3	1	0	3
23111AEC21	Advanced English-II				
23132AEC21	Hindi-II				
23135AEC21	French-II				
23111AEC22	English-II	3	1	0	3
23113AEC23	Mechanics And special theory of Relativity	4	1	0	3
23112GEC24	Allied Mathematics - III	3	1	0	3
23112GEC25	Allied Mathematics - IV	3	1	0	3
Practical					
23113SEC26L	Physics Practical - II	0	0	3	3
Skill Enhancement Course					
23113SEC27	Astro Physics	2	0	0	2
23113SEC28	Communication Physics	2	0	0	2
Ability Enhancement Compulsory Course					
231AECCCMS	Communication Skills	2	0	0	2
231SSCBE	Basic Behavioural Etiquette	0	0	0	1
	Total	22	5	3	25

SEMESTER - III		L	T	P	C
Course Code	Course Title	L	T	P	C
Theory					
23110AEC31	Tamil-III	3	1	0	3
23111AEC31	Advanced English-III				
23132AEC31	Hindi-III				
23135AEC31	French-III				
23111AEC32	English-III	3	1	0	3
23113AEC33	Thermodynamics and Statistical Physics	4	1	0	3
23112GEC34	Allied Chemistry - I	4	1	0	3
Practical					
23113SEC35L	Physics Practical - III	0	0	3	3
23114SEC36AL	Allied Chemistry Practical - I	0	0	3	2
Skill Enhancement Course					
23113SEC37	Energy Physics	2	0	0	2
23113SEC38	Mathematical Physics	2	0	0	2
Ability Enhancement Compulsory Course					
23113RMC39	Research Methodology	2	0	0	2
231ACLSOAN	Office Automation	0	0	0	1
	Total	20	4	6	24

SEMESTER - IV		L	T	P	C
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23110AEC41	Tamil-IV	3	1	0	3
23111AEC41	Advanced English-IV				
23132AEC41	Hindi-IV				
23135AEC41	French-IV				
23111AEC42	English-IV	3	1	0	3
23113AEC43	Optics and Spectroscopy	3	1	0	3
23112GEC44	Allied Chemistry - II	3	1	0	3
Practical					
23113SEC45L	Physics Practical - IV	0	0	3	3
23114SEC46AL	Allied Chemistry Practical - II	0	0	3	3
Skill Enhancement Course					
23113SEC47	Advanced Mathematical Physics	2	0	0	2
23113SEC48	Numerical Methods and C programming	2	0	0	2
Ability Enhancement Compulsory Course					
23113BRC49	Participation in Bounded research	2	0	0	2
231AECCEVS	Environmental Studies	2	0	0	2
231LSCLS	Leadership and Management Skills	0	0	0	1
	Total	**20**	**4**	**6**	**27**

SEMESTER - V		L	T	P	C
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23113AEC51	Atomic Physics	4	1	0	4
23113AEC52	Basic Electronics	4	1	0	4
23113AEC53	Electricity and Magnetism	4	1	0	4
23113DSC54_	Discipline Specific Elective - I	4	1	0	3
23113DSC55_	Discipline Specific Elective - II	4	1	0	3
Practical					
23113SEC56L	Physics Practical - V	0	0	3	3
Skill Enhancement Course					
231AECCVED	Value Education	2	0	0	2
23113SEC57	Internship / Carried out in II Year Summer Vocation	0	0	0	2
Audit Course					
231ACLSPSL	Professional Skills	0	0	0	1
	Total	**22**	**5**	**3**	**26**

SEMESTER - VI					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23113AEC61	Nuclear and Particle Physics	5	1	0	3
23113AEC62	Digital Electronics and Microprocessor 8085	5	1	0	3
23113DSC63_	Discipline Specific Elective - III	5	1	0	3
23113AEC64	Project Work	0	0	5	4
Practical					
23113SEC65	Physics Practical - VI	0	0	3	2
Skill Enhancement Course					
23113SEC66	General Awareness for CompetitiveExamination	2	0	0	2
231ACSIKWS	Indian Knowledge System	2	0	0	2
231EXACT	NSS/NCC/YRC/Physical Education	0	0	0	1
	Total	1 9	3	8	20

Sem - V	Discipline Specific Elective - I	23113DSC54 A	Lasers and Fiber Optics
		23113DSC54B	Disaster Management
		23113DSC54C	Nano material and their properties
		23113DSC54 D	Physics of functional materials and Devices
	Discipline Specific Elective - II	23113DSC55 A	Materials Science
		23113DSC55B	Digital Photography
Sem - VI	Discipline Specific Elective - III	23113DSC56 A	Physics of renewable energy systems
		23113DSC56B	Medical Instrumentation
		23113DSC56C	Sensor Technology Physics Fabrication and Circuit
		23113DSC56D	Techniques of Materials characterization

	Sem I	**Sem II**	**Sem III**	**Sem IV**	**Sem V**	**Sem VI**	**Total Credits**
Language	6	6	6	6	-	-	24
Core	3	3	3	3	12	10	34
Elective(generic/ discipline)	6	6	3	3	6	3	27
Lab	3	3	5	6	3	2	22
Skill Enhancement Course	4	4	4	4	4	4	24

AECC	3	3	3	5	1	-	15
Extension Activity	-	-	-	-	-	1	1
Total	25	25	24	27	26	20	**147**

SEMESTER - I		L	T	P	C
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23110AEC11	Tamil-I				
23111AEC11	Advanced English-I				
23132AEC11	Hindi-I	3	1	0	3
23135AEC11	French-I				
23111AEC12	English-I	3	1	0	3
23113AEC13	Properties of Matter and Sound	4	1	0	3
23112GEC14	Allied Mathematics - I	3	1	0	3
23112GEC15	Allied Mathematics - II	3	1	0	3
Practical					
23113SEC16L	Physics Practical - I	0	0	3	3
Skill Enhancement Course					
23113SEC17	Physics for Everyday Life	2	0	0	2
23113SEC18	Introductory Physics	2	0	0	2
Ability Enhancement Compulsory Course					
231AECCINC	Indian Constitution	2	0	0	2
231LSCUV	Universal Human Values	0	0	0	1
	Total	22	5	3	25

Course Code	Course Title	L	T	P	C
23110AEC11	Tamil-I	3	1	0	3

இக்கால இலக்கியம்

பாடநோக்கங்கள்

1. இக்கால தமிழ் இலக்கிய வகைகளின் மாதிரிகளை கற்பித்தல்.
2. தமிழின் இனிமையை உணரச் செய்தல்
3. தமிழின் ஈடுபாட்டையும் சுவைக்கும் திறனையும் ஏற்படுத்துதல்.
4. கவிதை எழுதும் திறனை உருவாக்குதல்
5. படைப்பாளர்களாக உருவாக்கும் திறனை ஏற்படுத்துதல்.

பயன்கள்

• மொழி ஆளுமைத்திறன் பெறுதல்.
• சமூக சிந்தனையை வளர்த்துக்கொள்ளுதல்.
• படைப்பாளர்களாக உருவாகும் திறனைப்பெறுதல்.
• இலக்கியங்களின் அறிவை மேம்படுத்துதல்.
• கவிதை எழுதும் முறையைபுரிந்துக்கொள்ளுதல்

அலகு -1
மரபுக்கவிதை
1. பாரதியார்--விடுதலை, வந்தேமாதரம்,காற்று
2.பாரதிதாசன் – அழகின் சிரிப்பு ,தமிழனுக்கு வீழ்ச்சி இல்லை
3.கவிமணி தேசிய விநாயகம்பிள்ளை—தொழிலாளியின் முறையீடு
4.நாமக்கல் கவிஞர்—தருணம் இதுவே,
5.கண்ணதாசன்-- அனுபவம்

அலகு -2
புதுக்கவிதைகள்
1.அப்துல்ரகுமான் --வெற்றி,
2.அறிவுமதி--நட்புக்காலம்
3.வைரமுத்து-- ருசி, சிற்பி—ஓடு ஓடு சங்கிலி
4.மு.மேத்தா—வெளிச்சம் வெளியே இல்லை

அலகு - 3
நாட்டுப்புறப்பாடல்
1.தாலாட்டுபாடல்
2.தொழில்பாடல்
3.ஒப்பாரிப்பாடல்

அலகு-- 4
சிறுகதை
1. தடயம்-- மா. ஜெயபிரகாசம்,
2. எதார்த்தம் - சு. தமிழ்ச்செல்வி
3.நீதி-- பூமணி

அலகு- 5

இலக்கியவரலாறு
கவிதை, சிறுகதை நாட்டுப் புறப்பாடல்
பொதுக்கட்டுரை - மனிதநேயம், வாழ்வியல் அறங்கள்
மனப்பாடப்பகுதி :பாரதியார் கவிதை-- வேண்டும்,பாரதிதாசன் கவிதை--
செந்தாமரை

பார்வைநூல்கள்:
1. பாரதியார் கவிதைகள் –மணிவாசகர் பதிப்பகம் சென்னை
2.பாரதிதாசன் கவிதைகள் பாரிநிலையம், சென்னை
4. நாட்டுப்புறவியல்
3. தமிழ் இலக்கிய வரலாறு முவரதராஜன் சாகித்திய அகாதெமி, சென்னை
முனைவர். ஆறு. ராமநாதன், மணிவாசகர் பதிப்பகம், சென்னை
5. தமிழ்சிறு கதையும் தோற்றம் வளர்ச்சி – தமிழ் புத்தகநிலையம், சென்னை
இணையதளம் -www.tamilvu.org

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	Course Title	L	T	P	C
23111AEC12	English-I	3	1	0	3

	Learning Objectives
LO1	To enable learners to acquire the linguistic competence necessarily required in various life situations.
LO2	To help them understand the written text and able to use skimming, scanning skills
LO3	To assist them in creative thinking abilities
LO4	To enable them become better readers and writers
LO5	To assist them in developing correct reading habits, silently, extensively and intensively

Unit No.	Unit Title & Text
I	**Poetry** 1.1 A Patch of Land - Subramania Bharati 1.3 A Nation's Strength – Ralph Waldo Emerson 1.4 Love Cycle - Chinua Achebe
II	**Prose** 2.1 JRD - Harish Bhat 2.2 Us and Them - David Sedaris From Dress Your Family in Corduroy andDenim
III	**Short Stories** 3.1 The Faltering Pendulum- Bhabani Bhattacharya 3.2 How I Taught my Grandmother to Read- Sudha Murthy 3.3 The Gold Frame- R.K. Laxman
IV	**Language Competency** 4.1 Vocabulary : Synonyms, Antonyms, Word Formation 4.2 Appropriate use of Articles and Parts of Speech 4.3 Error correction
V	**English for Workplace** 5.1 Self - introduction, Greetings 5.2 Introducing others 5.3 Listening for General and Specific Information 5.4 Listening to and Giving Instructions / Directions

Course Outcomes		
Course Outcomes	On completion of this course,students will;	
CO1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	PO1
CO2	Understand the total content and underlying meaning in the context.	PO1,PO2
CO3	Form the habit of reading for pleasure and for	

		information	PO4,PO6
CO4		Comprehend material other than the prescribed text	PO4,PO5,PO6
CO5		Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.	PO3,PO8

	Text books (Latest Editions)
1	Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi: Sahitya Akademi, 1967
2	How I taught my Grandmother to Read and other Stories, Murthy, Sudha,Penguin Books, India, 2004

	WebResources
1	A patch of land by Subramania Bharati translated by Usha Rajagoplan : https://books.google.co.in/books?id=iSHvOmXuvLMC&printsec=frontcover&dq=subramania+bharati+poems&hl=en&newbks=1&newbks_redir=0&source=gb_mobile_search&sa=X&redir_esc=y#v=onepage&q=subramania%20bharati%20poems&f=false
2	The Sparrow by Paul Laurence Dunbar https://poets.org/poem/sparrow-0
3	A Nation's Strength by Emerson https://poets.org/poem/nations-strength
4	Love cycle by Chinua Achebe : https://www.best-poems.net/chinua-achebe/love-cycle.html
5	JRD by Harish Bhat https://www.tata.com/newsroom/heritage/coffee-tea-jrd-tata-stories

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23113AEC13	Properties of Matter and Sound	4	1	0	3

COURSE	1. Study of the properties of matter leads to information which is of

OBJECTIVES	practical value to both the physicist and the engineers.
	2. It gives us information about the internal forces which act between the constituent parts of the substance.
	3. Students who undergo this course are successfully bound to get a better insight and understanding of the subject.

UNITS	COURSEDETAILS
UNIT-I	**ELASTICITY:** Hooke's law – stress-strain diagram – elastic constants –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:** 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	**SURFACE TENSION:** definition – 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
UNIT-IV	**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
UNIT-V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** 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 – application of ultrasonic waves
TEXT BOOKS	1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand & Co.
	2. BrijLal & N. Subrahmanyam, 2003, Properties of Matter, S.Chand & Co
	3. D.R.Khanna & R.S.Bedi, 1969, Textbook of Sound, AtmaRam & 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.Chand& Co.
REFERENC EBOOKS	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 & Co.
	3. A.P French, 1973, Vibration and Waves, MIT Introductory

		Physics, Arnold-Heinmann India.
WEBLINKS		1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work 2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html

COURSE OUTCOMES:

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

C OURSEOUTC OMES	**CO1**	Relate elastic behavior in terms of three modulii of elasticity and working of torsion pendulum.
	CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
	CO3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface
	CO4	Analyze simple harmonic motions mathematically and apply them.
	CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	S	M	S
CO2	M	S	S	S	M	M	S	M	S	S
CO3	S	M	S	M	S	S	M	S	S	S
CO4	S	S	S	S	S	M	S	M	M	M
CO5	M	M	S	S	M	S	S	S	S	M

Course Code	Course Title	L	T	P	C
23112GEC14	Allied Mathematics - I	3	1	0	3

Objectives of the Course	• The basic skills of differentiation, successive differentiation, and their applications.
	• Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

Unit – I

Leibnitz theorem (Proof not needed) and its applications – curvature and radius of curvature in Cartesian only (Proof not needed) – total differential coefficient (Proof not needed) – Jacobians of two & three variables – Simple problems in all these.

Unit – II

Reduction formula (when n is a +ve integer) for (i)

i. $\int_a^b e^{ax} x^n \, dx$

ii. $\int_a^{\square} \sin^n x \, dx$

iii. $\int_a^{\square} \cos^n x \, dx$

iv. $\int_0^x e^{ax} x^n \, dx$

v. $\int_0^{\square} \sin^n x \, dx$

vi. without proof $\int_0^{\square} \sin^n x \cos^n x \, dx$ and illustrations

Unit – III

Beta and Gamma functions

Unit – IV

Evaluation of double and triple integrals in simple cases – changing the order and evaluating of the double integration (Cartesian only)

Unit – V

Definition of Fourier series – Finding fourier coefficients for a given periodic function with period 2π and with period 2l – use of odd and even functions in evaluating fourier coefficients – half range sine and cosine series.

Recommended Text	1. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.
	2. Apostol, Calculus, Volumes I and II.
	3. G oldberg, Calculus and mathematical analysis.
Reference Books	1. Calculus – T.K.M. Pillai
	2. Trigonometry & Fourier series – T.K.M. Pillai.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)
Students will be able to
CLO 1: Determine Leibnitz theorem and its applications and Jacobians of two & three variables
CLO 2: Evaluate Reduction formula (when n is a +ve integer)
CLO 3: Solve Beta and Gamma functions
CLO 4: Evaluation of double and triple integrals in simple cases
CLO 5: Finding Fourier coefficients for a given periodic function

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Course Code	Course Title	L	T	P	C
23112GEC15	Allied Mathematics - II	3	1	0	3

Objectives of the Course	• Knowledge on Euler's formula and hyperbolic functions, and the Expansions of of sines and cosines.
	• Knowledge about the Expansion of inverse hyperbolic function and Separation of real and imaginary parts.

Unit – I

Binomial, Exponential & Logarithmic series (Formulae only) – Summation

Unit – II

Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices – Characteristics equation, eigen values, eigen vector – Cayley Hamilton's theorem (proof not needed) Simple application only.

Unit – III

Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ (n being a positive integer) – Expansion of $\sin^n \theta, \cos^n \theta, \sin^n \theta \cos^m \theta$ in a series of sines and cosines of multiples of θ (θ – given in radius) Expansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of powers of θ (only problems in all the above)

Unit – IV

Euler's formula for $e^{i\theta}$ – definition of hyperbolic functions – formulae involving hyperbolic functions – relation between hyperbolic and circular function – expansion of sinhx, coshx, tanhx in power of x.

