

**SCHOOL OF HUMANITIES, SCIENCES & MANAGEMENT
DEPARTMENT OF PHYSICS**

Periyar Nagar, Vallam, Thanjavur-613403, Tamilnadu
Phone +91-4362 264600, Fax +91-4362 264650
Email:headphy@pmu.edu, Web www.pmu.edu



**PERIYAR
MANIAMMAI**
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
think • innovate • transform

Minutes of Board of Studies

**CURRICULUM & SYLLABUS
FOR
B.Sc.PHYSICS**

I – VI SEMESTER

(FULL TIME – 3 Years)

REGULATION 2018

PERIYAR MANIAMMAI UNIVERSITY

I. UNIVERSITY VISION AND MISSION

VISION

- To be a world class innovative,competitive,up-to-date, academic institution providing technological and other inputs appropriate to the branch of study student has chosen to specialize.

MISSION

UM1: Offering well balanced programmes with scholarly faculty and state of art facilities to impart high level of knowledge.

UM2: Providing student centric education and foster their growth in creativity and entrepreneurship, critical thinking and collaborative work.

UM3:Involving progressive and meaningful research with concern for sustainability and environment.

UM4: Enabling the students to acquire the skill sets for global competencies.

UM5: Inculcating social responsibilities and ethics along with imparting knowledge.

II. DEPARTMENT VISION AND MISSION

VISION

To become a pioneer in Physics discipline with a strong research and teaching environment to adapt the challenges of international standards.

MISSION

- DM1:** To offer qualitative education to produce undergraduate, postgraduate and research scholars in Physics discipline leading to careers in the diversified domains of Government, research organization and academia.
- DM2:** To provide a platform that yields to advancement in Physics, resulting in innovative and creative ideas leading to new technologies and products.
- DM3:** To promote research activities in emerging fields of physics that would cater to the needs of the society .
- DM4:** To produce ethical, reliable, committed and successful professional to the society.

Table1: Mapping of University Mission with Department Mission

	DM1	DM2	DM3	DM4	TOTAL
UM1	3	3	2	1	9
UM2	3	3	3	1	10
UM3	3	3	3	2	11
UM4	3	2	2	3	10
UM5	2	2	2	3	9

3 - Highly related

2 - Medium

1 - Low

III. PROGRAMME EDUCATIONAL OBJECTIVE (PEO's)

The Graduate will be

- PEO-1:** proficient in applying a broad understanding of the basic principles of physics to the solution of physical problems
- PEO-2:** able to become a highly professional teacher/professor or renowned scientist
- PEO-3:** able to plan, coordinate, communicate, organize, make decision and lead a team to solve problems and develop application using physics.

PEO-4: professional, ethical, responsible and will contribute to society through active management.

Table2: Mapping of Department Mission (DM) with Program Educational Objectives (PEOs)

	PEO-1	PEO-2	PEO-3	PEO-4	Total
DM1	3	2	1	0	6
DM2	2	1	3	0	6
DM3	2	0	1	0	3
DM4	0	0	0	3	3

3 - Highly related

2 - Medium

1 - Low

IV. GRADUATE ATTRIBUTES

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The GAs are examples of the attributes expected of a graduate from an accredited programme. The Graduate Attributes of a Physicist are as follows:

- GA-1: Disciplinary Knowledge:** Apply knowledge of physics along with mathematics, chemistry and other domains appropriate to the programme.
- GA-2: Problem analysis and solution:** Identify, formulate, analyse and solve problems pertaining to physics by interdisciplinary approach
- GA-3: Design /Development of solutions:** Design and develop solutions for problem with appropriate consideration to public health, safety, environment and society.
- GA-5: Tool usage:** Acquire, select, manipulate relevant techniques, resources and ICT tools to interpret solutions to the problems .
- GA-6: Ethics and Social responsibility:** Practice ethical codes as a physics professional and realize the responsibility to environment and society.
- GA-7: Effective Communication:** Professional communication with the society to comprehend and formulate reports, documentation, effective delivery of presentation and responsible to clear instructions.
- GA-8: Individual and teamwork:** Perform as an individual and as a leader in diverse teams and in multi-disciplinary environment.

GA-9: Lifelong learning: Recognize the need and have the ability to engage in independent learning for continual development as a physicist.

V. PROGRAMME OUTCOMES (PO'S)

The Graduates will be able to

PO-1: understand how scientific and mathematical knowledge continually evolve and that is subject to change.

PO-2: identify and apply universal physical laws to the problem.

PO-3: communicate effectively (written /oral) and work effectively as an individual or team.

PO-4: understand the impact and ethics of scientific discoveries on influencing society locally and globally.

PO-5: work effectively in bringing multidisciplinary ideas to diverse professional environment.

PO-6: find, collect and assess scientific-based information - its relevance and reliability.

PO-7: design and perform experiments and thereby analyse and interpret data.

PO-8: use techniques, tools and skills necessary for emerging technologies.

Table 3: Mapping of Graduate Attributes (GA) with Program Outcomes (PO)

GA	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	Total
Disciplinary Knowledge	3	2	1	1	1	2	2	2	14
Problem analysis	3	2	0	0	1	1	3	2	12
Design / Development of solutions	2	1	0	1	2	3	3	2	14
Tool usage	1	1	1	2	1	2	3	3	14
Environment and sustainability	2	2	1	1	2	2	2	2	14
Ethics and Social responsibility	1	1	1	3	2	2	1	1	12
Effective communication	1	1	3	1	2	1	2	2	13
Individual and teamwork	2	2	1	2	2	2	2	1	14
Lifelong learning	3	2	1	1	2	2	2	2	15

Table4: Mapping of Program Educational Objectives (PEOs) with Program Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Total
PEO-1	3	3	1	1	2	3	2	2	17
PEO-2	3	3	1	1	2	2	2	2	16
PEO-3	2	3	1	1	1	2	2	2	14
PEO-4	1	2	1	3	1	3	2	1	14

3 - Highly related

2 - Medium

1 - Low

**CURRICULUM AND SYLLABUS FOR
B.Sc. (Physics) - BACHELOR OF SCIENCE
(THREE YEAR - FULL TIME)
REGULATION 2018**

(Applicable to the students admitted from the academic year 2018-2019 onwards)

SEMESTER I								
Type	Subject Code	Subject Title	L	T	P	SS	H	C
AECC 1	XGL101	Communication Skills in English	2	0	0	1	2	2
LAN	XGL102A / XGL102B	Ariviyal Tamil / Comprehensive English	3	0	0	0	3	3
CC 1	XMG103	Algebra, Trigonometry and Transform	4	1	0	0	5	5
CC 2 (DSC 2A)	XPH104	Properties of Matter and Sound	3	1	0	0	4	4
CC 3 (DSC 3A)	XPH105	Mechanics and Special Theory of Relativity	3	1	0	0	4	4
UMAN 1	XUM106	Human Ethics, Values, Rights and Gender Equality	3	0	0	0	3	0
CC 2 Lab	XPH107	Physics Practical I	0	0	3	0	3	2
Total			18	3	3	1	24	20