Unit – V

Expansion of inverse hyperbolic function – sinh-1x, cosh-1x and tanh-1x - Separation of real and imaginary parts of sin(x+iy), cos(x+iy), tan(x+iy), sinh(x+iy), cosh(x+iy), tanh(x+iy)

Recommended Text	1. T.K.M. Pillai, T.Natarajan, K.S. Ganapathi, Algebra, Vol I. S.Viswanathan Pvt.Ltd., Chennai – 2004 2. S.Narayanan, T.K.M.Pillai, S.Viswanathan Pvt.Ltd. & Vijay Nicole imprint Pvt. Ltd. 2004
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)
Students will be able to
CLO 1: Determine the Binomial, Exponential & Logarithmic series
CLO 2: Evaluate Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices and Hamilton's theorem
CLO 3: Solve Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ and theExpansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of powers of θ
CLO 4: Explain Euler's formula and relation between hyperbolic and circular function
CLO 5: Explain the inverse hyperbolic function and Separation of real and imaginary parts of sine, cosine and tan.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Course Code	Course Title	L	T	P	C
23113SEC16L	Physics Practical - I	0	0	3	3

COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Properties of Matter

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia of an irregular body.
4. Verification of parallel axes theorem on moment of inertia.
5. Verification of perpendicular axes theorem on moment of inertia.
6. Determination of moment of inertia and g using Bifilar pendulum.
7. Determination of Young's modulus by stretching of wire with known masses.
8. Verification of Hook's law by stretching of wire method.
9. Determination of Young's modulus by uniform bending – load depression graph.
10. Determination of Young's modulus by non-uniform bending – scale & telescope.
11. Determination of Young's modulusby cantilever – load depression graph.
12. Determination of Young's modulus by cantilever – oscillation method
13. Determination of Young's modulus by Koenig's method – (or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y, n and K by Searle's double bar method.
16. Determination of surface tension & interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson's ratio of rubber tube.
20. Determination of viscosity by Poiseullie's flow method.
21. Determinationradius of capillary tube by mercury pellet method.
22. Determinationof g using compound pendulum.

Course Code	Course Title	L	T	P	C
23113SEC17	Physics for Everyday Life (NME)	2	0	0	2

PHYSICS FOR EVERYDAY LIFE	
Learning Objective: To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics	
UNITS	**COURSE DETAILS**
UNIT-I	**MECHANICAL OBJECTS:** spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.
UNIT-II	**OPTICAL INSTRUMENTS AND LASER:** vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.
UNIT-III	**PHYSICS OF HOME APPLIANCES:** bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners
UNIT-IV	**SOLAR ENERGY:** Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.
UNIT-V	**INDIAN PHYSICIST AND THEIR CONTRIBUTIONS:** C.V.Raman, HomiJehangirBhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.
TEXT BOOKS	1. The Physics in our Daily Lives, UmmeAmmara, GugucoolPublishing, Hyderabad, 2019. 2. For the love of physics, Walter Lawin, Free Press, New York, 2011.

Course Code	Course Title	L	T	P	C
23113SEC18	Introductory Physics	2	0	0	2

COURSE	**FIRST SEMESTER – FOUNDATION COURSE**
COURSE TITLE	**INTRODUCTORY PHYSICS**
CREDITS	2
COURSE OBJECTIVES	To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.

UNITS	COURSE DETAILS
UNIT-I	vectors, scalars –examples for scalars and vectorsfrom physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physics constants
UNIT-II	different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces
UNIT-III	different forms of energy– conservation lawsof momentum, energy – typesof collisions –angular momentum– alternate energy sources– real life examples
UNIT-IV	types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion – comparisonof light and sound waves – free, forced, damped oscillations
UNIT-V	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
UNIT-VI	**PROFESSIONAL COMPONENTS:**expert lectures –seminars —webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. D.S. Mathur, 2010, Elements of Properties of Matter, S.Chand and Co 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co.
REFERENC EBOOKS	1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chand and Co.
WEB RESOURCES	1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/ 2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

COURSEOUTCOMES:

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

COURSEOU TCOMES	**CO1**	Apply concept of vectors to understand concepts of Physics and solve problems	
	CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.	
	CO3	Quantify energy in different process and relate momentum, velocity and energy	
	CO4	Differentiate different types of motions they would encounter in various courses and understand their basis	
	CO5	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.	

MAPPINGWITHPROGRAMOUTCOMES:

Mapcourseoutcomes**(CO)**foreachcoursewithprogramoutcomes**(PO)**inthe3-pointscaleofSTRONG(**3**),MEDIUM(**2**)andLOW(**1**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Course Code	Course Title	L	T	P	C
231AECCINC	Indian Constitution	2	0	0	2

Aim and Objectives:

1. To make the students understand about the Democratic Rule and Parliamentarian Administration.
2. To appreciate the salient features of the Indian Constitution.
3. To know the fundamental Rights and Constitutional Remedies.
4. To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
5. To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

UNIT I: THE MAKING OF INDIANCONSTITUTION

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II: FUNDAMENTAL RIGHTS AND FUNDAMENTAL DUTIES OF THE CITIZENS

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties .

UNIT III: DIRECTIVE PRINCIPLES OF STATE POLICY

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV: THE UNION EXECUTIVE, UNIONPARLIAMENT AND SUPREME COURT

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister RajyaSabha- LokSabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.

UNIT V: STATE COUNCIL – ELECTION SYSTEM AND PARTLIAMENTARY DEMOCRACY IN INDIA

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

Outcomes

Democratic values and citizenship Training are gained.

1. Awareness on Fundamental Rights are established.
2. The functions of union Government and State Governments are learnt.
3. The power and functions of the Judiciary learnt thoroughly.
4. Appreciation of Democratic parliamentary Rule is learnt.

REFERENCES:

1. Palekar S.A. Indian Constitution Government and polities, ABD Publications, India.
2. AiyerAlladi, Krishnaswami, Constitution and fundamental rights 2055.
3. Markandan K.C. Directive Principles in the Indian Constitution 2066.
4. KashyapSubash C Our Parliament, National Book, Trust New Delhi 2089.

Course Code	Course Title	L	T	P	C
231LSCUV	Universal Human Values	0	0	0	1

Aim:

Thiscourseaimsatmakinglearnersconsciousaboutuniversalhumanvaluesinanintegral manner, without ignoring other aspects that are needed for learner's personalitydevelopment.

Course Objectives:

Thepresentcoursedealswithmeaning,   purpose andrelevanceofuniversalhumanvaluesandhow to inculcate and practice them consciously to be a good human being and realize one'spotentials.

Course Outcomes:

By the end of the course the learners will be able to:

1. Know about universalhuman values and understandtheimportanceofvaluesinindividual, social circles, career path, and nationallife.
2. Learnfromcasestudiesoflivesofgreatandsuccessfulpeoplewhofollowedandpr actised human values and achieved self-actualisation.
3. Become conscious practitioners of humanvalues.
4. Realisetheirpotentialashumanbeingsandconductthemselvesproperlyinthewa ysofthe world.

Unit I

- Introduction:Whatislove?Formsoflove—forself,parents,family,friend,spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy andnon-violence
- Individuals who are remembered in history for practicing compassion andlove.
- Narratives and anecdotes from history, literature including localfolklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or groupexperience(s)
- SimulatedSituations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as

fact(veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or groupexperience(s)
- Simulatedsituations
- Case studies

Unit III

- Introduction:What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence andnon-killing
- Individuals and organizations that are known for their commitment tonon-Violence
- Narrativesandanecdotesaboutnon-violencefromhistory,andliteratureincluding local folklore
- Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practiceit?
- Sharing learner's individual and/or group experience(s) aboutnon-violence
- Simulatedsituations
- Case studies

Unit IV

- Introduction: What isrighteousness?
- Righteousness and *dharma*, Righteousness andPropriety
- Individuals who are remembered in history for practicingrighteousness
- Narratives and anecdotes from history, literature including localfolklore
- Practicingrighteousness:Whatwilllearnerslearn/ gainiftheypracticerighteousness? What will learners lose if they don't practiceit?
- Sharing learners' individual and/or groupexperience(s)
- Simulatedsituations
- Case studies

Unit V

- Introduction: What is peace? Its need, relation with harmony andbalance
- Individuals and organisations that are known for their commitment topeace
- Narratives and Anecdotes about peace from history, and literature includinglocalfolklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practiceit?
- Sharing learner's individual and/or group experience(s) aboutpeace

- Simulated situations
- Case studies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing thisvalue.
- Narratives and anecdotes dealing with instances of service from history,literatureincluding local folklore
- Practicingservice:Whatwilllearnerslearn/gaingainiftheypracticeservice? What will learners lose if they don't practiceit?
- Sharing learners' individual and/or group experience(s) regardingservice
- Simulatedsituations
- Case studies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restrain and

Ways of overcoming greed. Renunciation with action as true renunciation

- Individuals who are remembered in history for practicing thisvalue.
- Narrativesandanecdotesfromhistoryandliterature,includinglocalfolkloreabout individuals who are remembered for their sacrifice andrenunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or groupexperience(s)
- Simulatedsituations
- Case studies

SEMESTER - II		L	T	P	C
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23110AEC21	Tamil-II	3	1	0	3
23111AEC21	Advanced English-II				
23132AEC21	Hindi-II				
23135AEC21	French-II				
23111AEC22	English-II	3	1	0	3
23113AEC23	Mechanics And special theory of Relativity	4	1	0	3
23112GEC24	Allied Mathematics - III	3	1	0	3
23112GEC25	Allied Mathematics - IV	3	1	0	3
Practical					
23113SEC26L	Physics Practical - II	0	0	3	3
Skill Enhancement Course					
23113SEC27	Astro Physics	2	0	0	2
23113SEC28	Communication Physics	2	0	0	2
Ability Enhancement Compulsory Course					
231AECCCMS	Communication Skills	2	0	0	2
231SSCBE	Basic Behavioural Etiqutte	0	0	0	1
	Total	**22**	**5**	**3**	**25**

Course Code	Course Title	L	T	P	C
23110AEC21	Tamil-II	3	1	0	3

பக்திஇலக்கியம்

பாடநோக்கங்கள்

➢ காலந்தோறும்பக்திஇலக்கியம்வளர்ந்துள்ளதன்மையைக்கற்பித்தல்.
➢ நாயன்மார்கள், ஆழ்வார்களின்பக்திச்சிறப்பைஅறியசெய்தல்.
➢ ஆழ்வார்களின்பக்திஉணர்வைஊட்டுதல்
➢ பாடல்களில்இசைஇன்பம், ஓசைநயம்ஆகியவற்றைஉணரச்செய்தல்
➢ குழந்தைப்பருலத்தின்தன்மையைஉணர்த்துதல்

பயன்கள்

➢ நாயன்மார்கள்பக்திச்சிறப்பைஅறிதல்.
➢ ஆழ்வார்களின்பக்திநெறியைஉணர்தல்.
➢ பக்திஇலக்கியம்காலம்தோறும்வளர்ந்ததைஅறிதல்.
➢ பாடல்களில்இசைஇன்பம், ஓசைநயம்அறிதல்.
➢ குழந்தைப்பருலத்தின்தன்மையைஉணர்தல்.

அலகு- 1
பன்னிருதிருமுறைகள்
1.திருஞானசம்பந்தர்- திருத்தில்லைப்பதிகம்
2.திருநாவுக்கரசர் - திருநீற்றுப்பதிகம்
3.சுந்தரர் - திருவெண்ணைநல்லூர்
4.திருமூலர் - திருமந்திரம்(இளமைநிலையாமை)

அலகு- 2
பன்னிருஆழ்வார்கள்
1.ஆண்டாள் - திருப்பாவை
2.பெரியாழ்வார்- மூன்றாம்திருமுறை(பத்துபாடல்கள்)
3.மதுரகவியாழ்வார் - கண்ணின்நுண்சிறுதாம்பு

அலகு- 3
சிற்றிலக்கியங்கள்
1.மீனாட்சியம்மைப்முத்துக்குமாரசாமிபிள்ளைத்தமிழ்- செங்கீரை
பருவம், அம்புலிபருவம்
நந்திக்கலம்பகம்
குற்றாலகுறவஞ்சி- குறத்திநகர்வளம்கூறுதல்
காளமேகப்புலவர்பாடல்கள்

அலகு- 4
புதினம்
1.நா.பார்த்தசாரதியின்- குறிஞ்சிமலர்
சீதைபதிப்பகம்சென்னை.

அலகு-5
தமிழ்இலக்கியவரலாறு

1. பக்திஇலக்கியங்கள்
2. சைவமும்தமிழும்
3. வைணவசமயம்போற்றிவளர்த்ததமிழ்
4. சிற்றிலக்கியங்கள்
5. நாவல்இலக்கியம்

பார்வைநூல்கள் :

1. தேவாரம்மணிவாசகர்பதிப்பகம்சென்னை
2. நாலாயிரதிவ்யபிரபந்தம் - வர்த்தமானபதிப்பகம்சென்னை
3. தமிழ்இலக்கியவரலாறு - முனைவர்சசுபாஷ்சந்திரபோஸ்,
   இயல்வெளியீடு,தஞ்சாவூர
4. தமிழ்நாவல்இலக்கியம் -காகைலாசபதி- தமிழ்புத்தக,நிலையம், சென்னை
1. இணையதளம்www.tamilvu.org, www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	Course Title	L	T	P	C
23111AEC22	English-II	3	1	0	3

Learning Objectives	
LO1	To introduce learners to the essential skills of communication in English

LO2	To enable them use these skills effectively in academic and non-academic contexts
LO3	To help them identify and eliminate common mistakes in writing and speaking
LO4	To enable them use various business communication strategies and to use advanced vocabulary
LO5	To familiarize them in writing descriptive essays and respond to arguments orally and in writing

Unit No.	Unit Title & Text
I	**Poetry** 1.1 Very Indian Poem in Indian English - Nissim Ezekiel 1.2 Still I Rise - Maya Angelou 1.3 On Killing a Tree - Gieve Patel
II	**Prose** 2.1 If You Are Wrong Admit it- Dale Carnegie 2.2 Kindly Adjust Please - Shashi Tharoor 2.3 The Spoon-fed Age- W.R. Inge
III	**Fiction** Alchemist - Paulo Coelho
IV	**Language Competency** 4.1 Homonyms, Homophones, HomographsPortmanteau words 4.2 Subject Verb Agreement
V	**English in the Workplace** 5.1 Reading for General and Specific information [charts, tables, schedules, graphs etc] 5.2 Reading news and weather reports 5.3 Writing paragraphs 5.4 Taking and making notes

TextBooks(LatestEditions)	
1	The Alchemist - Paulo Coelho Harper - 2005
ReferencesBooks **(Latest editions,and the style as given below must be strictly adhered to)**	
1	Advanced English Grammar. Martin Hewings. Cambridge University Press, 2000
2	Descriptive English. SP Bakshi, Richa Sharma · 2019, Arihant Publications (India) Ltd.
3	The Reading Book: A Complete Guide to Teaching Reading. Sheena Cameron, Louise Dempsey, S & L. Publishing, 2019.
4	Skimming and Scanning Techniques, Barbara Sherman, Liberty University Press, 2014
5	Brilliant Speed Reading: Whatever you need to read, however ...Phil Chambers, Pearson, 2013.

6	The Archer, <u>Paulo Coelho</u>. Penguin Viking, 2020.

	WebResources
1	Very Indian poem by Nissim Ezekiel <u>http://econtent.in/pacc.in/admin/contents/40_%20_2020103001102714.pdf</u>
2	Still I Rise by Maya Angelou <u>https://www.poetryfoundation.org/poems/46446/still-i-rise</u>
3	The Flower by Tennyson: <u>https://www.poemhunter.com/poem/the-flower-2/</u>
4	On Killing a tree by Gieve Patel: <u>https://www.poemhunter.com/poem/on-killing-a-tree/</u>
5	If you are wrong, admit it: <u>https://www.tbr.fun/if-youre-wrong-admit-it/</u>

Course Outcomes	On completion of this course, students will;	
CO1	Learn to introduce themselves and talk about everyday activities confidently	PO1
CO2	Be able to write short paragraphs on people, places and events	PO1, PO2
CO3	Identify the purpose of using various tenses and effectively employ them in speaking and writing	PO4, PO6
CO4	Gain knowledge to write subjective and objective descriptions	PO4, PO5,PO6
CO5	Identify and use their skills effectively in formal contexts.	PO3,PO8

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23113AEC23	Mechanics And special theory of Relativity	4	1	0	3

COURSE OBJECTIVES	This course allows the students: 1. To have a basic understanding of the laws and principles of mechanics;

	2. To apply the concepts of forces existing in the system; To understand the forces of physics in everyday life; 3. To visualize conservation laws; 4. To apply Lagrangian equation to solve complex problems.

UNITS	COURSEDETAILS
UNIT-I	**LAWS OF MOTION:** Newton's Laws– forces – equations of motion – frictional force – motion of aparticlein a uniformgravitational field – types of everyday forces in Physics. *Gravitation*: Classical theory of gravitation–Kepler's laws, Newton's law of gravitation – Determination of G by Boy's method – Earth-moon system – weightlessness – earth satellites – parking orbit – earth density – mass of the Sun – gravitational potential – velocity of escape – satellite potential and kinetic energy –Einstein's theory of gravitation – introduction –principle of equivalence – experimental tests of general theory of relativity – gravitational red shift – bending of light – perihelion of mercury.
UNIT-II	**CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM:** conservation of linear and angular momentum – Internal forces and momentum conservation – center of mass – examples – general elastic collision of particles of different masses – system with variable mass – examples – conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass – proton scatteringby heavy nucleus.
UNIT-III	**CONSERVATION LAWS OF ENERGY:** Introduction – significance of conservation laws – law of conservation of energy concepts of work- power – energy – conservative forces – potential energy and conservation of energy ingravitational and electric field – examples –non-conservative forces – general law of conservation of energy.
UNIT-IV	**RIGID BODY DYNAMICS:** translational and rotational motion – angular momentum – moment of inertia – general theorems of moment of inertia – examples – rotation about fixed axis – kinetic energy of rotation – examples – body rollingalong a plane surface – body rolling down an inclined plane – gyroscopic precision – gyrostatic applications.
UNIT-V	**SPECIAL THEORY OF RELATIVITY:** Michelson-Morley experiment– frames of reference – Galilean Relativity – postulates of special theory of relativity – Lorentz transformation – consequences – time dilation–concept of simultaneity – Doppler effect – length contraction–variation of mass with velocity – Einstein's mass-energy relation– relativistic momentum – energy relation
TEXT BOOKS	1. J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai. 2. P.DuraiPandian, LaxmiDuraiPandian, MuthamizhJayapragasam,2005, Mechanics, 6threvised edition, S.Chand& Co. 3. D. S. Mathur & P. S. Hemne, 2000, Mechanics, Revised Edition, S.Chand&

	Co.	
REFE RENC EBOO KS	1. Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely. 2. Halliday, David & Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai. 3. Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi	
WEBLI NKS	1. https://youtu.be/X4_K-XLUIB4 2. https://nptel.ac.in/courses/115103115 3. https://www.youtube.com/watch?v=p075LPq3Eas 4. https://www.youtube.com/watch?v=mH_pS6fruyg 5. https://onlinecourses.nptel.ac.in/noc22_me96/preview 6. https://www.youtube.com/watch?v=tdkFc88Fw-M 7. https://onlinecourses.nptel.ac.in/noc21_me70/preview	

COURSE OUTCOMES:

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

COURSEOU TCOMES	**CO1**	Understand the Newton's Law of motion, understand general theory of relativity
	CO2	Acquire the knowledge on the conservation laws
	CO3	understand and differentiate conservative and non-conservative forces
	CO4	Gain knowledge on rigid body dynamics and solve problems based on this concept
	CO5	Appreciate Lagrangian system of mechanics, apply D' Alemberts principle

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	S	S	M	S	S
CO2	S	S	S	M	S	M	S	S	S	M
CO3	S	S	S	S	S	S	M	S	M	S
CO4	M	S	S	S	M	S	S	M	S	S
CO5	S	S	M	S	S	M	S	S	S	M

Course Code	Course Title	L	T	P	C
23112GEC24	Allied Mathematics - III	3	1	0	3

Objectives of the Course	• Knowledge on Ordinary differential equations and Formation of partial differential equation
	• Knowledge about the Lagrange's method, Laplace Transforms and Inverse Laplace transform.

UNIT I:

Ordinary differential equations of first order but of higher degree- Equations solvable for x and y – solvable for dy/dx, clairaut's form (simple case only)- homogeneous linear differential equation(Variable coefficients), variation of parameter.

UNIT II:

Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functions- definition of general, particular and complete solution – singular integral(Geometrical meaning not required) solution of first order equations in the slandered forms $f(p,q=0$, $f(x,p,q)=0$, $f(z,p,q)=0$ $f1(x,p=f_2(y,p)$ $z=(x,p+yq=f(p,q)$.

UNIT III:

Lagrange's method for solving $P_p + Q_q = R$ where p,q,r functions of X, Y, Z- (geometrical meaning is not needed)- (only problem in all the above- No proof needed for any formula) Cherpit's method The four standard forms.

UNIT IV:

Laplace Trnsforms- Definitions-

$L(e^{at})$ $L(cosat)$, $L(sinat)$, $L(t^n)$ where n is a positive integer – Basic theorem inlaplace (transform only) L (e $^{-st}$ cosbt), $L(e^{-st}$ sinbt), $L[e^{-st}$ f(t)]-L[F(t), L[f(t)], L[f'(t)]

UNIT V:

Inverse Laplace transform related to the above standard forms- solving second order ODE with constant coefficients using laplace transforms and simultaneous equation, variable coeffiecients. Fourier series: Periodic functions — Dirichlet conditions (Without Proof) Odd and Even functions change of interval — Half range series.

Recommended Text	1. S. Narayanan – differential equations
	2. T.K.M Pillai & S.Naranyanan- calculus
	3. M.L.Khanna- differential calculus

Website and e-Learning Source	
	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)
Students will be able to

CLO 1: Determine Ordinary differential equations of first order but of higher degree and homogeneous linear differential equation

CLO 2: Evaluate Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functionsand singular integral

CLO 3: Solve the Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ and theExpansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of powers of θ

CLO 4: Explain Laplace Transforms and Basic theorem Inlaplace transforms

CLO 5: Explain Inverse Laplace transform and solving second order ODE with constant coefficients

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Course Code	Course Title	L	T	P	C
23112GEC25	Allied Mathematics - IV	3	1	0	3

| Objectives of the Course | • Knowledge on Vector differentiation, Divergence and Double operators. |
| | • Knowledge about Vector integration, Gauss divergence theorem and Equation of sphere. |

UNIT – I

Vector differentiation – velocity & acceleration vectors- Gradient of a vector directional derivative - Init normal vector- tangent plane.

Unit- II

Divergence- Curl – Solenoidal &Irrotational vector- Double operators – Properties connecting grad, div & curl of a vector.

Unit –III

Vector integration –Line integrals – Conservative force field – Scalar field- Scalar potential-work done by d Force- Surface integrals – Volume integrals.

Unit –IV

Gauss divergence theorem , Stoke's theorem (statement, application & verification only)

Unit –V

Equation of sphere – Target plane – plane section of a sphere – Finding the centre & radius of the circle of integration – sphere through the circle of integration (only problem in all above)

| Recommended Text | T.K. Manickavasagem Pillai, Analytical Geometry (3D) & Vector calculus, Neq Gamma Publishing House, 1991. |
| Website and e-Learning Source | https://nptel.ac.in |

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Determine Vector differentiation, velocity & acceleration vectors and tangent plane.

CLO 2: Evaluate Divergence**,** Solenoidal &Irrotational vector and Properties connecting grad, div & curl of a vector.

CLO 3: Explain the Vector integration, Line integrals Scalar field, Scalar potential and Volume integrals.

CLO 4: Explain the Gauss divergence theorem, Stoke's theorem

CLO 5: ExplainEquation of sphere, Target plane, Finding the centre and radius of the circle of integration.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Course Code	Course Title	L	T	P	C
23113SEC26L	Physics Practical - II	0	0	3	3

COURSE OBJECTIVES	Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit. Set up experiments, observe, analyse and assimilate the concept

ELECTRICITY (any eight experiments)

1. Calibration of low range and high range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Measurement of low resistances using potentiometer.
4. Determination of field along the axis of a current carrying circular coil.
5. Determination of earth's magnetic field using field along axis of current carrying coil.
6. Determination of specific resistance of the material of the wire using PO box.
7. Determination of resistance and specific resistance using Carey Foster's bridge.
8. Determination of internal resistance of a cell using potentiometer.
9. Determination of specific conductance of an electrolyte.
10. Determination of e.m.f of thermo couple using potentiometer
11. Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone.
12. Determination of figure of merit of BG or spot galvanometer.
13. Comparison of EMF of two cells usingBG.
14. Comparison of capacitance using BG.

Course Code	Course Title	L	T	P	C
23113SEC27	Astro Physics	2	0	0	2

Learning Objective:

This course intends tointroduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provides an understanding of the physical nature of celestialbodies along with the instrumentation and techniques used in astronomical research

UNITS	COURSE DETAILS
UNIT-I	**TELESCOPES:** Optical telescopes – magnifying power, brightness, resolving power and f/a ratio – types of reflecting and refracting telescopes – detectors and image processing – radio telescopes – Hubble space telescope.
UNIT-II	**SOLAR SYSTEM:**Bode's law of planetary distances – meteors, meteorites, comets, asteroids – Kuiper belt – Oort cloud – detection of gravitational waves – recent advances in astrophysics.
UNIT-III	**ECLIPSES:** types of eclipses – solar eclipse – total and partial solar eclipse – lunar eclipse – total and partial lunar eclipse – transits. **THE SUN:**physical and orbital data – solar atmosphere – photosphere – chromosphere – solar corona – prominences – sunspots – 11year solar cycle – solar flares.
UNIT-IV	**STELLAR EVOLUTION:** H-R diagram – birth and death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae. **GALAXIES:** classification of galaxies – galaxy clusters –interactions of galaxies, dark matter and super clusters – evolving universe.
UNIT-V	**ACTIVITIES IN ASTROPHYSICS:** (i) Basic construction of telescope (ii) Develop models to demonstrate eclipses/planetary motion (iii) Night sky observation (iv) Conduct case study pertaining to any topic in this paper (v) Visit to any one of the National Observatories Any three activities to be done compulsorily.
TEXT BOOKS	1. BaidyanathBasu, (2001). An introduction to Astrophysics, Second printing, Prentice – Hall of India (P) Ltd, New Delhi 2. K.S.Krishnaswamy, (2002), Astrophysics – a modern perspective, New Age International (P) Ltd, New Delhi. 3. Shylaja, B.S. andMadhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient BlackSwan,

Course Code	Course Title	L	T	P	C

23113SEC28	Communication Physics	2	0	0	2

Learning Objective:

      To get a thorough knowledge on transmission and reception of radio waves, the different types of communication like fibre optic, radar, satellite, cellular

UNITS	COURSE DETAILS
UNIT-I	**RADIO TRANSMISSION AND RECEPTION:** transmitter – modulation types of modulation – amplitude modulation – limitations of amplitude modulation – frequency modulation – comparison of FM and AM – demodulation- essentials in demodulation – receivers: AM radio receivers – types of AM radio receivers – stages of superheterodyne radio receiver, advantages – FM receiver – difference between FM and AM receivers.
UNIT-II	**FIBER OPTIC COMMUNICATION:** introduction – basic principle of fiber optics – advantages – construction of optical fiber – classification based on the refractive index profile – classification based on the number of modes of propagation – losses in optical fibers – attenuation–advantages of fiberoptic communication
UNIT-III	**RADAR COMMUNICATION:** introduction - basic radar system –radar range – antenna scanning –pulsed radar system – search radar –tracking radar – moving target indicator Doppler effect-MTI principle – CW Doppler radar
UNIT-IV	**SATELLITE COMMUNICATION:** introduction history of satellites – satellite communication system – satellite orbits – basic components of satellite communication system – commonly used frequency in satellite – communication –multiple access communication – satellite communication in India
UNIT-V	**MOBILE COMMUNICATION:** introduction – concept of cell –basic cellular mobile radio system – cellphone – facsimile – important features of fax machine – application of facsimile – VSAT (very small aperture terminals) modem IPTV (internet protocol television) -Wi-Fi-4G (basic ideas)
TEXT BOOKS	1. V.K.Metha, Principles of Electronics, S. Chand and CoLtd., 2013 2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chandand Co, 2013
REFERENCE BOOKS	1. J.S. Chitode, Digital Communications, 2020, Unicorn publications 2. Senior John. M, Optical Fiber Communications: Principles and Practice, 2009, Pearson Education.

Course Code	Course Title	L	T	P	C
231AECCCMS	Communication Skills	2	0	0	2

Aim and Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learnersback
2. Identify what their non-verbal messages are communicating toothers
3. Understand role of communication in teaching-learningprocess
4. Learning to communicate through the digitalmedia
5. Understand the importance of empatheticlistening
6. Explore communication beyondlanguage.

Course Outcome:

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
    i. Identify the main claim of the text
    ii. Identify the purpose of the text
    iii. Identify the context of the text
    iv. Identify the concepts mentioned
- Evaluating these ideas and information
    i. Identify the arguments employed in the text
    ii. Identify the theories employed or assumed in the text

- Interpret the text
    i. To understand what a text says
    ii. To understand what a text does
    iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification of issues
- Provide back ground information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper sign posting techniques
- Be well structured
    i. Well-knit logical sequence
    ii. Narrative sequence
    iii. Category groupings

- Different modes of Writing   -
    i. E-mails
    ii. Proposal writing for Higher Studies
    iii. Recording the proceedings of meetings
    iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools
    i. Paint
    ii. Office
    iii. Excel
    iv. Power point

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better

- Effective ways of using Social Media
- Introduction to DigitalMarketing

Unit VII

- Meaning of non-verbal communication
- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference:

1. Sen Madhucchanda (2010), *An Introduction to Critical Thinking*, Pearson,Delhi

2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

SEMESTER - III					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23110AEC31	Tamil-III	3	1	0	3
23111AEC31	Advanced English-III				
23132AEC31	Hindi-III				
23135AEC31	French-III				
23111AEC32	English-III	3	1	0	3
23113AEC33	Thermodynamics and Statistical Physics	4	1	0	3
23112GEC34	Allied Chemistry - I	4	1	0	3
Practical					
23113SEC35L	Physics Practical - III	0	0	3	3
23114SEC36L	Allied Chemistry Practical - I	0	0	3	2
Skill Enhancement Course					
23113SEC37	Energy Physics	2	0	0	2
23113SEC38	Mathematical Physics	2	0	0	2
Ability Enhancement Compulsory Course					
23113RMC39	Research Methodology	2	0	0	2
231ACLSOAN	Office Automation	0	0	0	1
	Total	**20**	**4**	**6**	**24**

Course Code	Course Title	L	T	P	C
23110AEC31	Tamil-III	**3**	**1**	**0**	**3**

காப்பியஇலக்கியம்

பாடநோக்கங்கள்

➢ தமிழ்க்காப்பியங்களைஅறிமுகப்படுத்துதல்.
➢ காப்பியங்கள்கூறும்வாழ்வியல்அறங்களைஉணர்த்துதல்.
➢ காப்பியஇலக்கியங்களில்இலக்கியச்சுவையைபயிற்றுவித்தல்.
➢ நாடகஇலக்கியத்தின்தனித்துவத்தைக்கற்பித்தல்.
➢ புராணச்செய்திகளைமேம்படுத்திக்கொள்ளச்செய்தல்.

பயன்கள்

இலக்கியங்களின்சிறப்புகளைஅறிவர்
காப்பியக்கதைகள்வழிஅறச்சிந்தனைபெறுவர்
பல்வேறுகாப்பியவடிவங்களைபற்றியஅறிவுபெறுவர்.
நாடகபடைப்பாக்கத்திற்கானதூண்டுதலைப்பெறுவர்
புராணச்செய்திகள்வழிதமிழ்கலாச்சாரத்தைஅறிவர்.

அலகு 1
1.சிலப்பதிகாரம் - மதுரைகாண்டம் (வழக்குரைகாதை)
2.மணிமேகலை - விழாவறைகாதை
3.சீவகசிந்தாமணி - குணமாலையார்இலம்பகம்

அலகு 2
1.கம்பராமாயணம் - மந்தரைசூழ்ச்சிபடலம்
2.மகாபாரதம் - ஆரண்யபருவம்

அலகு 3
1.பெரியபுராணம் - இளையான்குடிமாறநாயனார்புராணம்
2. சீறாப்புராணம் - ஈத்தங்குழைவரவழைத்தப்படலம்
3.தேம்பாவணி - பிரிந்தமகனைகாண்படலம்

அலகு 4
நாடகம்சாபம்?விமோசனம்
மு.இராமசுவாமி,
செண்பகம்இராமசுவாமி,
பாவைபதிப்பகம்,ஜானிஜான்சாலை
சென்னை-14

அலகு 5
இலக்கியவரலாறு
காப்பியங்கள், இரட்டைக்காப்பியங்கள்
நாடகஇலக்கியம்

பார்வைநூல்கள் :

1. காப்பியத்திறன் - மணிவாசகர்நூலகம், சிதம்பரம்.
2. தமிழ்காப்பியங்கள் - கி. வா .ஜெகன்ஜெகநாதன், அமுதநிலையம், சென்னை .
3. நவீனநாடகஉருவாக்கம் - கோபழனி, தமிழ்பல்கலைக்கழகம், தஞ்சாவூர்.
4. இணையதளம் -www.tamilvu.org, www.noolulagam.com
5. சாபம்? விமோசனம்
மு.இராமசுவாமி,

செண்பகம்இராமசுவாமி,
பாவைபதிப்பகம்,ஜானிஜான்சாலை,
சென்னை-14

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	Course Title	L	T	P	C
23111AEC32	English-III	3	1	0	3

	Learning Objectives
LO1	To enhance the level of literary and aesthetic experience of students and to help them respond creatively.

LO2	To sensitize them to the major issues in the society and the world.
LO3	To provide them with an ability to build and enrich their communication skills
LO4	To equip them to utilize the digital knowledge resources effectively for their chosen fields of study
LO5	To help them think and write imaginatively and critically.