SEMESTER II								
Type	Subject Code	Subject Title	L	T	P	SS	H	C
AECC2	XGL201	English for Effective Communication	2	0	0	2	2	2
AECC 3	XES202	Environmental Studies	2	0	0	1	2	2
CC4	XMG203	Calculus and Differential Equations	4	1	0	0	5	5
CC 5 (DSC 2B)	XPH204	Electricity and Magnetism	3	1	0	0	4	4
CC 6 (DSC 3B)	XPH205	Atomic Physics	3	1	0	0	4	4
CC 5 Lab	XPH206	Physics Practical II	0	0	3	0	3	2
Total			14	3	3	3	20	19

SEMESTER III								
Type	Subject Code	Subject Title	L	T	P	SS	H	C
SEC 1	XPH301	Physics Workshop Skills	0	0	3	0	3	2
CC7	XCG302	Inorganic, Organic and Physical Chemistry I	3	1	0	0	4	4
CC 8 (DSC 2C)	XPH303	Heat and Thermodynamics	3	1	0	0	4	4
CC 9 (DSC 3C)	XPH304	Basic Electronics	3	1	0	0	4	4
GE 1		*Open Elective - To be chosen by student	3	0	0	0	3	3
CC7 Lab	XCG305	Volumetric and Qualitative Analysis	0	0	3	0	3	2
UMAN 2	XUM306	Disaster Management	1	0	0	2	1	0
CC 8 lab	XPH307	Physics Practical III	0	0	3	0	3	2
Minor Course * Extra Credit		Office Automation (15 hours)						1*
Total			13	3	9	2	25	21+1*

SEMESTER IV								
Type	Subject Code	Subject Title	L	T	P	SS	H	C
SEC 2	XPH401	Electrical Circuit Network Skills	0	0	3	0	3	2
CC10	XCG402	Inorganic, Organic and Physical Chemistry II	3	1	0	0	4	4
CC 11 (DSC 2D)	XPH403	Waves and Optics	3	1	0	0	4	4
CC 12 (DSC 3D)	XPH404	Digital electronics	3	1	0	0	4	4
GE 2		*Open Elective - To be chosen by student	3	0	0	0	3	3
CC10 Lab	XCG405	Volumetric and Qualitative Analysis	0	0	3	0	3	2
CC11 Lab	XPH406	Physics Practical IV	0	0	3	0	3	2
Minor Course * Extra Credit		Animation Software I (15 hours)						1*
Total			12	3	9	0	24	21+1*

SEMESTER V								
Type	Subject Code	Subject Title	L	T	P	SS	H	C
SEC 3	XPH501	Basic Instrumentation Skills	0	0	3	0	3	2
DSE 1A	XPH502A	Solid State Physics	3	1	0	0	4	4
	XPH502B	Atomic & Molecular Spectroscopy						
DSE 2A	XPH503A	Nuclear and Particle Physics	3	1	0	0	4	4
	XPH503B	Principles of Modern Physics						
DSE 3A	XPH504A	Microprocessor and C programming	3	1	0	0	4	4
	XPH504B	Micro Processor and Microcontroller						
GE 3		*Open Elective - To be chosen by student	3	0	0	0	3	3
DSE 1A Lab	XPH505	Physics Practical V A	0	0	3	0	3	2
CC lab	XPH506	Physics Practical V B	0	0	3	0	3	2
Minor Course * Extra Credit		Animation Software II (15 hours)						1*
* Extra credit	–	IPT (21 days)						2*
Total			12	3	9	0	24	21+3*

SEMESTER VI								
Type	Subject Code	Subject Title	L	T	P	SS	H	C
SEC 4	XPH601	Renewable Energy	0	0	3	0	3	2
DSE 1B	XPH602A	Wave mechanics	3	1	0	0	4	4
	XPH602B	Material Science						
DSE 2B	XPH603A	Micro Electro Mechanical System	3	1	0	0	4	4
	XPH603B	Numerical methods in Physics						
DSE 2B Lab	XPH604	Physics Practical VI A	0	0	3	0	3	2
CC lab	XPH605	Physics Practical VI B	0	0	3	0	3	2
DSE 3 B	XPH606	Project	0	0	0	0	8	6
	–	NSS/NCC/RRC....						
Total			6	2	9	0	25	20

DSC: Department Specific Core
 SEC: Skill Enhancement course
 GE: Generic Elective

DSE: Discipline Specific Elective
 AECC: Ability Enhancement Compulsory Course
 UMAN: University Mandatory

*Extra Credit

L - Lecture

T- Tutorial

P – Practical

C-Credit

Summary

Semester	S1	S2	S3	S4	S5	S6	P1	P2	Others
I	AECC1	LAN	CC1	CC2 (DSC2A)	CC3 (DSC3A)	UMAN1	CC2 Lab		
II	AECC2	AECC3	CC4	CC5 (DSC2B)	CC6 (DSC3B)			CC5 Lab	
III	SEC1	CC7	CC8 (DSC2C)	CC9 (DSC3C)	GE1	UMAN2	CC7 Lab	CC8 Lab	Minor Course*
IV	SEC2	CC10	CC11 (DSC2D)	CC12 (DSC3D)	GE2		CC10 Lab	CC11 Lab	Minor Course*
V	SEC3	DSE1A	DSE 2A	DSE3A	GE3		CC Lab	CC Lab	Minor Course* & IPT*
VI	SEC4	DSE1B	DSE 2B	DSE3B (PROJECT)			CC Lab	CC Lab	NSS/ NCC....

* Extra Credit

Total Number of subjects proposed with the credits is given below:

S. No.	Type of Subject	Numbers	Total Credit	Credits As per UGC norms
1	AECC (Theory & Lab)	03	06	04
2	Core Course (Theory & Lab)	12	66	72
3	DSE (Theory & Lab)	06	30	36
4	SEC	04	08	08
5	GE	03	09	-
6	UMAN	02	0	-
7	LAN	01	03	-
	Minor courses, IPT & NSS / NCC...	4*	4*	-
Total		31 + 4*	122 + 4*	120

*Extra credit

Branch	Total Credit	Core DSC (%)	DSE (%)	SEC (%)	AECC (%)	GE (%)	UMAN (%)	LAN (%)	Minor Course, IPT & NSS/NCC..
B.Sc.(Physics)	122+4*	66 (54.1%)	30 (24.6%)	8 (6.6%)	6 (4.9%)	9 (7.4%)	0 (0%)	3 (2.5%)	4* (Extra Credit)

* Extra Credit

DSC: Department Specific Core
SEC: Skill Enhancement course
DSE: Discipline Specific Elective

AECC: Ability Enhancement Compulsory Course
GE: Generic Elective
UMAN: University Mandatory

XGL101 – COMMUNICATION SKILLS IN ENGLISH

COURSE OUTCOMES

CO1: Cog (Rem), Identify different strategies of reading and writing skills.