Unit No.	Unit Title & Text
I	**Poetry:** 1.1 The Voice of the Mountains - Mamang Dai 1.2 A Song of Hope - Oodgeroo Noonuccal 1.3 In an Artist's Studio - Christina Rossetti
II	**Scenes From Shakespeare:** 2.1 Romeo & Juliet -The Balcony Scene 2.2 Macbeth-Banquet Scene 2.3 Julius Caesar - Murder Scene
III	**Speeches of Famous personalities** 3.1 Yes, We Can-Barack Obama 3.2 You've Got to Find What You Love-Steve Jobs
IV	**Language Competency** 4.1 Writing letters and emails 4.2 Writing and messaging in social media platforms [blogs, twitter, instagram.facebook] 4.3 Learning netiquette, email etiquette
V	**English for Workplace** 5.1 Data Interpretation and Reporting 5.2 Data Presentation and analysis 5.3 Meeting Etiquettes - language, dress code, voice modulation. Online Meetings - Terms and expressions used 5.4 Conducting and participating in a meeting

	Text Books (Latest Editions)
1	**Arden Shakespeare Complete works by <u>Shakespeare</u> (Author), <u>William</u> (Author), Bloomsbury, 2011)**
References Books **(Latest Editions,and the style as given below must be strictly adhered to)**	
1	<u>The Shakespeare Book: Big Ideas Simply Explained, Stanley Wells et al. DK Publishing, 2015</u>
3	Famous Speeches by Mahatma Gandhi, Createspace Independent Publishing Platform, 2016
4	How to Build a Professional Digital Profile Kindle Edition by <u>Jeanne Kelly Bernish</u>, Bernish Communications Associates, LLC; 1st edition (May 29,

	2012)	
5	Keys to Teaching Grammar to English Language Learners, Second Ed.: A Practical Handbook by <u>Keith S Folse</u>, Michigan Teacher Training, 2016.	
6	Role Play-Theory and Practice.<u>Krysia M Yardley-Matwiejczuk</u>, SAGE publications ltd, 1997	

Web Resources	
1	The Voice of the Mountains by Mamang Dai: https://www.scribd.com/document/558838656/The-Voice-of-the-Mountain-By-Mamang-Dai-Adivasi-Resurgence
2	A song of Hope by Kath Walker: http://www.wordslikethis.com.au/a-song-of-hope/
3	In an artist's studio by Christina Rossetti: https://www.poetryfoundation.org/poems/146804/in-an-artist39s-studio
4	Sita by Toru Dutt: https://www.poetrynook.com/poem/s%E2%94%9C%C2%ABta

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Broaden their outlook and sensibility and be acquainted with cultural diversity and divergence in perspectives.	PO1
CO2	Be updated with basic informatics skills and attitudes relevant to the emerging knowledge society	PO1,PO2
CO3	Produce grammatically and idiomatically correct language.	PO4,PO6
CO4	Gain knowledge in writing techniques to meet academic and professional needs.	PO4,PO5 ,PO6
CO5	Be equipped with sufficient practice in Vocabulary, Grammar, Comprehension and Remedial English from the perspective of career oriented tests.	PO3,PO8

Course Code	Course Title	L	T	P	C
23113AEC33	Thermodynamics and Statistical Physics	4	1	0	3

COURSE OBJECTIVES	1. The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. 2. Practical exhibition and explanation of transmission of heat in good and bad conductor. 3. Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its

	relation

UNITS	COURSEDETAILS
UNIT-I	**THERMODYNAMICS - I:** zeroth law and first law of thermodynamics – 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-II	**THERMODYNAMICS - II:** second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram – thermodynamicalscale of temperature – Maxwell's thermodynamical relations – Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.
UNIT-III	**LOW TEMPERATURE PHYSICS:** Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyletemperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetization - specific heat capacity – specific heat capacity of gases C_P & C_V– Meyer's relation – Joly's method for determination of C_V – Regnault's methodfor determination of C_P
UNIT-IV	**HEAT TRANSFER:** modes of heat transfer: conduction, convection and radiation. *Conduction*: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination ofthermal conductivity of a bad conductor by Lee's disc method. *Radiation*: black body radiation (Ferry's method) – 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	**STATISTICALMECHANICS:** 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 BOOKS	1. Brijlal &N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand& Co. 2. Narayanamoorthy&KrishnaRao, 1969,Heat, Triveni Publishers, Chennai. 3. V.R.Khanna&R.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish & Co, Meerut
REFER ENCE BOOKS	1. J.B.Rajam & C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chand& Co. Ltd. 2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand & Sons. 3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand & Co.
WEB LINKS	1. https://youtu.be/M_5KYncYNyc 2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

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

	CO1	Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high

<table>
<tr><td rowspan="5">COURSEOUT COMES</td><td></td><td>temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics</td></tr>
<tr><td>CO2</td><td>Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines</td></tr>
<tr><td>CO3</td><td>Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy</td></tr>
<tr><td>CO4</td><td>Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them</td></tr>
<tr><td>CO5</td><td>Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac . Apply to quantum particles such as photon and electron</td></tr>
</table>

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG **(S)**, MEDIUM **(M)** and LOW **(L)**.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	S	M	S	S	S	M	M	S	M

Course Code	Course Title	L	T	P	C
23112GEC34	Allied Chemistry - I	4	1	0	3

COURSE OBJECTIVES:

1. To understand the various theories of coordination chemistry.
2. To study the various concepts of resonance and halogen compounds.
3. To study the properties of aromatic compounds and organic reactions.
4. To learn the concepts of solid-state chemistry.

UNIT – I COORDINATION CHEMISTRY AND INDUSTRIAL CHEMISTRY:

Coordination Chemistry: Nomenclature–Werner's, sidgwick and Pauling's the ories. Chelation-industrial importance of EDTA, Biological role of hemoglobin and Chrophyll.

Industrial Chemistry: Fuelgases – Watergas, producer gas, LPG gas, Gobar gas and natural gas. Fertilizers – NPK and mixed Fertilizers- soaps and detergents.

UNIT –II ELECTRON DISPLACEMENT EFFECTS AND HALOGEN COMPOUNDS:

Polareffects: Inductive effect –Relative Strength of Aliphatic monocarboxylic acid and aliphatic amines. Resonance–Condition for resonance.Consequences of resonance – resonance of energy.Basic property of aniline and acidic property of phenol.Hyper conjugation – Heat of hydrogenation – Bond length and dipole moment.Steric effect.

Halogen containing compounds: Important chloro-hydrocarbons use dassolvents. Pesticides–Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC Types of solvents:-Polar, Non-polar.

UNIT – III AROMATIC COMPOUNDS AND ORGANIC REACTIONS:

Aromatic compounds: Structure, stability resonance and aromaticity of benzene. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, properties and uses.Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Halo form reactions

Chemotherapy: Explanation with two examples each for analgesics, antibacterial, anti - inflammatory, antibiotics, antiseptic and disinfectant, anesthetics local and general (Structures not necessary).

UNIT – IV SOLIDSTATE, ENERGETICS AND PHASERULE:

Solidstate: Typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices

Energetics: First law of thermodynamics – state and path function – need for the second law – carnotscycle and thermo- dynamic scale of temperature, spontaneous and Non–spontaneous processes–entropy – Gibbs free energy.

Phase rule: Phase, component, degree of Freedom, phase rule definitions – one component system–water system.

UNIT – V CHEMICALEQUILIBRIUMANDCHEMICALKINETICS:

Chemical equilibrium: Criteria of homo generous and heterogeneous equilibria, - decomposition of HI, N_2O_4, $CaCO_3 + Pd_5$.

Chemical Kinetics: Order of reaction and their determinations-activation energy, effects of temperature on reaction rate.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Assignments and seminar on industrial applications of coordination compounds, describing thermodynamic conditions for Haber and contact process, Arrhenius theory for rate constant of a reaction, Thermodynamic conditions for spontaneous and non- spontaneous processes, mode of action of antibiotic, analgesics and anti-inflammatory drugs.

REFERENCES:

1. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
2. Morrison R.T. and Boyd R.N., Bhattacharjee S.K. Organic Chemistry (7th edition), Pearson India, (2011).
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chandand Co.
4. https://gascnagercoil.in/wp-content/uploads/2020/12/allied-chemistry-book.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To describe structure and functions of biologically important coordination compounds.
2. To apply eletromeric and resonance effect to predict reactivity and stability of organic compounds
3. To classify the drugs based on their mode of actions.
4. To predict conditions for spontaneous and non-spontaneous reactions.
5. To calculate Gibb's free energy, work function and entropy of a reaction

Course Code	Course Title	L	T	P	C
23113SEC35L	Physics Practical - III	0	0	3	3

COURSE OBJECTIVES	1. Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

THERMODYNAMICS (Any Eight of the below list)
1. Determination of specific heat by cooling – graphical method.

2. Determination of thermal conductivity of good conductor by Searle's method.
3. Determination of thermal conductivity of bad conductor by Lee's disc method.
4. Determination of thermal conductivity of bad conductor by Charlaton's method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction/graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan's constant for Black body radiation.
9. Verification of Stefan's-Boltzmans law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtz resonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kunds tube.
14. Determination of frequency of an electrically maintained tuning fork
15. To verify the laws of transverse vibration using sonometer.
16. Frequency of AC by using sonometer.

Course Code	Course Title	L	T	P	C
23114SEC36AL	Allied Chemistry Practical - I	0	0	3	2

COURSE OBJECTIVES:

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions.
3. To learn the techniques of qualitative analysis of organic compounds

Volumetric Analysis:

1. Acidimetry and alkalimetry:

    (a) Strongacid VS strongbase

    (b) Weakacid VS strongbase

    (c) Determination of hardness of water.

2. Permanganometry:

    (a) Estimation off erroussulphate

    (b) Estimation of oxalic acid

3. Iodometry:

    (a) Estimation of potassium dichromate

    (b) Estimation of potassium permanganate

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

    1. To understand the use of volumetric pipette, burette and analytical balance.
    2. To explain the principles of volumetric analysis.

Course Code	Course Title	L	T	P	C
23113SEC37	Energy Physics	2	0	0	2

Learning Objective:

    To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.

UNITS	COURSE DETAILS
UNIT-I	**INTRODUCTION TO ENERGY SOURCES:** energy consumption as a measure of prosperity – world energy future – energy sources and their

UNIT	COURSE DETAILS
	availability – conventional energy sources – non-conventional and renewable energy sources – comparison – merits and demerits.
UNIT-II	**SOLAR ENERGY:** solar energy Introduction – solar constant – solar radiation at the Earth's surface – solar radiation geometry – Solar radiation measurements – solar radiation data –solar energy storage and storage systems – solar pond – solar cooker – solar water heater – solar greenhouse – types of greenhouses – solar cells.
UNIT-III	**WIND ENERGY:** introduction –nature of the wind – basic principle of wind energy conversion – wind energy data and energy estimation – basic components of Wind Energy Conversion Systems (WECS) – advantages and disadvantages of WECS – applications – tidal energy
UNIT-IV	**BIOMASS ENERGY:** introduction – classification – biomass conversion technologies –photosynthesis – fermentation - biogas generation – classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.
UNIT-V	**ENERGY STORAGE:** Energy storage systems – Mechanical Energy storage – Compressed Air storage – Electrical storage – Thermal energy storage - importance of energy storage- batteries - lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – advantages and disadvantages of fuel cells – applications of fuel cells - hydrogen storage.
TEXT BOOKS	1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4th Edn. 2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rd Edn.
REFERENCE BOOKS	1. John Twidell& Tony Weir, Renewable Energy Resources, Taylor & Francis, 2005, 2nd Edn. 2. S.A. Abbasi and NasemaAbbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008.

Course Code	Course Title	L	T	P	C
23113SEC38	Mathematical Physics	2	0	0	2

Learning Objective:

To understand higher mathematical concepts which are applied to solve problems in Physics and similar situations

UNITS	COURSE DETAILS
UNIT-I	**MATRICES:** types of matrices – symmetric, Hermitian, unitary and orthogonal

	matrices– characteristic equation of a matrix – Eigen values and Eigen vectors of a matrix – Cayley-Hamilton theorem – inverse of matrix by Cayley-Hamilton theorem – similarity transformations – diagonalization of 2x2 real symmetric matrices.
UNIT-II	**VECTOR CALCULUS:** vector differentiation – directional derivatives –definitions and Physical significance of gradient, divergence, curl – Laplace operators– vector identities – line, surface and volume integrals – statement, proof and simple problems for Gauss's divergence theorem, Stoke's theorem, Green's theorem.
UNIT-III	**ORTHOGONAL CURVILINEAR COORDINATES:** tangent basis vectors – scale factors – unit vectors in cylindrical and spherical coordinate systems –gradient of a scalar –divergence and curl of a vector – Laplacian in these coordinate systems.
UNIT-IV	**FOURIER SERIES:** periodic functions –Dirichlet's conditions – general Fourier series – even and odd functions and their Fourier expansions – Fourier cosine and sine – half range series – change of length of interval. Fourier analysis of square wave, saw-tooth wave, half wave/full wave rectifier wave forms. **FOURIER TRANSFORMS**: Fourier Integral theorem(Statement only)–Fourier, Fourier sine and Fourier cosine transforms,– Fourier transform ofsingle pulse – trigonometric,exponential and Gaussianfunctions – inverse Fourier transform – convolution theorem.
UNIT-V	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (PDE):** PDE for transverse vibrations in elastic strings (one dimensional wave equation) –one dimensional heat flow equation – solutions to these PDE's by method of separation of variables – problems based on boundary conditions and initial conditions.
TEXT BOOKS	1. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India. 2. Mathematical Physics – P. K. Chattopadhyay, New Age International Publishers. 3. Mathematical Physics – B. D. Gupta. 4. Mathematical Physics – H. K. Das, S. Chand and Co, New Delhi.
REFERENCE BOOKS	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.

Course Code	Course Title	L	T	P	C
23113RMC39	Research Methodology	2	0	0	2

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V: Laboratory Safety

General guidelines. Hygiene – Eye, foot, skin and hand protection – Safety rules -Equipment protection – Respiratory protective equipment – safety equipment – Leakingcompressed gas cylinders – electrical safety. Fire – fire extinguishers.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 2099.

3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.

4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.

5. R.Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry,

Sultan Chand and Sons, New Delhi, 2005.

6. E. Balagurusamy, Numerical methods, Tata McGraw-Hill

7. S.S. Sastry, Introductory Methods of Numerical analysis, PHI, N.Delhi

Course Code	Course Title	L	T	P	C
231ACLSOAN	Office Automation	0	0	0	1

Aim and Course Objectives :

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india

2. Microsoft Office 2007 Bible – John Walkenbach,HerbTyson,FaitheWempen,caryN.Prague,MichaelR.groh,PeterG.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.

3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.

4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications

5. https://en.wikipedia.org

6. https://wiki.openoffice.org/wiki/Documentation

7. http://windows.microsoft.com/en-in/windows/windows-basics-all-topics

SEMESTER - IV					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23110AEC41	Tamil-IV	3	1	0	3
23111AEC41	Advanced English-IV				
23132AEC41	Hindi-IV				
23135AEC41	French-IV				
23111AEC42	English-IV	3	1	0	3
23113AEC43	Optics and Spectroscopy	3	1	0	3

23112GEC44	Allied Chemistry - II	3	1	0	3
Practical					
23113SEC45L	Physics Practical - IV	0	0	3	3
23114SEC46L	Allied Chemistry Practical - II	0	0	3	3
Skill Enhancement Course					
23113SEC47	Advanced Mathematical Physics	2	0	0	2
23113SEC48	Numerical Methods and C programming	2	0	0	2
Ability Enhancement Compulsory Course					
23113BRC49	Participation in Bounded research	2	0	0	2
231AECCEVS	Environmental Studies	2	0	0	2
231LSCLS	Leadership and Management Skills	0	0	0	1
Total		**20**	**4**	**6**	**27**

Course Code	Course Title	L	T	P	C
23110AEC41	Tamil-IV				

<div align="center">சங்கஇலக்கியம்</div>

பாடநோக்கங்கள்
* இலக்கியங்கள்வாயிலரகசமுதாயக்கருத்தக்களை
* பழந்தமிழ்இலக்கியவளத்தைஉணர்த்துதல்.
* சங்கஅக, புறபாடல்மரபுகளைப்பயிற்றுவித்தல்
* வாழ்வியல்அறங்கள்மற்றும்வரலாற்றுச்செய்திகளை .பயிற்றுவித்தல்
* புறஇலக்கியங்கள்காட்டும்வாழ்வியல்அறங்களைஎடுத்துக்கூறுதல்
பயன்கள்

- பழந்தமிழ்இலக்கியமரபைஅறிவர்.
- சங்கஇலக்கியங்களில்உள்ளஅழகியல்கூறுகளைஉணர்வர்.
- வாழ்வியல்அறங்கள்மற்றும்வரலாற்றுச்செய்திகளைஅறிவர்.
- சங்கஅக, புறபாடல்மரபுகளைபுரிந்துக்கொள்வர்.
- *புறஇலக்கியங்கள்காட்டும்வாழ்வியல்அறங்களைஉணர்வர்.

அலகு 1
    1. குறுந்தொகை- பாடல்எண்: 28,38

    2. நற்றிணை - பாடல்எண்: 1,27,28,167,168

    3.ஐங்குறுநூறு- பாடல்எண்: இளவேனில்பத்து

அலகு 2
    1.கலித்தொகை - பாடல்எண்: 3,7

    2.அகநானூறு- பாடல்எண்:5,42,100

    3. புறநானூறு- பாடல்எண்: 182,204,41,121

அலகு 3
    சிறுபாணாற்றுப்படைமுழுவதும்

அலகு 4
    திருக்குறள் - செய்நன்றிஅறிதல், கூடாநட்பு,நலம்புனைந்துரைத்தல்

    நாலடியார் - பாடல்எண்: 1,172,215,253

அலகு 5
    இலக்கியவரலாறு

    1.சங்கஇலக்கியம்

    2.எட்டுத்தொகை, பத்துப்பாட்டு

    3.பதினெண்கீழ்க்கணக்குநூல்கள்

பார்வைநூல்கள்

- குறுந்தொகை - கழகவெளியீடு, சென்னை
- நற்றிணை - கழகவெளியீடு, சென்னை
- ஐங்குறுநூறுகழகவெளியீடு,சென்னை
- கலித்தொகைகழகவெளியீடு,சென்னை
- அகநானூறு - கழகவெளியீடு,சென்னை
- புறநானூறு - கழகவெளியீடு,சென்னை
- திருக்குறள் - பரிமேலழகர்உரை,கழகவெளியீடு,சென்னை
- இணையதளம் -www.tamilvu.org, www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	Course Title	L	T	P	C
23111AEC42	English-IV	3	1	0	3

Learning Objectives	
LO1	To help learners imbibe the rules of language unconsciously and tune to deduce language structure and usage.
LO2	To enable them use receptive skills through reading and listening to acquire good exposure to language and literature.
LO3	To help them develop style in speech and writing and manipulate the tools of language for effective communication.
LO4	To provide exposure to plays, autobiographies and expose them to value based ideas.
LO5	To enhance their language skills especially in the areas of grammar and pronunciation.