CO2: Aff (INT), Revise the library skills in their learning process.

CO3: Cog (Apply), Apply different techniques to various types of material such as a novel, newspaper, poem, drama and other reading papers.

CO4: Cog(Understanding), use visual aids to support verbal matters into language discourse.

CO5: Cog (Understand), Psy (Guided Response)Prepares to face the written exam with confidence and without any fear or tension..

COURSE CODE	COURSE NAME	L	T	P	C
XGL101	COMMUNICATION SKILLS IN ENGLISH	2	0	0	2
		L	T	P	H
		2	0	0	2
UNIT I The Process of Communication					9
Communication- the process of communication - barriers of communication - different types of communication					
UNIT II REFERENCE SKILLS, REFERENCE SKILLS,					9
Pronunciation – Vowels – Consonants – Transcription of Words and Sentences					
UNIT III READING RELATED STUDY SKILLS					9
Organizing successful meeting, One to one meeting, editing, criteria for successful meetings, memo, e mails					
UNIT IV WRITING RELATED STUDY SKILLS					9
Articles – Question Tag –Punctuation – Types of Sentences – Types of Questions, Cause and Effect.					
UNIT V EXAM PREPARATION SKILLS;					9
Presentation skills, Importance of body language in presentations, Verbal and Non Verbal communication					

Text books			
1. Sanghita Sen. Communication and Language Skills. Cambridge Press, Chennai, 2015			
2. Sumant. <i>Technical English</i> . Vijay Nicole Imprints, Chennai, 2011			
3. Dorathyadams. Everyday English. Cengage Learning, New Delhi, 2009			
	LECTURE	PRACTICAL	TOTAL
	25	20	45

Table 1: Mapping of Cos with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO2	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO3	1	0	0	0	0	0	1	0	1	0	0	0	0	0
CO4	2	0	0	0	0	0	1	0	1	0	0	0	0	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scale Value	2	0	0	0	0	0	2	0	1	0	0	0	0	0
	1	0	0	0	0	0	1	0	1	0	0	0	0	0

1-5= 1, 6-10 = 2, 11-15= 3

0-No Relation, 1- Low Relation, 2 – Medium Relation, 3- High Relation

Table 2: Mapping of COs with GAs:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	0	0	0	0	0	0	0	1	1	2	0	0
CO2	0	0	0	0	0	0	0	0	0	2	0	0
CO3	0	0	0	0	0	0	0	0	0	1	0	0
CO4	0	0	0	0	0	0	0	0	0	0	1	0
CO5	0	0	0	0	0	0	0	1	1	1	1	0
Total	0	0	0	0	0	0	0	2	2	6	2	0
Scale	0	0	0	0	0	0	0	1	1	2	1	0

1-5= 1, 6-10 = 2, 11-15= 3

0-No Relation, 1- Low Relation, 2 – Medium Relation, 3- High Relation

UMAN 1					
Subject Code	Title of the Paper	L	T	P	C
XPH102	அறிவியல்தமிழ்	3	1	0	3
நோக்கங்கள் : <ul style="list-style-type: none"> பல்வேறு அறிவியல் துறை சார்ந்த நுட்பங்களை தமிழ்மொழி மூலம் அறிந்து கொள்ளல். கலைச் சொல்லாக்க உத்திகளைத் தெரிந்து அவற்றைப் பயன்படுத்துதல். வடமொழி வேர்ச்சொற்களைக் கண்டறிந்து கொள்ளல். புவியியல், நிலவியல் பற்றிப் பழந்தமிழ் இலக்கியங்கள் மூலம் அறிந்து கொள்ளல். தொல்காப்பியம் மூலம் அறிவியல் செய்திகளை உணர்தல். பல்வேறு கல்வித்துறை சார்ந்த பிரிவுகள் குறித்து தெளிவு பெறல். இக்காலக் கல்வியமைப்பின் பொதுவான நிலைகளைப் புரிந்து கொள்ளல். அறிவியல் சிறுகதைகளின் தோற்றம் மற்றும் வளர்ச்சிநிலை பற்றிய அறிவினைப் பெறுதல். அறிவியல்தமிழ் வளர்ச்சியில் நாடகங்களின் பங்கு குறித்து தெளிவு பெறுதல். 					

அலகு- 1

அறிவியல்தமிழ் - பொறியியல், தொழில்நுட்பம், மருத்துவம், உழவியல். தமிழில் அறிவியல் - தமிழில் நுட்பம். படைப்புப் பணி - சொல்லாக்க உத்திகள் - நுட்பமான வேறுபாடுகளை உணர்ந்து சொல்லாக்கம் செய்தல் - கலைச்சொற்கள் - இந்தியமொழிகளுக்குப் பொதுவானகலைச் சொற்களை உருவாக்குதல் - வடமொழிவேர்ச்சொற்களை மிகுதியாகக் கொண்டிருத்தலைப் பயன்படுத்துதல்.

அலகு- 2

புவியியல், நிலவியல் பற்றி பழந்தமிழ் இலக்கியம் குறிப்பிடும் தகவல்கள் - தொல்காப்பியம் குறிப்பிடும் உயிரியல், மண்ணியல் பற்றிய அடிப்படைச் செய்திகள் - தமிழ் மருத்துவக் கல்வி - அறிவியல் தமிழுக்கு இதழியல் உத்திகள் - வளர் தமிழ்.

அலகு- 3

மொழியியல் கல்வி - கட்டடக் கலைக்கல்வி - சமுதாயக்கல்வி - சேய்மைக்கல்வி - மண்ணியல், புவியியல், கணக்கியல் ஆகியவை இணைந்தகல்வி - இக்காலக் கல்விப் பொதுநிலை - கலை, அறிவியல் - என்பவற்றின் விளக்கங்கள்.

அலகு- 4

சிறுகதை -இலக்கணம் உருவாக்கும் உத்திகள் - சிறந்த சிறுகதைகள் - சிறுகதை வகைகள் - நல்ல சிறுகதை உருவாக்கம் - வரலாறு - சமூகம் - மொழிபெயர்ப்பு மற்றும் அறிவியல் சிறுகதைகள்.

அலகு- 5

நாடகம் - நாடக இலக்கணம், இருவகைநாடகங்கள் - படிப்பதற்குரிய நாடகம் - நடிப்பதற்குரிய நாடகம் - சரித்திரநாடகம், சமூகநாடகம் - நகைச்சுவை நாடகங்கள் - அமெச்சூர் நாடகங்கள் - தொழில்முறை நாடகங்கள்.

மேற்பார்வை நூல்கள் :

1. அறிவியல் தமிழ் - டாக்டர் வா.செ. குழந்தைச்சாமி
2. வளர் தமிழ் - இதழ்கள்
3. இலக்கியவரலாறு - சிறுகதை பற்றியது
4. இலக்கியவரலாறு - புதினம் பற்றியது

SUBCODE			SUB NAME			L	T	P	C
XMG103			ALGEBRA, TRIGONOMETRY AND TRANSFORMS			4	1	0	5
C	P	A				L	T	P	H
3	0	0				4	1	0	5
PREREQUISITE: Basic concepts of Matrices, Numbers, Differentiation and Integration									
COURSE OUTCOMES:									
Course outcomes						Domain		Level	
After the completion of the course, students will be able to									
CO1:Find the roots of the polynomials equations of rational and irrational numbers efficiently.						Cognitive		Remembering	
CO2.Determine eigen values and eigen vectors of the matrices using orthogonal transformation.						Cognitive		Understanding	
CO3.Apply trigonometric and inverse trigonometric Functions						Cognitive		Applying	
CO4:Find the Laplace transforms of derivatives and integrals using standard results.						Cognitive		Remembering	
CO5:Solve the differential equations with applications of Laplace and Fourier Transforms.						Cognitive		Applying	
UNIT I									15
Curvature – Radius of curvature – center of curvature – circle of curvature – Evaluation of double integrals - change of order of integration in double integrals- Application of doubleintegral to find the area between curves.									
UNIT II									15
Evaluation of triple integrals – Beta and Gamma functions – relations between them – Evaluation of multiple integrals using Beta and Gamma functions.									
UNIT III									15
Solving second order linear differential equations with constant coefficients whose R.H.S is of the form ve^{mx} , where v is any function of x - Linear equations with variable coefficients.									

UNIT IV	15						
Formation of partial differential equations by elimination of arbitrary constants and functions -Definitions of general, particular and complete solutions - solving standard forms $f(p, q) = 0$, $f(x, p, q) = 0$, $f(y, p, q) = 0$, $f(z, p, q) = 0$, $f(x, p) = f(y, q)$, $z = px + qy + f(p, q)$ - Lagrange's Differential equations $Pp + Qq = R$.							
UNIT V	15						
Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl – Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Stokes theorem – (Statements only).							
	<table border="1"> <thead> <tr> <th>LECTURE</th> <th>TUTORIAL</th> <th>TOTAL</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">45</td> <td style="text-align: center;">30</td> <td style="text-align: center;">75</td> </tr> </tbody> </table>	LECTURE	TUTORIAL	TOTAL	45	30	75
LECTURE	TUTORIAL	TOTAL					
45	30	75					
TEXT							
1. Kandasamy. P, Thilagavathi. K “Mathematics for B.Sc. Branch I”, Volume II, III and IV, S.Chand and Company Ltd, New Delhi, 2004.							
REFERENCES							
1. Narayan .S and Manicavachagam Pillay T.K. “Ancillary Mathematics”, Viswanathan Publishers and Printers, 2004.							
E REFERENCES							
www.nptel.ac.in							
1. Advanced Engineering Mathematics Prof. Jitendra Kumar							
2. Department of Mathematics Indian Institute of Technology, Kharagpur							

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3									1		1
CO 2	3									1		1
CO 3	3	2								1	1	2
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	5	3	6

1 - Low , 2 – Medium , 3- high

XPH104 - PROPERTIES OF MATTER AND SOUND

COURSE OUTCOMES

CO1. Cog: R, U, App; *Identify* the principles of elasticity, *derive* expression for twisting couple and *determine* rigidity modulus of a wire.

CO2. Cog: U, App; *Develop Knowledge* on bending of beams, its properties and *application*.

CO3. Cog: R, U; *Define* surface tension, *recall* the concepts of low pressure and *explain* the methods of production of low pressure.

CO4. Cog: U, Ana; *Understand* flow of liquid, viscosity and *identify* its *applications*.

CO5. Cog: R, Ana; *Describe* the production, propagation, perception & *analysis* of acoustical wave.

COURSE CODE	COURSE NAME	L	T	P	C
XPH104	PROPERTIES OF MATTER AND SOUND	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT I ELASTICITY					7+3
Stress – Strain Diagram – Elastic Module, Work done per unit volume in shearing strain – relation between elastic constants – Poisson’s Ratio- Expression for Poisson’s ratio in terms of elastic constants – Twisting couple on a wire – Work done in twisting – Torsional pendulum – Determination of rigidity modulus of a wire.					
UNIT II BENDING OF BEAMS					8+3
Expression for bending moment – Cantilever – Expression for depression – Experiment to find Young’s Modulus – Cantilever oscillation – Expression for period – Uniform bending – Expression for elevation – Experiment to find Young’s modulus using microscope – Non Uniform bending – Expression for depression – Experiment to determine Young’s modulus using mirror and telescope.					
UNIT III SURFACE TENSION					10+3
Definition and dimensions of surface tension - Excess of pressure over curved surfaces - Application to spherical and cylindrical drops and bubbles - Variation of Surface tension with temperature - Jaegar's method. Physics of Low Pressure. Production and Measurement of low pressure - Grades' molecular pump - Rotary pump - Knudsen absolute gauge.					

UNIT IV VISCOSITY			10+3
Co-efficient of viscosity and its dimensions - Rate of flow of liquid in a capillary tube - Poiseuilles' formula - Experiment to determine co-efficient of viscosity of a liquid - Variation of viscosity of a liquid with temperature - Applications of viscosity.			
UNIT V SOUND			10+3
Laws of transverse vibrations in strings – verification by Sonometer - Music and noise- Characteristics of musical sound - Reverberation and Reverberation time – Sabine’s formula – Optimum reverberation – Measurement of reverberation time – Absorption coefficient – Acoustics design – Ultrasonic Production: Piezo electric oscillator and magnetostriction oscillator method – Properties – Applications.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
<ol style="list-style-type: none"> 1. Brijlal and Subramanian, 'Properties of Matter', S. Chand and company Ltd, New Delhi, 2003. 2. N. Subrahmaniyam and Brijlal, 'A Text Book of Sound', Vikash Publishing House, Second Revised Edition, 1995. 3. R. Murugeshen, 'Properties of Matter and Acoustics', S. Chand and company Ltd, New Delhi, 2004. 			
REFERENCES			
<ol style="list-style-type: none"> 1. D.S. Mathur, ' Elements of Properties of Matter', S. Chand and company Ltd, New Delhi, 2000. 2. Subramanian Iyer and Jeyaraman, 'Properties of matter' 3. L.P. Sharma, H.C. Saxena, 'Oscillations, Waves and Sound' 4. R. L. Saigal, 'A Text Book of Sound' 			

Mapping with Programme Outcomes

Cos	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	3	2	0	0	3	0	1
CO ₂	3	1	0	2	3	3	0	1
CO ₃	3	3	3	0	0	3	3	2
CO ₄	3	3	0	0	3	3	0	2
CO ₅	1	3	3	1	2	3	0	2
	13	13	8	3	8	15	2	8
Scaled to 1, 2, 3	3	3	2	4	2	3	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH105 - MECHANICS AND SPECIAL THEORY OF RELATIVITY

COURSE OUTCOMES

CO1. Cog: R, U, App; *Recall, associate and solve* the fundamentals of vector, differential equations and laws of motion.