	Unit Title & Text

Unit No.	
I	**Life Writing** 1.1 I am Malala-Malala Yousafzai - Chapter 1 1.2 My Inventions - Nikola Tesla - Chapter 2
II	**One Act Plays** 2.1The Zoo Story- Edward Albee 2.2 The Proposal- Anton Chekhov
III	**Interviews** 3.1 Nelson Mandela's Interview with Larry King. 3.2 Rakesh Sharma's Interview with Indira Gandhi from Space 3.3 Lionel Messi with Sid Lowe (Print)
IV	**Language Competency** 4.1 Refuting, Arguing & Debating 4.2 Making Suggestions & Responding to Suggestions, Asking for and Giving Advice or Help4.3 Interviews (face to face, telephone and video conferencing)
V	**English for Workplace** 5.1 Job Applications: Covering letters, CV and Resume 5.2 Creating a digital profile - Linkedin 5.3 Filling Forms (Online & Manual): creation of account, railway reservation, ATM,Credit/debit card 5.4 Body Language -Practical Skills for Interviews

	TextBooks(LatestEditions)
1.	I Am Malala The Girl Who Stood Up for Education and Was Shot by the Taliban by Malala Yousafzai, Christina Lamb , Little Brown, 2013.
2	My Inventions by Nikola Tesla Ingram Short title, 2011 Edition
Reference Books **(Latest editions,and the style as given below must be strictly** **adhered to)**	
1	Writing Your Life: A Guide to Writing Autobiographies,Mary Borg, Taylor & Francis, 2021
2	One-act Plays for Acting Students: An Anthology of Short Norman A. Bert · 1987 ·
3	The One-Act Play Companion: A Guide to plays, playwrights ... Colin Dolley, Rex Walford · 2015
4	How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Role Play-Theory and Practice.Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn to communicate effectively and appropriately in real life situation.	PO1
CO2	Use English effectively for study purpose across the curriculum	PO1,PO2
CO3	Develop interest in and appreciation of Literature	PO4,PO6
CO4	Develop and integrate the use of the four language skills	PO4,PO5,PO6
CO5	Enhance their language skills especially in the areas of grammar and pronunciation.	PO3,PO8

Course Code	Course Title	L	T	P	C
23113AEC43	Optics and Spectroscopy	3	1	0	3

COURSE OBJECTIVES	1. To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; 2. To explain the behaviour of light in different mediums; To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; 3. To understand the design of optical systems and methods to minims aberrations; 4. To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

UNITS	COURSE DETAILS
UNIT-I	**INTRODUCTION TO OPTICS:** postulates of geometrical optics *Lens*: thick and thin lenses – focal length, critical thickness, power and cardinal points of a

	thick lens – lens makers formula (no derivation) – aberrations: spherical aberration,chromatic aberrations, coma,and astigmatism– curvature of the field – distortion – chromatic aberrations methods. *Prism*: narrow angled prisms - dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope. *Eyepieces*: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces, construction and working –merits and demerits of the eyepiece. *Resolving power*: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of, (i) Prism (ii) grating (iii) telescope *Fiber Optics*: Basic ideas of optical fibre – Numerical aperture – Stepped and graded index fibres – Fibre optic communication (Block diagram only).
UNIT-II	**INTERFERENCE:** division of wave front, Fresnel's biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton's rings. *Interferometers* : Michelson's interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation D_1 and D_2 lines of sodium light, (iii) determination of a thickness of a mica sheet.
UNIT-III	**DIFFRACTION:** Fresnel's assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit – Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima.
UNIT-IV	**POLARISATION:** optical activity – optically active crystals –polarizer and analyser–double refraction – optic axis, principal plane – Huygens's explanation of double refraction in uniaxial crystals – polaroids and applications – circularlyand elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel's explanation – specific rotation – Laurent half shade polarimeter – experiment to determine specific rotatory power.
UNIT-V	**SPECTROSCOPY:** infra-red spectroscopy near infra-red and far infra-red – properties –origin of IRspectra – IR spectrophotometer – applications interpretation of IR spectra – CH, CO, CN bending and stretching vibrational modes only – scattering of light – Raman effect –classical theory –quantum theory –mutual exclusion principle – Raman spectrometer- characteristics of Raman lines –applications – ultraviolet and visible spectroscopy –properties – spectrophotometer.
TEXT BOOKS	1. Subramaniam. N&Brijlal, 2014,Optics, 25th edition,S.Chand &Co. 2. S.L.Gupta,V.Kumar& R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, Pragati Prakashan, Meerut. 3. G.Aruldhass,2000,Molecular Structure and Spectroscopy,II edition.PHIPvt Ltd, New Delhi.
REFER ENCEB OOKS	1. Agarwal B.S, 2011,Optics, KedernathRamnath Publishers, Meerut. 2. Sathyaprakash, 1990,Optics,VII edition, RatanPrakashanMandhir, New Delhi. 3. C.N.Banewell, 2006, Introduction to Molecular Spectroscopy,IV edition,TMH Publishing Co,New Delhi.

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	Outline basic knowledge of methods of rectifying different defects in lenses
	CO2	Discuss the principle of superposition of wave, use these ideas to understand the wave nature of light
	CO3	Extend the knowledge about nature of light through diffraction techniques
	CO4	Interpret basic formulation of polarization
	CO5	Relate the principles of optics to various fields of IR, Raman

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	M	M	S	S	M	M
CO2	M	S	M	S	M	S	M	M	S	S
CO3	S	M	S	S	S	M	S	S	M	M
CO4	S	M	S	M	M	S	M	M	S	M
CO5	S	M	S	M	S	S	M	S	S	S

Course Code	Course Title	L	T	P	C
23112GEC44	Allied Chemistry - II	3	1	0	3

COURSE OBJECTIVES:

1. To learn the basics of nuclear chemistry and metallic bond.
2. To understand the properties and applications of carbohydrates, amino acids and proteins.
3. To study the basic concepts of polymers, heterocyclic compounds and stereoisomerism.

UNIT – I Nuclear Chemistry and Metallic bond:

Nuclear Chemistry: Fundamental particles of nucleus- isotopes, isobars, isotones and isomers – differences between chemical reactions and nuclear reactions, nuclear fusion and fission- radioactive series.

Metallic bond: Electron gas, Pauling and band theories, semiconductors – intrinsic, extrinsic – type and p – type semico nductors.

Compounds of sulphur and sodiumthiosulphate

UNIT – II Carbohydrates, Amino Acids and Proteins:

Carbohydrates: classification –glucose and fructose–preparation and properties – structure of glucose –Fischer and Haworth cyclic structures.

Amino acids and proteins: Amino acids – Classification based on structure. Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) – proteins – Classification based on physical properties and biological functions. Structure of proteins–primary and secondary (elementary treatment).

UNIT – III Polymers, Heterocyclic Compound and Stereoisomerism:

Synthetic polymers: preparation, properties and uses of Teflon, epoxy resins, polyester resin.

Heterocyclic compounds: Furan, pyrrole and pyridine –preparation, properties and uses – basic properties of pyridine and pyrrole.

Stereoisomerism: Optical isomerism – Lactic and tartaric acid – racemic mixture and resolution. Geometrical isomerism–maleic and fumaricacids.

Unit – IV Surface and photochemistry:

Surface Chemistry: Emulsions, gels–preparation, properties - Electrophoresis and applications, chromatography – Column, paper and thin layer Chromatography.

Photochemistry: Laws of photochemistry and applications.

Unit – V Electrochemistry, pH and Buffer

Electrochemistry: Specific and equivalent conductivity–their determination – effect of dilution on conductivity. Ostwald's Dilution law, Kohlrausch law, conductivity measurements, and conduct metric titrations.

pH and buffer: Importance of Ph and buffers –pH determination by colorimetric and electrometric methods.

UNIT – VI Current Contours (For Continuous Internal Assessment Only):

Assignments and seminar on nuclear radiation, nuclear reactors, structure of carbohydrates and proteins, aromaticity of heterocyclic compounds. Hands on training to determine dissociation constant of acetic acid using conduct meter and to determination of pH of acetic acid sodium acetate buffer by conductivity measurements.

REFERENCES:

1. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.

2. Bahl, B.S. and Bahl, A., Organic Chemistry, (12thedition), New Delhi, Sultan Chand & Co., (2010).

3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.

4. https://oms.bdu.ac.in/ec/browse.php?type=UG

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To explain theory of nuclear chemistry and chemical bonding.

2. To classify carbohydrates and proteins.

3. To synthesise polymers and hetero cyclic compounds.

4. To apply conductivity measurements to determine degree of dissociation of weak electrolyte and pH of buffer solution.

5. To explain preparation and applications of emulsion and gels in chromatography.

Course Code	Course Title	L	T	P	C
23113SEC45L	Physics Practical - IV	0	0	3	3

COURSE OBJECTIVES	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

OPTICS (any eight experiments)
1. Determination of refractive index of prism using spectrometer.
2. Determination of refractive index of liquid using hollow prism and spectrometer
3. Determination of dispersive power of a prism.
4. Determination of radius of curvature of lens by forming Newton's rings.
5. Determination of thickness of a wire using air wedge.
6. Determination of Cauchy's Constants.
7. Determination of resolving power of grating
8. Determination of resolving power of telescope

9.	Comparison of intensities using Lummer Brodhum Photometer.
10.	Determination of range of motion using Searlesgoniometer.
11.	Verification of Newton's formula for a lens separated by a distance.
12.	Determination of refractive index of a given liquid by forming liquid lens
13.	Determination of refractive index using Laser.
14.	Determination of wavelengths, particle size using Laser/Monochromatic source.
15.	Determination of resolving power of Diffraction grating using Laser
16.	Determination ofwire using Laser.

Course Code	Course Title	L	T	P	C
23114SEC46AL	Allied Chemistry Practical - II	0	0	3	3

COURSE OBJECTIVES:

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions.
3. To learn the techniques of qualitative analysis of organic compounds

Organic Analysis:

Analyse the following organic Compounds.

1. Carbohydrate

2. Amide

3. Aldehyde

4. Ketone

5. Acid

6. Amine

The students may be trained to perform the specific reactions like tests for aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

REFERENCES:

1. R.Gopalan, Elements of analytical chemistry, S.Chand, New Delhi, 2000.

2. N.S.Gnanapragasam and G.Ramamurthy, Organic Chemistry lab manual, S.Viswanathan and Co. Pvt. Ltd. Chennai-1998

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To understand the use of volumetric pipette, burette and analytical balance.
2. To explain the principles of volumetric analysis,

Course Code	Course Title	L	T	P	C
23113SEC47	Advanced Mathematical Physics	2	0	0	2

Learning Objective:

The fundamentals of matrices and vector calculus learnt in earlier course will enable students to learn advanced topics and theorems. The special functions and applications of partial differential equations will be of use in research at a later stage.

UNITS	COURSE DETAILS
UNIT-I	**MATRICES:** introduction – special types of matrices – transpose – conjugate– conjugate transpose– symmetric andanti symmetric – Hermitian and skew Hermitian – orthogonal and unitary – properties – characteristic equation – roots and characteristic vectors – diagonalization– Cayley–Hamilton theorem –simple problems

	VECTOR CALCULUS: ∇ operator – divergence – second derivative of vector functions or fields –Laplacian operator – curl of a vector – line integral – line Integral of a vector field around an infinitesimal rectangle – curl of conservative field – surface integral – volume integral (without problem) – Gauss's divergence theorem and proof – Stroke's theorem and proof –simple problems.
UNIT-II	
UNIT-III	**SPECIAL FUNCTIONS:** definition –Beta function – Gamma function – evaluation of Beta function – other forms of Beta function – evaluation of Gamma function – other forms of Gamma function – relation between Beta and Gamma functions – simple problems.
UNIT-IV	**FROBENIUS METHOD AND SPECIAL FUNCTIONS:** singular points of second order linear differential equations and importance –singularities of Bessels and Laguerre equations, Frobenius method and applications to differential equations: Legendre and Hermite differential equations – Legendre and Hermite polynomials – Rodrigues formula –generating function – orthogonality
UNIT-V	**PARTIAL DIFFERENTIAL EQUATIONS:** solutions to partial differential equations using separation of variables - Laplace's equation in problems of rectangular – cylindrical and spherical symmetry – conducting and dielectric sphere in an external uniform electric field – wave equation and its solution for vibrational modes of a stretched string
TEXT BOOKS	1. Mathematical Physics, B.D. Gupta-Vikas Publishing House, 4 th Edition (2006) 2. Mathematical Physics, SatyaPrakash (Sultan Chand)
REFERENCE BOOKS	1. Mathematical MethodsorPhysicists,G.B.Arfken,H.J.Weber,F.E.Harris (2013, 7th Edn., Elsevier) 2. Mathematical Physics–H. K. Dass, Dr. Rama Verma (S. Chand Publishing) 3. Advanced Engineering Mathematics, Erwin Kreyszig (Wiley India) 4. Mathematical Physics and Special Relativity, M. Das, P.K. Jena and B.K. Dash (SrikrishnaPrakashan)

Course Code	Course Title	L	T	P	C
23113SEC48	Numerical Methods and C programming	2	0	0	2

Learning Objective:

To understand the methods in numerical differentiation and integration andto develop the problem solving skills of the student. To introduce and explain the basic structure, rules of compiling and execution of C programming.

UNITS	COURSE DETAILS
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, miles to kilometer – 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 – constants, variables and data types – character set, key words and identifiers – declaration of variables and data types – operators – expressions: arithmetic, relational, logical, assignment – increment and decrement – conditional – comma 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 – declaring arrays – storing arrays in memory –initializing arrays – simple programs
TEXT BOOKS	1. Numerical methods,Singaravelu,Meenakshipublication,4thEdn., 1999. 2. Numerical methodsP.Kandasamy, K.Thilagavathy, K. Gunavathi, S.Chand, 2016 3. Programming in C, Balagurusamy, TMG, ND, 2012 4. Numerical Analysis,,M.K.Venkatraman, NPH, 2013 **5.** Numerical Analysis, B.D.Gupta, Konark Publishers, New Delhi, 2013
REFERE NCE BOOKS	1. Schaum's outline series, Theory and Problems of programming in C, C.Byronand S. Gottfried, Tata McGraw Hill 2003 3. Numerical methods and C Programming, Veerarajan, 2015.

Course Code	Course Title	L	T	P	C
231AECCEVS	Environmental Studies	2	0	0	2

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Introduction, types, characteristic features, structure, and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – the value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ

and ex-situ conservation of biodiversity. Field study of common plants, insects, and birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION

Control of SO2, NOX, CO, and HC) (b) Water pollution: Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical, and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–the role of an individual in prevention of pollution – pollution case studies – A field study of the local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES

The effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion, and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants. Field study of the local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

Environmental Issues and possible solutions – 12 Principles of green chemistry - nuclear accidents and the holocaust, case studies – wasteland reclamation – consumerism and waste products – environment production act – Air Act – Water Act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquakes, cyclones, and landslides. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies. Environmental Education and Environmental Education at different levels of Education Environmental awareness and attitude change.Environmental Stressors and Disaster Management Education

TEXT BOOKS:
1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.

2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ.,

House, Mumbai, 2001.

3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.

4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

Course Code	Course Title	L	T	P	C
231LSCLS	Leadership and Management Skills	0	0	0	1

Aim:

The aim of the course cultivatingandnurturingtheinnateleadershipskillsofthe youthsothattheymaytransformthesechallengesintoopportunitiesandbecometorchbearersofthe future by developing creativesolutions.

Course Objective:

The Module is designed to:

> ➢ Help students to develop essential skills to influence and motivateothers

- ➢ Inculcate emotional and social intelligence and integrative thinking for effective leadership
- ➢ Create and maintain an effective and motivated team to work for thesociety
- ➢ Nurture a creative and entrepreneurialmindset
- ➢ Make students understand the personal values and apply ethical principles inprofessionaland social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengthsandabilities that affect their own leadership style and can create their leadership vision
2. Learnanddemonstrateasetofpracticalskillssuchastimemanagement,selfmanagement,handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop businessplans
4. Apply the design thinking approach forleadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I-LeadershipSkills

a. Understanding Leadership and itsImportance
- • What isleadership?
- • Why Leadershiprequired?
- • Whom do you consider as an idealleader?

b. Traits and Models ofLeadership
- • Are leaders born ormade?
- • Key characteristics of an effectiveleader
- • Leadership styles
- • Perspectives of differentleaders

c. Basic LeadershipSkills
- • Motivation
- • Teamwork
- • Negotiation
- • Networking

UNIT II -Managerial Skills

a. Basic ManagerialSkills
- • Planning for effectivemanagement
- • How to organize teams?
- • Recruiting and retainingtalent
- • Delegation oftasks
- • Learn tocoordinate
- • Conflictmanagement

b. Self-ManagementSkills
- Understanding self-concept
- Developingself-awareness
- Self-examination
- Self-regulation

UNIT III –EntrepreneurialSkills

a. Basics ofEntrepreneurship
- Meaning ofentrepreneurship
- Classification and types ofentrepreneurship
- Traits and competencies ofentrepreneur

b. Creating BusinessPlan
- Problem identification and ideageneration
- Ideavalidation
- Pitchmaking

UNIT IV - Innovative Leadership andDesignThinking

a. Innovative Leadership
- Concept of emotional and socialintelligence

- Synthesis of human and artificialintelligence
- Why does culture matter for today's globalleaders

b. DesignThinking
- What is designthinking?
- Key elements of designthinking:
  - Discovery
  - Interpretation
  - Ideation
  - Experimentation
  - Evolution.
- How to transform challenges intoopportunities?
- How to develop human-centric solutions for creating socialgood?

UNIT V- EthicsandIntegrity

a. Learning throughBiographies
- What makes an individualgreat?
- Understanding the persona of a leader for deriving holisticinspiration
- Drawing insights forleadership
- How leaders sail through difficultsituations?

b. Ethics andConduct
- Importance ofethics

- Ethical decisionmaking
- Personal and professional moral codes ofconduct
- Creating a harmoniouslife

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Bbiography of E. Sreedharan*. Penguin,UK.

- Brown, T. (2012). *Change by Design.* HarperBusiness

- Elkington, J., &Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.

- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India PrivateLimited

- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin BooksIndia

- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential WithinUsAll.* WilliamCollins

- KurienV.,& Salve G. (2012). *I Too Had a Dream*. Roli Books PrivateLimited

- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American ManagementAssociation

- McCormackM.H. (1986).*WhatTheyDon'tTeachYouatHarvardBusinessSchool:NotesFromA Street-Smart Executive*. RHUS

- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good.*Harpercollins

- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*.Penguin

- Sternberg R. J., Sternberg R. J., &BaltesP. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge UniversityPress.

E-Resources

- Fries,K. (2019).8EssentialQualitiesThatDefineGreatLeadership .*Forbes*.Retrieved2019- 02-15 from https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63.

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SEMESTER - V				
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory				
23113AEC51	Atomic Physics	4	1	0	4
23113AEC52	Basic Electronics	4	1	0	4

Course Code	Course Title	L	T	P	C
23113AEC53	Electricity and Magnetism	4	1	0	4
23113DSC54_	Discipline Specific Elective - I	4	1	0	3
23113DSC55_	Discipline Specific Elective - II	4	1	0	3
Practical					
23113SEC56L	Physics Practical - V	0	0	3	3
Skill Enhancement Course					
231AECCVED	Value Education	2	0	0	2
23113SEC57	Internship / Carried out in II Year Summer Vocation	0	0	0	2
Audit Course					
231ACLSPSL	Professional Skills	0	0	0	1
	Total	**22**	**5**	**3**	**26**

Course Code	Course Title	L	T	P	C
23113AEC51	Atomic Physics	4	1	0	4

COURSE OBJECTIVES	1. To study about electric charges, their properties through experiments; To gain knowledge on photoelectric effect; 2. To solve problems based on Einstein's photoelectric equation; 3. To make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electrons;

| | 4. To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields; |
| | 5. To understand the principle, production and applications of lasers. |

UNITS	COURSE DETAILS
UNIT-I	**THE ELECTRON AND POSITIVE RAYS:** e/m of electronby Dunnington's method –charge of electron by Millikan's oil drop method – properties of positive rays –e/m of positive rays by Thomson's parabola method (*problems calculation of e/m ratio of positive rays*)–mass spectrographs and uses– Bainbridge and Dempster's mass spectrographs
UNIT-II	**PHOTOELECTRIC EFFECT:** photoelectric emission – Leonard's experiment – Richardson and Compton experiment –laws of photoelectric emission – Einstein's photoelectric equation (*problems using Einstein's photoelectric equation*) –experimental verification by Millikan's method – photoelectric cell– photo emissive cell –photovoltaic cell – photo conducting cell – applications of photoelectric cells –photomultiplier.
UNIT-III	**ATOMIC STRUCTURE:** Sommerfield's relativistic atom model –vector atom model –various quantum numbers – L-S and J-J coupling – Pauli's exclusion principle –magnetic dipole moment of an electron due to orbital and spin motion – Bohr magneton - Stern and Gerlach experiment – Lande 'g' factor.
UNIT-IV	**SPLITTING OF SPECTRAL LINES:** excitation, ionisation and critical potentials – Davis and Goucher's method – optical spectra – spectral notation and selection rules – fine structure of sodium D-line – Zeeman effect – experimental arrangement and classical theory of normal Zeeman effect – Larmor's theorem –quantum theory of normal Zeeman effect – anomalous Zeeman effect –explanation of splitting of D_1 and D_2 lines of sodium – Paschen Back effect - Stark effect (Qualitative only).
UNIT-V	**X-Ray SPECTRA:** X-ray – Coolidge tube – Properties – X-ray Spectra – Continuous and characteristics X-ray spectrum – Mosley's law (Statement, Explanation and Importance) – Compton effect – Expression for change of wave length - X-ray diffraction-Bragg's law- Bragg's spectrometer- Powder crystal method – Quantum theory: The distribution of energy in the spectrum of a black body – its results - Planck's hypothesis – derivation of Planck's law of radiation
TEXT BOOKS	1. R. Murugesan, Modern Physics, S. Chand & Co. (All units) (Units I&II-Problems) 2. Brijlal & N. Subrahmanyam, Atomic & Nuclear Physics, S. Chand & Co. (All units) 3. J. B. Rajam, Modern Physics, S. Chand & Co. 4. Sehgal&Chopra, Modern Physics, Sultan Chand, New Delhi 5. Avadhahnulu, An Introduction to Lasers - Theory and Applications, M.N., S.Chand& Co., New Delhi, 2001.
REFERENCE BOOKS	1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill. 2. Modern Physics, S. Ramamoorthy, National Publishing & Co. 3. Laser and Non-Linear Optics by B.B.Laud, Wiley Easter Ltd.,New York,1985.
WEB	1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html

LINKS		2. https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx 3. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay 4. https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei

COURSE OUTCOMES:

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

COURSEO UTCOMES	**CO1**	**List** the properties of electrons and positive rays, **define** specific charge of positive rays
	CO2	**Outline** photoelectric effect and the terms related to it, **State** laws of photoelectric emission.
	CO3	**Explain different atom models,** Describe **different quantum numbers and different coupling schemes.**
	CO4	**Differentiate between** excitation and ionization potentials, **Explain** Davis and Goucher's experiment
	CO5	**Understand the condition for production of laser, Appreciate various** properties and applications of lasers.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	S	S	M	S	M	M	M
CO5	S	M	S	S	M	S	S	M	M	S

Course Code	Course Title	L	T	P	C
23113AEC52	Basic Electronics	4	1	0	4

COURSE OBJECTIVES	The main objectives of this course are to: 1. Acquire knowledge and apply it to various electronic instruments. 2. Gain knowledge about the development of the electronic instruments. 3. Motivate the students to apply the principles of electronics in their

UNITS	COURSE DETAILS
	day-to-day life.

UNITS	COURSE DETAILS
UNIT-I	**SEMICONDUCTORS DEVICES:** *Diodes:* Introduction – Hall effect – Junction diodes – PN Junction – Biased PN Junction – Volt Ampere characteristic of a PN Junction – Zener diode – Tunnel diode – Backward diode. *Transistors:* Junction Transistor – Transistor construction – Modes of operation of a transistor – static characteristic in CB and CE modes – Transistor amplifier – Transistor Biasing.
UNIT-II	**POWER ELECTRONICS:** Introduction - power electronics - The Triac – Construction - Operations – Characteristics - Applications. The Diac – Operations – Applications of Diac – Lamp dimmer – heat controller. FET – SCR - UJT – Construction – Operations –Characteristics - advantages– applications - UJT over voltage detector.
UNIT-III	**AMPLIFIERS:** *Voltage and power amplifiers:* Classification of amplifiers – Transistor amplifiers in cascade – Power amplifiers – Class A power amplifier – Push Pull connection – push pull class B Power amplifier – Characteristics of an amplifier. *Feedback amplifiers:* feedback and related termsblock diagram of a feedback amplifier- Transfer gain of an amplifier with feedback- Emitter follower circuit
UNIT-IV	**OSCILLATORS:** Introduction - Types of oscillators - Fundamental principle of oscillator - Concept of feedback oscillator -Tuned collector oscillator - Analysis - Hartley oscillators – Analysis – Colpitt's oscillator – Analysis - Phase shift oscillator-Analysis - Wien bridge oscillator - Analysis - Crystal oscillator – Analysis.
UNIT-V	**OPERATIONAL AMPLIFIER:** Differential amplifier – Basic circuit – Operation – CMRR -Operational amplifier – Characteristics – Circuit symbol - Frequency response - Slew rate – Applications - Inverting amplifier – Non inverting amplifier - Adder - Subtractor - Integrator- Differentiator.
TEXT BOOKS	1. Foundations of Electronics, D Chattopadhyaya & P C Rakshit, New Age Intrenational Publishers, Second Edition (2005) 2. Principles of Electronics, V K Mehta, Rohit Mehta, S. Chand Company, Eleventh revised Edition (2015)
REFERENCE BOOKS	1) Principles of Electronics – V.K. Metha 2) A text book of Applied Electronics – R.S. Sedha 3.) Integrated Electronics, Jacob Millman and Christos C. Halkias, Tata McGraw Hill Publishing Company, Second edition (2015)
WEBLINKS	https://nptel.ac.in/course.html/Electronics/Basic%20electrnics https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/ https://nptel.ac.in/course.html/electronics/operational%20amplifier

COURSE OUTCOMES:

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

Course Outcomes	**CO1**	differentiate between different types of amplifiers and their applications
	CO2	design different types of oscillators
	CO3	design operational amplifier circuits and to analyse their properties

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG **(S)**, MEDIUM **(M)** and LOW **(L)**.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	M
CO2	M	M	S	S	M	S	S	M	M	S
CO3	M	S	S	S	S	S	S	S	S	S

Course Code	Course Title	L	T	P	C
23113AEC53	Electricity and Magnetism	4	1	0	4

COURSE OBJECTIVES	The main objectives of this course are to: 1. Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances. 2. Understand Biot and Savart's law and Ampere's circuital law to

	describe and explain the generation of magnetic fields by electrical currents.

UNITS	COURSE DETAILS
UNIT-I	**ELECTROSTATICS**: Gauss theorem and its application – Intensity at a point due to uniformly charged cylinders – Electrostatic potential – Deduction of Coulomb's law from Gauss law - Electrical potential - Equipotential surface - Potential due to a (i) dipole (ii) uniformlychargedsphere – Capacitor – Principle of a capacitor – Spherical and cylindrical capacitors – Capacitors in series and in parallel – Energy of a charged capacitor – Energy loss due to sharing of charges.
UNIT-II	**DIELECTRICS:** Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics - Dielectric strength, Capacitance of a parallel plate condenser with dielectric slab between the plates - Electric displacement D - electric polarization P - Relation between D, E and P - Dielectric constant and electric susceptibility.
UNIT-III	**MAGNETOSTATICS:** Magnetic field – Intensity of magnetization – Permeiability – Susceptibility – Relation between them – Potential due to dipole – Relation between potential and intensity – Properties of dia, para, fero magnetic matterials – Hysteresis – B.H curve. Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Divergence and curl of magnetic field, Ampere's Circuital Law and its application to So1enoid,Hall effect, determination of Hall coefficient and applications.
UNIT-IV	**ELECTROMAGNETIC INDUCTION:** Faraday's laws of Electromagnetic induction - Lenz's law - Self-induction - Self-inductance of a long solenoid – Mutual induction - Mutual inductance of two coils - Co-efficient of mutual induction – Energy stored in magnetic field - Relation between self-induction and mutual inductance – Anderson method –Eddy current – Electromagnetic damping - Co-efficient of coupling – Transformer theory.
UNIT-V	**ALTERNATNG CURRENT AND ELECTROMAGNETIC WAVES:** Alternating current - A.C Circuit with single components - Relation between current and voltage in LR and CR circuit - Phase and Vector diagrams - LCR series and parallel resonant circuit - Q —factor - Power in ac circuits - Wattless current - Power factor. Idea of displacement current - Maxwell's equations – Derivation - Maxwell's wave equation (with derivation) - Transverse nature of electromagnetic waves - Poynting theorem (Statement only)
TEXT BOOKS	1. Electricity and Magnetism – D.L. Seghal and Chopra.
REFER ENCE BOOKS	1) Electricity and Magnetism – Brijlal and Subramaniam. 2) Electricity and Magnetism – Narayanamoorthi and Nagarathnam.
WEB LINKS	https://www.worldscientific.com/worldscibooks/ 10.1142/11036#t=aboutBook https://en.wikipedia.org/wiki/Electricity_and_Magnetism_(book)

COURSE OUTCOMES:

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

Course Outcomes	**CO1**	**Cognitive abilities and skills relating to solution of problems in Physics and Physics Related Disciplines**
	CO2	**Practical skills relating to the conduct of laboratory and industrial work in** **General skills relating to non-subject specific competencies,**
	CO3	**Understand communication, ICT knowledge, interpersonal, organization skills and ethical standards.**

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	M
CO2	M	M	S	S	M	S	S	M	M	S
CO3	M	S	S	S	S	S	S	S	S	S

Course Code	Course Title	L	T	P	C
23113DSC54A	Lasers and Fiber Optics	4	1	0	3

Learning Objective:

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

UNITS	COURSE DETAILS
UNIT-I	**FUNDAMENTALS OF LASER:** basic principles: spontaneous and stimulated emission – Einstein'scoefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two and

	three level laser system – resonatorconfiguration – quality factor – threshold condition – concept of Qswitching–Theoryofmodelocking–cavitydumping.
UNIT-II	**TYPES OF LASER: s**olidstatelaser: rubylaser, Nd:YAGlaser,Nd:Glasslaser– semiconductor laser: intrinsic semiconductor laser, doped semiconductorlaser, injection laser – dye laser – chemical laser: HCL laser, DF- CO_2, COchemicallaser. Gaslaser:neutral atom gas laser (He-Ne laser), CO_2laser, Copper vapour laser.
UNIT-III	**APPLICATIONS OF LASER:** application of laser in metrology – optical communication – materialprocessing: 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 lightpropagation through fiber – total internal reflection – optical fiber – coherent bundle – numerical aperture and skew mode – phase shift andattenuation during total internal reflection – types of fiber: single mode andmulti-mode fiber – step index and graded index fiber – fiber optic sensors – applicationoffiberoptics.
UNIT-V	**CHARACTERISTICS AND FABRICATION OF OPTICAL FIBER:** fiber characteristics: mechanical and transmission characteristics – absorption loss and scattering loss measurements – dispersion – connectorsand splicers – fiber termination – optical time domain reflectometer(OTDR) and its uses – fiber material – fiber fabrication – fiber optic cablesdesign.
TEXT BOOKS	1. B.B. Laud - Laser and Non-linear Optics, New Age International Publications Third Edition, NewDelhi. 2. An Introduction to laser, theory and applications by Avadhunulu, M.N.S.,Chand &Co, NewDelhi
REFERENCE BOOKS	1. A.Sennaroglu,"PhotonicsandLaserEngineering:Principles,Devicesan dApplications"McGraw-HillEducation,2010. 2. K.R.Nambiar,"Lasers:Principles,TypesandApplications",NewAgeInt ernational,2004.

Course Code	Course Title	L	T	P	C
23113DSC54B	Disaster Management	4	1	0	3

AIM: Disaster management aims to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

Course Objectives:
1. To provide students an understanding the need for studying the disaster management
2. Develop an understanding about the various types of disasters.

3. To expose students to the risk and vulnerability analysis
4. To create awareness about disaster prevention and risk reduction
5. To establish relationship between disasters and developments.
6. To understand Rehabilitation, Reconstruction and Recovery in the event of Disaster
7. To gain knowledge on Climate Change Adaptation and IPCC Scenario and Scenarios in the context of India.

ContentofCourse
UnitI:IntroductiontoDisasters
ChapterNo.1 Disaster:Concept,Meaning,andDefinition **ChapterNo.2**HistoryofMajorDisasterEventsinIndia **ChapterNo.3**TypesofDisasters–NaturalDisasters:Famine,Drought,Flood,Cyclone, Tsunami, Earthquake
UnitII:DisasterMitigationandDisasterManagement
ChapterNo.4 Man-madeDisasters:Riots,Blasts,Industrial,Militancy **ChapterNo.5**Profile,FormsandReductionofVulnerability **Chapter No. 6** Disaster Mitigation: Concept and Principles
UnitIII:ImpactofDisaster
ChapterNo.7 DisasterManagement:ConceptandPrinciples
ChapterNo.8 Pre-disaster-PreventionandPreparedness
ChapterNo.9 Physical,Economic,Social,Psycho-socioAspects,EnvironmentalImpacts
UnitIV:DisasterProcessandIntervention
ChapterNo.10 DuringDisaster-RescueandRelief
ChapterNo.11 Post-disaster-RehabilitationandReconstruction **ChapterNo.12**VictimsofDisaster-Children,Elderly,andWomen **ChapterNo.13**Displacement-Causes,Effectsand Impact
UnitV:DisasterIntervention
ChapterNo.14 MajorIssuesandDynamicsintheAdministrationofRescue,Relief, Reconstruction and Rehabilitation **ChapterNo.15**ComponentsofRescue,Relief,Reconstruction; Rehabilitation **ChapterNo.16**DisasterPolicyinIndia;DisasterManagementAuthority-NDMA, SDMA, DDMA; Disaster Management Act, 2005

Key*Words:*Disaster,DisasterMitigation,DisasterManagementandDisasterProcess

References:

1. AnilSinha(2001),DisasterManagement-

LessonsDrawnandStrategiesforFuture.New Delhi, Jain

Publications.