CO2. Cog: R, U; Acquire *knowledge* and *describe* momentum, work, energy, rotational motion, oscillatory motion and its *relation*

CO3. Cog: R, U; Aff: Rec.; *Explain* various laws of gravitation and *how* it is used in the latest science of satellite launching.

CO4. Cog: R, U, App; *Describe* the concepts of statics, hydrostatics and hydrodynamics, *recall* the laws of floatation and *construct* models for pressure variations.

CO5. Cog: R, U; *Understand* the theory of relativity, Lorentz transformations and *derive* mass-energy equivalence.

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH105	MECHANICS AND SPECIAL THEORY OF RELATIVITY	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT I PROJECTILE, IMPULSE & IMPACT					5+2
Projectile- Path of a projectile is a parabola – Range on a inclined plane – Impulse – Impact –					

Impulsive force – Laws of impact – Impact of a smooth sphere on a horizontal plane – Direct & oblique impact – Loss of kinetic energy – Motion of two interacting bodies			
UNIT II DYNAMICS OF RIGID BODIES			12+4
Kinetic energy of rotation – Angular momentum of a rotating body – Compound pendulum – equivalent simple pendulum – reversibility of centres of oscillation and suspension – centre of percussion – minimum period – Determination of g and radius of gyration of a bar pendulum. Law of conservation of momentum – Center of mass - Velocity and Acceleration of centre of mass – System of variable mass- Equation of a Rocket motion – conservation of linear and angular momentum.			
UNIT III GRAVITATION, CENTER OF GRAVITY AND CENTRE OF PRESSURE			8+3
Newton's law of gravitation - Boy's method of determination of G - Kepler's laws - orbital velocity and escape velocity - Geo-stationary and Communication- Satellites Centre of gravity of solid and hollow tetrahedron, solid and hollow hemisphere. Centre of pressure - vertical rectangular lamina - vertical triangular lamina.			
UNIT IV HYDRODYNAMICS			10+3
Equation of continuity of flow - venturimeter - Pitot's tube for liquids - Euler's equation for unidirectional flow - Torricelli's theorem - Bernoulli's theorem and applications. Laws of floatation - meta centre - meta centric height of a ship. Atmospheric pressure its variations with altitude - reasons for such variations.			
UNIT V THEORY OF RELATIVITY			10+3
Galilean-Newtonian relativity, Galilean frames formations- Michelson Morley Experiment and its importance – Einstein's postulates – Lorentz transformation – Relativity of space and time – Addition of velocities – Variation of Mass with velocity – Mass- Energy equivalence- Physical significance.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
M. Narayanamoorthy and N. Nagarethnam, 'Dynamics', National publishing Company, Chennai, 8th Edition, 2002.			
R. Mugrugesan, KiruthigaSivaprakash, 'Modern Physics', S. Chand & Co. Ltd. New Delhi, First Edition, 1992.			

M.Narayanamoorthy and N.Nagarethinam, 'Hydrostatics', National Publishing company, Chennai.

REFERENCES

P. R. Subramaniam, T. Jayaraman and C. Rangarajan S.V., 'Mechanics for B.Sc., Classes', Publishers Chennai.

2. D.S. Mathur, 'Elements of Properties of Matter', S. Chand and company Ltd, New Delhi, 2000.

3. Gupta Kumar, 'Elementary Statistical Mechanics'

E-Resource :

<https://nptel.ac.in/courses/115/101/115101011/>

https://www.ibiblio.org/ebooks/Einstein/Einstein_Relativity.pdf

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	3	1	2	3	2	0	1
CO₂	3	2	1	2	3	3	0	1
CO₃	3	3	2	2	3	3	3	2
CO₄	3	3	0	2	3	2	0	2
CO₅	3	2	2	2	3	3	0	2
	15	13	6	10	15	13	2	8
Scaled to 1, 2, 3	3	3	2	2	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH107	PHYSICS PRACTICAL –I	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

1. Young's modulus - Non uniform bending – Scale and telescope
2. Young's modulus – Non uniform bending – Pin and microscope.
3. Koenigs – Uniform Bending Method – Young's Modulus.
4. Screw Gauge and Vernier Caliper (Measurements)
5. Surface tension and interfacial surface tension by drop weight method.
6. Coefficient of viscosity – burette method.
7. Compound Pendulum – Determination of g and K.
8. Surface tension by capillary rise method.
9. Torsional pendulum- determination of the rigidity modulus of thin wire.
10. Stokes method – determine the viscosity of the given liquid.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.

2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	1		2	1	2	3	3
CO₂	3	1		2	1	2	3	2
CO₃	3	1		1	1	2	2	1
CO₄	3	1		2	1	2	3	2
	12	4		7	4	6	11	8
Scaled to 1, 2, 3	3	1		2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

XGL201 - ENGLISH FOR EFFECTIVE COMMUNICATION

COURSE OUTCOMES:

- CO1. Cog: *RDefine* and *Describe* how to make effective speeches academically and in social situations
- CO2. Psy *Identify* the forms of language used in different speeches and how to listen actively and critically.
- CO3. Cog: R, *Produce* the proper tone of language required in writing and speaking in Business communication
- CO4. Aff: Initializing Values, Display knowledge on grammar and other linguistic features in writing various forms of business communication.
- CO5. Cog: Appl, *Comprehend* and prepare how to write business reports, minutes, Proposals etc.

SUBCODE	SUB NAME	L	T	P	C
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XGL201		2	0	0	2
C:P:A =	ENGLISH FOR EFFECTIVE COMMUNICATION	L	T	P	H
1:0.6:0.4		2	0	0	4
UNIT I - PUBLIC SPEECH					09
Introduction to public speaking; functions of oral communication; skills and competencies needed for successful speech making; importance of public speaking skills in everyday life and in the area of business, social, political and all other places of group work.					
UNIT II – TYPES OF SPEECH					09
Various types of Speeches: manuscript, impromptu, memorized and extemporaneous speeches; analyzing the audience and occasion; Developing ideas; finding and using supporting materials; Developing speech outline; Organization of Speech; introduction, development and conclusion; language used in various types of speeches; Adapting the speech structures to the Audience; paralinguistic features					
UNIT III- BUSINESS COMMUNICATION					09
Introduction to business communication; modern developments in the style of writing letters memos and reports: block letters, semi block letters, full block letters, simplified letters etc.					
UNIT IV- USE OF LANGUAGE					09
The language used in memos/minutes/telephone memos/ letters/assignments; art of writing E-mail etc.					
UNIT V- USE OF GRAMMAR					09
The use of active and passive voice; the use of grammar, propriety, accuracy, exactness, the tone & other elements of language used in these writings; The format of various types of Reports/ projects etc.					
	LECTURE	TUTORIAL	PRACTICAL	TOTAL	
	45	0	0	45	

TEXT BOOKS

1. Strengthen Your Writing by V.R. Narayanaswamy (Orient Longman)
2. A course in written English: by Ghosh, R N; Inthira, S R [Author]; Moody, K W [Author].1978
3. Writing With A Purpose, Jaya Sasikumar, Champa Tickoo, Published by Oxford University Press, Paper Back, Language – English Freeman, Sarah: Study Strategies.

New Delhi: Oxford University Press, 1979. 13.

4. Reading for Meaning, Paul Gunashekar M.L. Tickoo, Published by S. Chand & Company Ltd. Sultan Chand & Company

REFERENCE BOOKS

1. John Sealy, Writing and Speaking Author:, Oxford University Press, New Delhi Third Edition 2009.
2. Williams K S, Communicating in Business (8th Edition) Engage Learning India Pvt. Ltd.; 2012
3. John Sealy, Writing and Speaking, Oxford University Press, New Delhi Third Edition 2009.

XES202 - ENVIRONMENTAL STUDIES

COURSE OUTCOMES

- CO1. Cog: (R and U) ; Describe** the significance of natural resources and *explain* anthropogenic impacts.
- CO2.Cog: U ;Illustrate** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.
- CO3. Cog: R, Aff: Receiving ;Identify** the facts, consequences, preventive measures of major pollutions and *recognize* the disaster phenomenon
- CO4. Cog: (U & Anal) :Explain** the socio-economic, policy dynamics and*practice* the control measures of global issues for sustainable development.
- CO5. Cog: (U & App): Recognize** the impact of population and the concept of various welfare programs, and *apply*themodern technology towards environmental protection..

COURSE CODE	COURSE NAME	L	T	P	C
XES202	ENVIRONMENTAL STUDIES	2	0	0	2
C:P:A = 1.5: 0 : 0.5		L	T	P	H
		2	0	0	2
UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY					12
<p>Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, flood, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, 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.</p>					
UNIT – II ECOSYSTEMS AND BIODIVERSITY					7
<p>Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</p>					
UNIT – III ENVIRONMENTAL POLLUTION					10
<p>Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.</p>					
UNIT –IV SOCIAL ISSUES AND THE ENVIRONMENT					10
<p>Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of</p>					

Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT –V HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education - HIV / AIDS – Women and Child welfare programme– Role of Information Technology in Environment and human health – Case studies.

	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT BOOKS

1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.
2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.
4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
5. Introduction to International disaster management, Butterworth Heinemann, 2006.
6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

REFERENCE BOOKS

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.
4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.
5. Sundar, Disaster Management, Sarup& Sons, New Delhi, 2007.
6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

E RESOURCES

1. <http://www.e-booksdirectory.com/details.php?ebook=10526>
2. <https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science>
3. <https://www.free-ebooks.net/ebook/What-is-Biodiversity>
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. <http://bookboon.com/en/pollution-prevention-and-control-ebook>

6. <http://www.e-booksdirectory.com/details.php?ebook=8557>
7. <http://www.e-booksdirectory.com/details.php?ebook=6804>
8. <http://bookboon.com/en/atmospheric-pollution-ebook>
9. <http://www.e-booksdirectory.com/details.php?ebook=3749>
10. <http://www.e-booksdirectory.com/details.php?ebook=2604>
11. <http://www.e-booksdirectory.com/details.php?ebook=2116>
12. <http://www.e-booksdirectory.com/details.php?ebook=1026>
13. <http://www.faadooengineers.com/threads/7894-Environmental-Science>

Mapping of CO's with GA's:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9
CO1	2				2	2		2	3
CO2	2				2				1
CO3	2		3		3	3		2	2
CO4	2		3		3	3	2	3	2
CO5	2			1	2	2		3	1
	10		6	1	12	10	2	10	9
Scaled to 0,1,2,3 scale	2		2	1	2	2	1	2	2

1 - Low, 2 – Medium, 3 – High

XMG203 CALCULUS AND DIFFERENTIAL EQUATIONS

SUBCODE			SUB NAME			L	T	P	C
XMG203			CALCULUS AND DIFFERENTIAL EQUATIONS			4	1	0	5
C	P	A				L	T	P	H
3	0	0				4	1	0	5
PREREQUISITE: Basic concepts of Matrices, Numbers, Differentiation and Integration									
COURSE OUTCOMES:									
Course outcomes						Domain		Level	
After the completion of the course, students will be able to									
CO1: Compute radius of curvature, centre of curvature and						Cognitive		Understanding	

circle of curvature. Change the order of integration and to compute the double integral. Apply double to find the area between curves.		Applying
CO2: Use Beta and Gamma function computing the multiple integrals and explain the relation between them.	Cognitive	Understanding Applying
CO3: Solve the linear homogeneous and non-homogeneous differential equation with constant and variable coefficients.	Cognitive	Applying
CO4: Define general, complete and particular solutions and to solve standard forms of partial differential equations.	Cognitive	Understanding Applying
CO5: Compute gradient, divergence and curl of vectors. Apply theorem to evaluate line, surface and volume integral.	Cognitive	Remembering Understanding Applying
UNIT I		15
Curvature – Radius of curvature – center of curvature – circle of curvature – Evaluation of double integrals - change of order of integration in double integrals- Application of double integral to find the area between curves.		
UNIT II		15
Evaluation of triple integrals – Beta and Gamma functions – relations between them – Evaluation of multiple integrals using Beta and Gamma functions.		
UNIT III		15
Solving second order linear differential equations with constant coefficients whose R.H.S is of the form ve^{mx} , where v is any function of x - Linear equations with variable coefficients.		
UNIT IV		15
Formation of partial differential equations by elimination of arbitrary constants and functions -Definitions of general, particular and complete solutions - solving standard forms $f(p, q) = 0$, $f(x,p,q) = 0$, $f(y,p,q) = 0$, $f(z, p, q) = 0$, $f(x,p) = f(y,q)$, $z = px + qy + f(p,q)$ - Lagrange's Differential equations $Pp+Qq = R$.		
UNIT V		15
Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl –		

Integration of vectors – line integral – surface integral – Green’s theorem in the plane – Gauss divergence theorem – Stokes theorem – (Statements only).