2. Backer,C.W.andChapman,W.(ed.).(1969),ManandSocietyinDisasters,New Delhi,

3. Clarke,J.I.,PeterCurson,et.al.(ed.) (1991),PopulationandDisaster,Oxford,Basil Blackwell Ltd.

4. Cuny,Frederick(1984),DisastersandDevelopment,Oxford,OxfordU niversityPress. Disaster Management Act 2005

5. Garb,S.andEng.E(1969),DisastersHandBook,NewYork,Springer.

6. Gupta, M.C, L.C. Gupta, B. K. Tamini and Vinod K. Sharma (2000), Manual on Natural Disaster Management in India, New Delhi, National Institute of Disaster Management. Hoff,A. (1978),PeopleinCrisis- UnderstandingandHelping,California,AddisonWesley.

7. Maskrey,Andrew(1989),DisasterMitigation:ACommunityBasedA pproach,Oxford, Oxfarm.

8. Narayan,Sachindra(ed.) (2000),AnthropologyofDisasterManagement,NewDelhi,Gyan Publishing House.

9. NidhiGDhawan(2014),DisasterManagementandPreparedness,New Delhi,Jain Publications.

10. Parasuraman,S.andUnnikrishnan,P.V. (2000),IndiaDisastersReport:TowardsPolicy Initiative, New Delhi, Oxford University Press.

11. Satendra,K.J.AnandhaKumarandV.K.Naik(2013),India'sDisasterR eport,NewDelhi, National Institute of Disaster Management.

12. Singh,R.B.(ed.)(2000),DisasterManagement,NewDelhi,RawatPublications.

13. Sinha,P.C.(ed.)(1998),EncyclopediaofDisasterManagement(Vol.1- 10),NewDelhi, Anmol Publications.

14. TataInstituteofSocialSciences(2002).SpecialVolumeonDisasterMa nagement,Indian Journal of Social Work, Vol.63, Issue 2, April.

Course Outcomes:
CO1: Understand the need and significance of studying disaster management
CO2: Understand the different types of disasters and causes for disasters.
CO3: Gain knowledge on the impacts Disasters on environment and society
CO4: Study and assess vulnerability of a geographical area.
CO5: Students will be equipped with various methods of risk reduction measures and risk mitigation.
CO6: Understand the role of Information Technology in Disaster Management

CO7: Understand Geographical Information System applications in Disaster Management

Course Code	Course Title	L	T	P	C
23113DSC54_C	**Nanomaterial and their properties**	4	1	0	3

Unit I. Introduction to Nanomaterials

Definitions and historical development of nanomaterials. Classification of nanomaterials, including nanosized metals, alloys, semiconductors, and ceramics. Overview of unique properties that differentiate nanomaterials from their bulk counterparts.

Unit II. Fundamental Properties of Nanomaterials

Size and shape dependence of properties such as optical, electrical, thermal, and magnetic characteristics. Discussion on how properties like melting point, density, and specific surface area change at the nanoscale. Introduction to concepts like quantum confinement and its effects on electronic properties.

Unit III. Synthesis of Nanomaterials

Overview of synthesis methods including top-down (e.g., mechanical milling) and bottom-up approaches (e.g., chemical vapor deposition, sol-gel methods). Specific techniques for synthesizing carbon-based nanomaterials like carbon nanotubes and fullerenes. Bio-inspired synthesis methods and nanocomposite fabrication.

Unit IV. Characterization Techniques

Methods for characterizing nanomaterials such as Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), and X-ray Diffraction (XRD). Spectroscopic techniques including UV-Vis spectroscopy, Raman spectroscopy, and surface analysis methods. Interpretation of data from these characterization techniques.

Unit V. Applications of Nanomaterials

Exploration of applications in various fields such as nanoelectronics, biomedical applications, energy storage (batteries, fuel cells), and environmental sensing. Discussion on the role of nanomaterials in enhancing material properties for high-strength composites and other advanced technologies.

Course Code	Course Title	L	T	P	C
2311DSC54_D	**Physics of functional materials and devices**	4	1	0	3

Unit I
Structures of Melts and Solids
Introduction, X-ray Analysis, The Hard Sphere Model of Atoms, Crystal Structure, Crystal Structures of Solid Metals, Crystal Defects in Pure Metals, Structures of Alloy Melts and Solids.
Theory of Atoms and Molecules: Introduction, The Bohr Model of Atomic Structure, The Quantum, Mechanical Model of Atomic Structure, Solution of the Schrödinger Equation for Atoms, Quantum, Mechanics and Probability: Selection Rules, The Quantum Mechanical Model of Molecular Structure, Diatomic Molecules, Polyatomic Molecules.

Unit II Theory of Solids

Introduction, Bonds in Molecules and Solids: Some Definitions, Bonds in Molecules and Nonmetallic Solids, Metallic Bonds, Band Theory of Solids, Elastic Vibrations in Solids, Influence of Lattice Defects on Electronic Structures in Crystals

Unit III Properties of Gases

Introduction, Kinetic Theory of Gases, Energy Distribution in Particle Systems: Maxwell–Boltzmann Distribution Law, Gas Laws, Heat Capacity, Mean Free Path, Viscosity, Thermal Conduction, Diffusion, Molecular Sizes, Properties of Gas Mixtures, Plasma – The Fourth State of Matter,

Unit IV

Transformation Kinetics: Diffusion in Solids: Introduction, Thermodynamics, Transformation Kinetics, Reaction Rates, Kinetics of Homogeneous, Reactions in Gases, Diffusion in Solids, Mechanical, Thermal and Magnetic Properties of Solids: Total Energy of Metallic Crystals, Elasticity and Compressibility, Expansion, Heat Capacity, Magnetism.

Unit V

Transport Properties of Solids. Optical Properties of Solids: Thermal Conduction, Electrical Conduction, Metallic Conductors, Insulators, Semiconductors, Optical Properties of Solids, Properties of Liquids and Melts: Introduction, X-ray Spectra of Liquids and Melts, Models of Pure, Liquids and Melts, Melting Points of Solid Metals, Density and Volume, Thermal Expansion, Heat capacity, Transport Properties of Liquids, Diffusion, Viscosity, Thermal Conduction.

Reference

Physics of Functional Materials, by **Hasse Fredriksson,** KTH Stockholm, Sweden, and **Ulla Åkerlind** University of Stockholm, Sweden

Course Code	Course Title	L	T	P	C
23113DSC55A	Materials Science	4	1	0	3

Learning Objective:

- To learn imperfections in crystals, deformation of materials and testing of materials.
- To get knowledge on behavior of a material, under the action of light and their applications. To know the applications of crystal defects.

UNITS	COURSE DETAILS
UNIT-I	**CRYSTALLOGRAPHIC FUNDAMENTALS:** Crystal lattice – Primitive and Unit cell – Seven classes of crystals – Bravais lattice – Miller Indices – Structure of crystals – Simple cubic, Hexagonal close packed structure, Face centered cubic structure, Body centered cubic structure – Sodium chloride structure – Zinc Blende structure – Diamond Structure. *Crystallography:* Diffraction of X-Rays by Crystals – Bragg's law in one dimension – Experimental method in X-Ray diffraction – Laue method, Rotating crystal method – Powder Photograph method – Laue's equations.
UNIT-II	**CRYSTAL IMPERFECTIONS:** introduction – point defects: vacancies, interstitials, impurities, electronic defects – equilibrium concentration of point imperfections – application of point defects –line defects: edge dislocation, screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt &twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections.
UNIT-III	**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-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
TEXT BOOKS	3. Material science and Engineering,Raghavan V, Prentice Hall of India, Sixth Edition, 2015 4. Materials science, V. Rajendran, McGraw Hill publications2011
REFERENCE BOOKS	1. William D. Callister, Jr., Material Science & Engineering – An Introduction, 8th Edition, John Wiley & Sons, Inc., 2007 2. W. Bolton, "Engineering materials technology", 3rd Edition, Butterworth & Heinemann, 2001.

Course Code	Course Title	L	T	P	C
23113DSC55B	Digital Photography	4	1	0	3

Learning Objective:

To understand the principles of photography and image formation and the science and arts behind it. To understand the essential components of conventional and digital cameras and also the different image processing techniques.

UNITS	COURSE DETAILS
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 – POSTPRODUCTION:** hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness andcontrast – 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.
TEXT BOOKS	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
REFERENCE BOOKS	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

Course Code	Course Title	L	T	P	C
23113SEC56L	Physics Practical - V	0	0	3	3

COURSE	Demonstrate various optical phenomena principles, working, apply with

OBJECTIVES	various materials and interpret the results.

1. Bi-prism – Determination of μ.
2. Thickness of a thin film of Bi-prism
3. Brewster's law – polarization
4. Y – by Corlus method.
5. Dispersive power of plane diffraction grating.
6. Diffraction a straight edge.
7. Kundt's tube – Velocity of sound, Adiabatic Young's modulus of the material of the rod.
8. Forbe's method – Thermal conductivity of a metal rod.
9. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.
10. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.

11. Spectral response of photo conductor (LDR).
12. Potentiometer –Resistance and Specific resistance of the coil.
13. Potentiometer – E.M.F of a thermocouple.
14. Carey Foster's bridge - Temperature coefficient of resistance of the coil.
15. Deflection Magnetometer – Determination of Magnetic moment of a bar magnet and BHusing circular coil carrying current.
16. Vibration magnetometer - Determination of BH using circular coil carrying current– Tan B position.
17. B.G – Figure of Merit – Charge Sensitivity
18. Zener diode – voltage regulations
19. Bride rectifier using diodes
20. Clipping and clamping circuits using diodes.
21. Characteristics of a transistor –(CE mode)
22. Characteristics of a transistor –(CB mode).
23. RC coupled CE transistor amplifier - single stage.
24. Transistor Emitter follower.
25. Colpitt's oscillator -transistor.
26. Hartley oscillator - transistor.
27. Astable multivibrator - transistor.
28. Bistablemultivibrator - transistor.
29. FET - characteristics.
30. FET - amplifier (common drain)
31. UJT -characteristics
32. AC circuits with L,C,R -Series resonance.
33. AC circuits with L,C,R - Parallel resonance.
34. Operational amplifier - inverting amplifier and summing.
35. Operational amplifier - non-inverting amplifier and summing.
36. Operational amplifier – differential amplifier
37. Operational amplifier - differentiator & integrator.
38. Operational amplifier - D/A converter by binary resistor method.

Course Code	Course Title	L	T	P	C
231ACLSPSL	Professional Skills	0	0	0	1

Aim and CourseObjectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful careerpath

2. Prepare good resume, prepare for interviews and groupdiscussions

3. Explore desired career opportunities in the employment market in consideration ofanindividual SWOT.

Course Outcomes:

At the end of this course the students will be able to:

1. Preparetheirresumeinanappropriatetemplatewithoutgrammaticalandothererror sandusing proper syntax

2. Participate in a simulatedinterview

3. Actively participate in group discussions towards gainfulemployment

4. Capture a self - interview simulation video regarding the job roleconcerned

5. Enlist the common errors generally made by candidates in aninterview

6. Perform appropriately and effectively in groupdiscussions

7. Explore sources (online/offline) of careeropportunities

8. Identify career opportunities in consideration of their own potential andaspirations

9. Usethenecessarycomponentsrequiredtoprepareforacareerinanidentifiedoccupa tion(as a case study).

Unit I:ResumeSkills

Resume Skills: Preparation andPresentation

- Introduction of resume and itsimportance
- Difference between a CV, Resume and Biodata
- Essential components of a goodresume

   ii. Resume skills: commonerrors

- Common errors people generally make in preparing theirresume
- Prepare a good resume of her/his considering all essentialcomponents

Unit II: InterviewSkills

   i. Interview Skills : Preparation andPresentation

- Meaning and types of interview (F2F, telephonic, video,etc.)
- Dress Code, Background Research, Do's andDon'ts
- Situation ,Task,ApproachandResponse(STARApproach)forfacinganinte rview
- Interview procedure (opening, listening skills, closure,etc.)

- Importantquestionsgenerallyaskedinajobinterview(openandclo sedended questions)

ii.   Interview Skills:Simulation
- Observation of exemplaryinterviews
- Comment critically on simulatedinterviews

iii.   Interview Skills : CommonErrors
- Discuss the common errors generally candidates make ininterview
- Demonstrate an idealinterview

Unit III: GroupDiscussionSkills

Meaning and methods of GroupDiscussion

- Procedure of GroupDiscussion
- Group Discussion-Simulation
- Group Discussion – CommonErrors

Unit IV: ExploringCareer Opportunities

Knowing yourself – personalcharacteristics

- Knowledge about the world of work, requirements of jobs includingself-employment.
- Sources of careerinformation
- Preparing for a career based on their potentials and availability ofopportunities

SEMESTER - VI					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
Theory					
23113AEC61	Nuclear and Particle Physics	5	1	0	3
23113AEC62	Digital Electronics and Microprocessor 8085	5	1	0	3
23113DSC63_	Discipline Specific Elective - III	5	1	0	2
23113AEC64	Project Work	0	0	5	4
Practical					
23113SEC65	Physics Practical - VI	0	0	3	2
Skill Enhancement Course					
23113SEC66	General Awareness for Competitive Examination	2	0	0	2
231ACSIKWS	Indian Knowledge System	2	0	0	3
231EXACT	NSS/NCC/YRC/Physical Education	0	0	0	1
	Total	19	3	8	20

Course Code	**Course Title**	**L**	**T**	**P**	**C**

23113AEC61	Nuclear and Particle Physics	5	1	0	3

COURSE OBJECTIVES	1. To understand constituents, properties and models of nucleus.To give reason for radioactivity and study their properties. 2. To learn about the principles of various particle detectors and accelerators. 3. To acquire knowledge on different types of nuclear reactions and their applications. 4. To know the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles.

UNITS	COURSE DETAILS
UNIT-I	**PROPERTIES OF NUCLEUS:** constituents of nucleus – isotopes, isobars, isotones – nuclear size, mass, density, charge, spin, angular momentum, magnetic dipole moment, electric quadrupole moment (qualitative) – binding energy – mass defect – packing fraction – nuclear stability – binding energy per nucleon graph – properties of nuclear force – meson theory of nuclear forces – Yukawa potential. **NUCLEAR MODELS:** liquid drop model –Weizacker's semi-empirical mass formula – shell model – magic numbers.
UNIT-II	**RADIO ACTIVITY:** radio activity – laws of radioactivity – radioactive disintegration, decay constant, half-life, mean-life (only final formulae) – unitsof radioactivity–successive disintegration – transient and secular equilibrium– properties of alpha, beta and gamma rays – Geiger-Nuttal law –α-ray spectra – Gammow's theory of α-decay (qualitative) –β-ray spectrum – neutrino theory of β-decay – nuclear isomerism – K-shell capture – internal conversion – non-conservation of parity in weak interactions.
UNIT-III	**PARTICLE DETECTORS AND ACCELERATORS** **DETECTORS:** Interaction between the energetic particles and matter – Heavy charged particles – Electrons – Gamma ray - gas detectors –ionization chamber - Solid State detector - Wilson Cloud chamber – Nuclear emission – Linear accelerators. *Accelerators:***linear accelerators -** G-M counter – scintillation counter – photo multiplier tube (PMT) – semiconductor detectors – neutron detector **– cyclotron – synchrotron – betatron– electron synchrotron – protonsynchrotron (bevatron)**
UNIT-IV	**NUCLEAR REACTIONS:** types of nuclear reactions –conservation laws in nuclear reaction – Q-value– threshold energy – nuclear fission – energy released in fission – chain reaction – critical mass – nuclear reactor – nuclear fusion – sources of stellar energy – proton-proton cycle – Carbon-Nitrogen cycle – thermonuclear reactions – controlled thermonuclear reactions.
UNIT-V	**COSMIC RAYS AND ELEMENTARY PARTICLES** *Cosmic rays:* discovery of cosmic rays – primary and secondary cosmic rays –

	cascade theory of cosmic ray showers – altitude and latitude effects –discovery of positron – pair production – annihilation of matter – Van-Allen radiation belts – big-bang theory – future of the Universe (elementary ideas only). *Elementary particles:* particles and antiparticles – classification of elementary particles – types of fundamental interactions – quantum numbers of elementary particles – conservation laws and symmetry – quarks and types – quark model (elementary ideas only).	
TEXT BOOKS	2. R Murugeshan & Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co. (2013) 3. Brijlal& N. Subramaniyan, Atomic and Nuclear Physics S.Chand& Co	
REFERENCE BOOKS	1. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub. 2. Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008) 3. Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998).	
WEB LINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/nuccon.html 2. https://www.kent.edu/physics/nuclear-physics-links 3. https://www2.lbl.gov/abc/links.html	

COURSE OUTCOMES:

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

COURSE OUTCOMES	**CO1**	Describe various models that explain about the nuclear structures
	CO2	Give reason for various kinds of radioactivity and also know laws governing them
	CO3	Know the principles and applications of various particle detectors and accelerators.
	CO4	Discuss the concepts used in nuclear reaction.
	CO5	Classify various elementary particles and study the effect of cosmic rays.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	S	M	S	S
CO2	S	S	M	S	M	M	S	M	M	M
CO3	M	M	S	M	S	M	M	S	S	S
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	M	M	S	M	M	S

Course Code	**Course Title**	**L**	**T**	**P**	**C**

23113AEC62	Digital Electronics and Microprocessor 8085	5	1	0	3

COURSE OBJECTIVES	1. To learn all types of number systems, Boolean algebra and identities, digital circuits for addition and subtraction, flip-flops, registers, counters. 2. To get the knowledge on fundamentals of 8085 architecture, instruction sets and simple programs.