	LECTURE	TUTORIAL	TOTAL
	45	30	75

TEXT

1. Kandasamy. P, Thilagavathi. K “Mathematics for B.Sc. Branch I”, Volume II, III and IV, S.Chand and Company Ltd, New Delhi, 2004.

REFERENCES

1. Narayan .S and Manicavachagam Pillay T.K. “Ancillary Mathematics”, Viswanathan Publishers and Printers, 2004.

E REFERENCES

www.nptel.ac.in

1. Advanced Engineering Mathematics Prof. Jitendra Kumar
2. Department of Mathematics Indian Institute of Technology, Kharagpur

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3									1		1
CO 2	3									1		1
CO 3	3	2								1	1	2
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	5	3	6

1 - Low , 2 – Medium , 3- high

XP204 ELECTRICITY AND MAGNETISM

COURSE OUTCOMES

CO1. Cog: R, U, App; **Recall, understand and use** the basic theorems of scalars and vectors

CO2. Cog: R, U, App;**Identify** and **explain** Gauss theorem and its applications and **apply** knowledge of the concepts of electrostatics

CO3. Cog: R, U, Ana.;**Recall** Biot-Savart's law, **explain** current passing through straight conductor, coil, solenoid and **distinguish** various properties of magnetic materials.

CO4. Cog: R, U;**Define** Faraday's law and Lenz's law and **demonstrate** mutual and self inductance of the coil.

CO5.Cog: R, App, E;**Select** the principle of magneto-statics, **develop** Maxwell's equation and **explain** EM wave propagation.

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH204	ELECTRICITY AND MAGNETISM	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT I ELECTROSTATICS					12+4
Electrostatic field - electric flux - Gauss's theorem of electrostatics - Application of Gauss theorem - electric field due to a point charge - infinite line of charge, uniformly charged spherical shell and solid sphere - plane charged sheet - charged conductor - Electric potential as line integral of electric field - potential due to a point charge - electric dipole - uniformly charged spherical shell and solid sphere. Capacitance of an isolated spherical conductor - Parallel plate, spherical and cylindrical condenser - Energy per unit volume in electrostatic field - dielectric medium - Parallel plate capacitor completely filled with dielectric.					
UNIT II CURRENT ELECTRICITY					8+3
Kirchoff's Laws of Electricity(Statement), Wheatstone's bridge – Carrey Foster's Bridge – Heating effect: Joule's law, Seebeck effect, Peltier effect, Thomson effect – Thermodynamics of thermocouple – Thermo electric diagrams – Determination of Thomson, Peltier coefficient – Measurement of thermo emf using potemtrometer.					
UNIT III MAGNETISM					10+3
Magneto statistics: Biot-Savart's law & its applications - straight conductor, circular coil and solenoid carrying current - Ampere's circuital law - Magnetic properties of materials: magnetic intensity, magnetic induction, permeability, magnetic susceptibility - brief introduction of dia, para and ferro magnetic materials.					
UNIT IV ELECTROMAGNETIC INDUCTION					5+2
Faraday's laws of electromagnetic induction - Lenz's law - self and mutual inductance, L of a single coil, M of two coils - Energy stored in magnetic field.					
UNIT V MAXWELL'S EQUATION AND ELECTROMAGNETIC WAVE					10+3

PROPAGATION			
Equation of continuity of current - displacement vector - Maxwell's equations - Poynting vector - energy density in electromagnetic field - electromagnetic wave propagation through vacuum and isotropic dielectric medium - transverse nature of EM waves - polarization.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. R. Murugesan, 'Electricity and Magnetism', S. Chand & Company Ltd. New Delhi, 2008. 2. Brijlal and N. Subrahmanyam, 'Electricity and Magnetism', Ratan PrakashanMandir, Agra, 2000. 3. K.K.Tiwari, 'A Text Book of Electricity and Magnetism', S. Chand & Company Ltd. New Delhi, 2002. 4. Edward M. Purcell, 'Electricity and Magnetism', McGraw Hill Education. 5. D C Tayal, 'Electricity and Magnetism', Himalaya Publishing House.			
REFERENCES			
1. D.L. Sehgal, K.L. Chopra and N.K. Sehgal, 'Electricity and Magnetism', 5 th Edition, Sultan chand& Sons, New Delhi, 1996. 2. William Hayt, 'Engineering Electromagnetism', TMH ed. 3. D. Kraus, 'Introduction to Electromagnetic Theory', Wiley Eastern. 4. Benjamin Cummings, 'Introduction to Electrodynamics', 3rd Edition 5. J H Fewkes& JYarwood, 'Electricity and Magnetism', Oxford University Press, Vol.I.			

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	3	0	3	3	3	0	1
CO₂	3	3	1	3	2	3	0	1
CO₃	3	3	1	3	2	3	3	2
CO₄	3	3	1	3	2	3	0	2
CO₅	3	3	1	3	2	3	0	2
	15	15	4	15	11	15	2	8
Scaled to 1, 2, 3	3	3	1	3	3	3	1	2

XPH205 ATOMIC PHYSICS

COURSE OUTCOMES:

CO1. Cog., A: R,U, An, E; **Recall** Atomic structure, **Compare** various atom models, **Distinguish** various potentials and **Explain** special quantization and spectra of atom.

CO2. Cog: U, An; **Demonstrate** alkali spectra of atom, **Compare** LS & JJ couplings, **Distinguish** X-rays and **Analyze** various applications of X-ray.

CO3. Cog., A: U, E; **Explain** the dual nature of particles and uncertainty principle.

CO4. Cog: R, E; **Define** matter waves and wave amplitude and **Explain** Schrodinger equation for non-relativistic particles.

CO5. Cog: U, E; **Explain** physical interpretation of wave function, probabilities, normalization and tunneling across a rectangular potential barrier.

COURSE CODE	COURSE NAME	L	T	P	C
XPH205	ATOMIC PHYSICS	3	1	0	4
		L	T	P	H
		3	1	0	4

UNIT I Atomic Structure	11+3
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Atom models – spectral series of hydrogen atom – Excitation of atoms – Critical, Excitation and Ionisation Potential – Experimental determination of critical potential - Frank and Hertz's method – Sommerfield atom model – Qualitative treatment – Derivation of condition for the allowed elliptical orbits – Quantum numbers associated with Vector atom model – Paul's exclusion principle – The periodic classification of elements (Periodic table) – Bohr magnetron – spatial quantization – Stern and Gerlach experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra– Bohr's quantization rule and atomic stability– calculation of energy levels for hydrogen like atoms and their spectra.