UNITS	COURSE DETAILS
UNIT-I	**NUMBER SYSTEMS AND LOGIC GATES:** 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 & 2's complement methods –basic logic gates -universal logic gates (NAND & NOR) – Boolean laws – De-Morgan's theorem – minimization techniques (Karnaugh map: 2, 3, 4 variables).
UNIT-II	**LOGIC DESIGNS:** adders, half &full adder – subtractors, half &full subtractor – parallel binary adder – magnitude comparator – multiplexers (4:1) &demultiplexers (1:4), encoder (8-line-to-3- line) and decoder (3-line-to-8-line), BCD to seven segment decoder.
UNIT-III	**REGISTERS AND COUNTERS:** 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 &ring counter
UNIT-IV	**MEMORY ELEMENTS:** general memory operations, ROM, RAM (static and dynamic), PROM, EPROM, EEPROM, EAROM. IC – logic families: RTL, DTL, TTL logic, CMOS NAND & NOR Gates, CMOS Inverter, Programmable Logic Devices – Programmable Logic Array (PLA), Programmable Array Logic (PAL) - Magnetic tape – Magnetic disc – Bubble memory.
UNIT-V	**MICROPROCESSOR 8085:** introduction to microprocessor – INTEL 8085 architecture – register organization –pin configuration of 8085, interrupts and its priority – Program Status Word (PSW) – instruction set of 8085 –addressing modes of 8085 –assembly language programming using 8085 –programmes for addition (8-Bit & 16-Bit), subtraction (8-Bit & 16-Bit), multiplication (8- Bit), division (8- Bit) – largest and smallest number in an array – BCD to ASCII and ASCII to BCD.
TEXT BOOKS	1. M.Morris Mano, "Digital Design "3rd Edition, PHI, NewDelhi. 2. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI. New Delhi. 1999.(UNITS I to IV) 3. S.Salivahana& S. Arivazhagan-Digital circuits and design 4. Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing, Mumbai.- Ramesh S.Gaonakar
REFERENCE	1. Herbert Taub and Donald Schilling. "Digital Integrated

BOOKS	Electronics" . McGraw Hill. 1985.
	2. Malvino and Leach. "Digital Principles and Applications". TMG HillEdition
	3. Microprocessors and Interfacing – Douglas V.Hall
	4. Microprocessor and Digital Systems – Douglas V.Hall
WEBLINKS	1. https://youtu.be/-paFaxtTCkI
	2. https://youtu.be/s1DSZEaCX_g

COURSE OUTCOMES:

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

	CO1	Describe various models that explain about the digital electronics
COURSE OUTCOMES	CO2	Give reason for various kinds of logic designs
	CO3	Know the principles and applications of various logic circuits
	CO4	Discuss the concepts used in registers and counters.
	CO5	Classify the microprocessor and study the architect.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	M	S	S
CO2	S	S	M	S	M	M	S	M	M	M
CO3	M	M	S	M	S	M	M	S	S	S
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	M	M	S	M	M	S

Course Code	Course Title	L	T	P	C

23113DSC63A	NANOSCIENCE	5	1	0	3

Learning Objective:

This course aims to provide an overall understanding of Nanoscience and Nanotechnology and introduces different types of nanomaterials, their properties, fabrication methods, characterization techniques and a range of applications.

UNITS	COURSE DETAILS
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
TEXT BOOKS	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.
REFERENCE BOOKS	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.

Course Code	Course Title	L	T	P	C

		5	1	0	3
23113DSC63B	Medical Instrumentation	5	1	0	3

Learning Objective:

This course aims to provide background of the Physics principles inmedical instrumentation technologies through theoretical and practical learning.

UNITS	COURSE DETAILS
UNIT-I	**BIOMETRICS:**introduction to man-instrument system and its components – problems encountered in measuring living systems – transducers– force, motion, pressure transducers. **AUDIOMETRY:** mechanism of hearing – air and bone conduction – threshold of hearing – audiometer – masking in audiometry – pure tone and speech audiometer – evoked response audiometry – hearing aids
UNIT-II	**BIOELECTRIC POTENTIALS AND ELECTRODES:** biomedical signals – sources of bioelectric potentials – resting, action and propagation of bioelectric potentials –bio-potential electrodes – skin surface, needle electrodes. **BIOMEDICAL RECORDERS:** electro-conduction system of heart – electro cardiogram (ECG) – Einthoven's triangle — electro encephalogram (EEG) –brain waves – EEG instrumentation – recording of evoked potentials – electro myogram (EMG)–pulse oximeter.
UNIT-III	**DIAGNOSTIC RADIOLOGY:** radiography – primary radiological image – contrast agents, filters – beam restrictor, grid – image quality **COMPUTED TOMOGRAPHY:** linear tomography – computed tomography – helical and multi slice – image quality– radiation dose. **RADIOISOTOPES AND NUCLEAR MEDICINE:** radioisotopes – radiopharmaceuticals – technetium generator – gamma camera – positron emission tomography – disposal of radioactive waste.
UNIT-IV	**ULTRASOUND IMAGING:** ultrasound transducer – ultrasound imaging– Doppler ultrasound – ultrasound image quality and bio-effects. **MAGNETIC RESONANCE IMAGING:**proton and external magnetic field – precession – radiofrequency and resonance – MRI signal – relaxation time – MRI instrumentation – imaging sequences – biosafety
UNIT-V	**PROJECT ASSIGNMENT:** clinical practice of *one* of the following: electro cardiogram, electro encephalogram, electro myogram, electro oculogram, computed tomography, positron emission tomography, ultrasound
TEXT BOOKS	1. Leslie Cromwell, Fred Weibell, Erich Pfieffer (2002) Biomedical Instrumentation and Measurements Prentice Hall of India, New Delhi. 2. R. S. Khandpur (2003) Handbook of Biomedical Instrumentation 2nd Edn. Tata McGraw Hill, New Delhi. 3. KuppusamyThayalan (2017), Basic Radiological Physics 2nd Edn. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
REFERENCE BOOKS	1. John Webster (2004) Bioinstrumentation John Wiley and Sons, Singapore. 2. John Enderle, Susan Blanchard, Joseph Bronzino (2005) Introduction to Biomedical Engineering, 2nd ed. Elsevier, San Deigo 3. William Hendee, Geoffrey Ibbott, Eric Hendee (2005) Radiation therapy Physics 3rd ed. Wiley-Liss, New Jersey

Course Code	Course Title	L	T	P	C

23113DSC63_C	Sensor Technology Physics Fabrication and Circuit	0	0	3	2

Unit I: Fundamentals of Sensors
- **Introduction to Sensors and Transducers**
    - Definitions and classifications (active vs. passive, absolute vs. relative)
    - Signal types and systems
- **Sensor Characteristics**
    - Transfer function, calibration, nonlinearity, saturation, repeatability, dead band, resolution

Unit II: Sensing Principles
- **Types of Sensors**
    - Mechanical and electromechanical sensors
    - Resistive sensors (potentiometric types), strain gauges
    - Inductive sensors (LVDT, reluctance change types)
    - Capacitive sensors, thermal sensors, magnetic sensors
    - Proximity sensors and piezoelectric effect

Unit III: Interface Electronic Circuits
- **Circuit Design for Sensors**
    - Input characteristics of interface circuits
    - Amplifiers and excitation circuits
    - Analog to digital converters (ADC)
    - Bridge circuits and data transmission methods

Unit IV: Smart Sensor Technologies
- **Architecture and Integration**
    - Features of smart sensors
    - Fabrication techniques including micromachining and microelectronics
    - Wafer bonding processes

Unit V
- **Signal Conditioning**
    - Analog and digital signal conditioning techniques
- **Fabrication Techniques**
    - Microfabrication methods including lithography and etching
- **Applications of Sensors**
    - Real-world applications in various fields

Course Duration and Format
- Typically spans several weeks (e.g., an 8-week online course format).
- May include practical sessions or labs for hands-on experience.
1. https://web.mitsgwalior.in/images/EEIOT/Syllabis/Syllabus%20Sensor%20Technology%202220222.pdf
2. https://www.shiksha.com/college/iiser-bhopal-indian-institute-of-science-education-research-57301/course-online-sensor-technologies-physics-fabrication-and-circuits-1196389
3. https://talentsprint.com/course/sensor-technologies-iisc
4. https://www.sjsu.edu/me/docs/syllabi-ME284_01-Lee-F21-081921.pdf
5. http://www.digimat.in/nptel/courses/video/108106193/108106193.html
6. https://kanchiuniv.ac.in/wp-content/uploads/2024/05/SensorsTechnology.pdf
7. https://archive.nptel.ac.in/content/syllabus_pdf/108106193.pdf

Course Code	Course Title	L	T	P	C
2311DSC63_D	Techniques of Material Characterization	0	0	3	2

Course Objective(s): To introduce the students to the principles of optical and electron microscopy, X-ray diffraction and various spectroscopic techniques

Introduction: Need of materials characterization and available techniques.

UNTI-I Optical Microscopy: Optical microscope - Basic principles and components, Different examination modes (Bright field illumination, Oblique illumination, Dark field illumination, Phase contrast, Polarised light, Hot stage, Interference techniques), Stereomicroscopy, Photo- microscopy, Colour metallography, Specimen preparation, Applications.

UNIT-II Electron Microscopy: Interaction of electrons with solids, Scanning electron microscopy Transmission electron microscopy and specimen preparation techniques, Scanning transmission electron microscopy, Energy dispersive spectroscopy, Wavelength dispersive spectroscopy.

UNIT-III Diffraction Methods: Fundamental crystallography, Generation and detection of X-rays, Diffraction of X-rays, X-ray diffraction techniques, Electron diffraction.

UNIT-IV Surface Analysis: Atomic force microscopy, scanning tunneling microscopy, X-ray photoelectron spectroscopy.

UNIT-V Spectroscopy: Atomic absorption spectroscopy, UV/Visible spectroscopy, Fourier transform infrared spectroscopy, Raman spectroscopy.

UNIT-VI Thermal Analysis: Thermo gravimetric analysis, Differential thermal analysis, Differential Scanning calorimetry, Thermo mechanical analysis and dilatometry.

Course learning outcomes: Students will have achieved the ability to:

1. apply appropriate characterization techniques for microstructure examination at different magnification level and use them to understand the microstructure of various materials
2. choose and appropriate electron microscopy techniques to investigate microstructure of materials at high resolution
3. determine crystal structure of specimen and estimate its crystallite size and stress
4. use appropriate spectroscopic technique to measure vibrational / electronic transitions to estimate parameters like energy band gap, elemental concentration, etc.
5. apply thermal analysis techniques to determine thermal stability of and thermodynamic transitions of the specimen.

Recommended Books:
1. *Li, Lin, Ashok Kumar Materials Characterization Techniques Sam Zhang; CRC Press, (2008).*
2. *Cullity, B.D., and Stock, R.S., "Elements of X-Ray Diffraction", Prentice-Hall, (2001).*
3. *Murphy, Douglas B, Fundamentals of Light Microscopy and Electronic Imaging, Wiley-Liss, Inc. USA, (2001).*
4. *Tyagi, A.K., Roy, Mainak, Kulshreshtha, S.K., and Banerjee, S., Advanced Techniques for Materials Characterization, Materials Science Foundations (monograph series), Volumes 49 – 51, (2009).*
5. *Wendlandt, W.W., Thermal Analysis, John Wiley & Sons, (1986).*
6. *Wachtman, J.B., Kalman, Z.H., Characterization of Materials, Butterworth-Heinemann, (1993).*

Course Code	Course Title	L	T	P	C
23113SEC65L	Physics Practical - VI	0	0	3	2

COURSE OBJECTIVES	To perform basic experiments on characteristics of electronic devices and then get into the applications such as amplifiers, oscillators, counters, multivibrators. Perform fundamental experiments on microprocessor 8085 and learn to write programs by themselves.

Electronics
Minimum of Ten Experiments from the list: 1. Zener diode – voltage regulations 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. RC coupled CE transistor amplifier - single stage. 7. Transistor Emitter follower. 8. Colpitt's oscillator -transistor. 9. Hartley oscillator - transistor. 10. Astablemultivibrator - transistor. 11. Bistablemultivibrator - transistor. 12. FET - characteristics. 13. FET - amplifier (common drain) 14. UJT -characteristics 15. AC circuits with L,C,R -Series resonance. 16. AC circuits with L,C,R - Parallel resonance. 17. Operational amplifier - inverting amplifier and summing. 18. Operational amplifier - non-inverting amplifier and summing. 19. Operational amplifier – differential amplifier 20. Operational amplifier - differentiator and integrator. 21. Operational amplifier - D/A converter by binary resistor method. 22. 5V, IC Regulated power supply. 23. Construction of seven segment display. 24. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR 25. Verification of De Morgan's theorem using ICs –NOT, OR, AND 26. NAND as universal building block. 27. NOR as universal building block. 28. Half adder / Half subtractor using basic logic gate ICs 29. Microprocessor 8085 – addition (8 bit only) 30. Microprocessor 8085 – subtraction (8 bit only) 31. Microprocessor 8085 – multiplication (8 bit only) 32. Microprocessor 8085 – division (8 bit only) 33. Microprocessor 8085 – square (8 bit only) 34. Microprocessor 8085 – square root (8 bit only) 35. Microprocessor 8085 – largest/smallest of numbers (8 bit only) 36. Microprocessor 8085 –ascending/descending order 37. Microprocessor 8085 – Fibonacci series

Course Code	Course Title	L	T	P	C
231ACSIKWS	Indian Knowledge System	2	0	0	2

Course Objectives:

The course design seeks to address the following issues:

• To introduce to the students the overall organization of IKS

• To develop an appreciation among the students the role and importance of Veda, Vedāṅgas, Upa Vedas and Purāṇas

• To show case the multi-dimensional nature of IKS and their importance in the contemporary society

• To motivate the students to take up a detailed study of some of these topics and explore their application potential

Syllabus

UnitI:IntroductiontoIndianKnowledgeSystem(IKS),Definition,ConceptandScopeof IKS(4)

1. Definition, Concept and Scope of IKS
2. IKS based approaches on Knowledge Paradigms
3. IKS in ancient India and in modern India

UnitII:IKSandIndianScholars,IndianLiterature (8)

1. PhilosophyandLiterature(MaharishiVyas,Manu,Kanad,Pingala,Parasar,Banabhatta, Nagarjuna and Panini)
2. MathematicsandAstronomy(Aryabhatta,Mahaviracharya,Bodhayan,Bhashkaracharya, Varahamihira and Brahmgupta)
3. Medicineand Yoga(Charak,Susruta,Maharishi Patanjaliand Dhanwantri)
4. Sahitya(Vedas,Upvedas,Upavedas(Ayurveda,Dhanurveda,Gandharvaveda)
5. PuranandUpnishad)andshaddarshan(Vedanta,Nyaya.Vaisheshik,Sankhya,Mimamsa, Yoga, Adhyatma and Meditation)
6. Shastra(Nyaya,vyakarana,Krishi,Shilp,Vastu,Natya and Sangeet)

UnitIII:IndianTraditional/tribal/ethniccommunities, theirlivelihoodandlocalwisdom(6)

1. Geophysicalaspects,Resourcesand Vulnerability
2. Resourceavailability,utilizationpatternandlimitations
3. Socio-CulturallinkageswithTraditionalKnowledge System
4. Tangibleandintangiblecultural heritage.

UnitIV:UniqueTraditionalPractices andAppliedTraditionalKnowledge (8)

1. Myths, Rituals, Spirituals, Taboosand BeliefSystem, Folk Stories, Songs,Proverbs, Dance,Play, Acts and Traditional Narratives
2. Agriculture,animalhusbandry, Forest,SacredGroves,WaterMills,SacredWaterBodies,Land,   water   and   Soil

Conservation and management Practices
3. Indigenous Bio-resource Conservation,Utilization Practices andFood Preservation Methods, Handicrafts, Wood Processing and Carving, -Fiber Extraction and Costumes
4. Vaidya(traditional healthcaresystem),Tantra-Mantra,AmchiMedicineSystem
5. Knowledgeofdyeing,chemistryofdyes,pigmentsandchemicals

UnitV:Protection,preservation,conservationandManagementofIndianKnowledge System(4)

1. DocumentationandPreservationofIKS
2. ApproachesforconservationandManagementof natureandbio-resources
3. Approachesand strategies toprotectionand conservationofIKS

Course Outcomes:
CO1: Explain the historicity of Indian Knowledge System and the broad classification of Indian philosophical systems
CO2: Explain the potential of Sanskrit in natural language processing
 CO3: Explain the features of Indian numeral system and its role in science & technology advancement
CO4: Illustrate the basic elements of the Indian calendar and the components of Indian Panchanga
CO5: Outline the science, engineering & technology heritage of ancient and medieval India