UNIT II Atomic spectra	11+3
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Atomic Spectra of hydrogen – deuteron and alkali atoms – spectral terms – doublet fine structure – screening constants for alkali spectra for s, p, d, and f states – selection rules. Singlet and triplet fine structure in alkaline earth spectra – L-S and J-J couplings – Weak spectra – continuous X-ray

spectrum and its dependence on voltage – Duane and Haunt’s law – Characteristics X-rays – Moseley’s law – doublet structure and screening parameters in X-ray spectra – X-ray absorption spectra.			
UNIT III Matter Waves			7+3
Position measurement- gamma ray microscope thought experiment– Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory– Estimating minimum energy of a confined particle using uncertainty principle– Energy-time uncertainty principle.			
UNIT IV Schrodinger Equation and its Applications			7+3
Two slit interference experiment with photons, atoms and particles – linear superposition principle as a consequence – Matter waves and wave amplitude – Schrodinger equation for non-relativistic particles – Momentum and Energy operators– stationary states.			
Unit V Physical interpretation and Energy spectra			9+3
Physical interpretation of wave function, probabilities and normalization– Probability and probability current densities in one dimension – One dimensional infinitely rigid box- energy eigen values and eigen functions, normalization– Quantum dot as an example– Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
<ol style="list-style-type: none"> 1. Arthur Beiser, Concepts of Modern Physics, 2002, McGraw-Hill. 2. Rich Meyer, Kennard, Coop, Introduction to Modern Physics, 2002, Tata McGraw Hill 3. David J. Griffith, Introduction to Quantum Mechanics, 2005, Pearson Education 4. Jewett & Serway, Physics for scientists & Engineers with Modern Phys., 2010, Cengage Learning. 5. A.K. Ghatak and S. Lokanathan, Quantum Mechanics: Theory & Applications, 2004, Macmillan. 6. C.H. Holbrow, J.N. Lloyd, J.C. Amato, E. Galvez et.al. Modern Introductory Physics, 2010, Springer. 			
REFERENCES			

1. John R. Taylor, Chris D. Zafiratos, Michael A. Dubson, Modern Physics, 2004, PHI Learning.
2. H.S. Mani and G.K. Mehta, Introduction of Modern Physics, 1988, Affiliated East-West Press.
3. Thomas A. Six Ideas that Shaped Physics: Particle Behave like Waves, Moore, 2003, McGraw Hill

E-Resource:

http://www.fulviofrisone.com/attachments/article/446/atomic_physics_max_born_blackie_1937.pdf
https://drive.google.com/file/d/1KNkAqNJYV7-Hq87uu9Sh-KNYCXB_pZQq/view

Mapping with Programme Outcomes

Cos	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	3	0	1
CO ₂	3	2	1	2	3	2	0	1
CO ₃	3	2	1	2	3	2	3	2
CO ₄	3	2	1	2	3	2	0	2
CO ₅	3	2	1	2	3	2	0	2
	15	10	4	11	15	11	2	8
Scaled to 1, 2, 3	3	2	1	3	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH206	PHYSICS PRACTICAL –II	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain **knowledge** in the scientific methods and **identify** the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; **Manipulate** and **complete** all the experiments with excellent **application** knowledge.

LIST OF EXPERIMENTS

- 1 Young's modulus – Uniform bending – Scale and telescope.
- 2 Young's modulus – Uniform bending – Pin and microscope.
- 3 Static torsion – determine the rigidity modulus.
- 4 Potentiometer – Voltmeter calibration (low range)
- 5 Meter bridge – determination of specific resistance.
- 6 Potentiometer – Thermister – Temperature Coefficient.
- 7 Meter bridge – verification of laws of resistance.
- 8 Potentiometer – Internal resistance of cells.
- 9 Sonometer – Verification of laws.
- 10 Comparison of surface tension by capillary rise method.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.

5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1	1	2	1	2	3	2
CO ₃	3	1	1	1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	1	2	2	1	2	3	2
	15	5	4	7	5	10	14	10
Scaled to 1, 2, 3	3	1		2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

XPH301 PHYSICS WORKSHOP SKILLS

COURSE OUTCOMES:

- CO1. Cog: U, Ap; **Relate** SI and CGS units and **Apply** their knowledge in various measuring instruments.
- CO2. Cog: Ap, An; **Recall and Develop** their knowledge to find welding defect & handling of various tools and **Distinguish** like metal, composites and alloy materials.
- CO3. Cog: Ap; **Apply** their knowledge to handle multimeter and soldering to construct circuit.
- CO4. Cog: U, Ap; **Identify** the diode, transistor and FET - ICs on PCB and **Construct** the regulated power supply and timer circuits.
- CO5. Cog: U, C; **Infer** small mechanism of lever, break and gear and **Adapt** working principle of power generation system.

COURSE CODE	COURSE NAME	L	T	P	C
XP301	PHYSICS WORKSHOP SKILLS	0	0	2	2
		L	T	P	H
		0	0	2	2
UNIT - I Measuring Instruments and Units					7
Measuring units, conversion to SI and CGS., Familiarization with meter scale, Vernier caliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc..					
UNIT - II Mechanical Skill					11
Concept of workshop practice, Overview of manufacturing methods: casting, foundry, machining, forming and welding - Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing - introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools - lubricating oils - Cutting of a metal sheet using blade - Smoothing of cutting edge of sheet using file – Drilling of holes of different diameter in metal sheet and wooden block – Use of bench vice and tools for fitting – Make funnel using metal sheet.					
UNIT - III Electrical skill					9
Use of Multimeter – Soldering of electrical circuits having discrete components (R, L and C)					
Unit - IV Electronic Skill					9
Basic principle of diode, transistor and FET - ICs on PCB - Operation of oscilloscope – Making regulated power supply, timer circuit, electronic switch using transistor and relay					
UNIT - V Introduction to prime movers					9
Mechanism, gear system, wheel, fixing of gears with motor axel – Lever mechanism - lifting of heavy weight using lever, breaking systems, pulleys, working principle of power generation systems – demonstration of pulley experiment.					
		TUTORIAL	PRACTICAL	TOTAL	
		15	30	45	
TEXT BOOKS					
1. B.L. Theraja, A text book in Electrical Technology, S. Chand and company.					
2. M.G. Say, Performance and design of AC machines, ELBS Edn.					

3. K.C. John, Mechanical workshop practice, 2010, PHI learning Pvt, Ltd.

REFERENCES

1. Bruce J. Black, Workshop processes, practices and materials, 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732].

2. Lawrence Smyth/Liam Hennessy, New engineering technology, The Educational company of Ireland [ISBN: 0861674480]

Mapping with Programme Outcomes

Cos	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	2	3	0	1
CO ₂	3	2	1	3	2	3	0	1
CO ₃	3	2	1	3	2	3	3	2
CO ₄	3	2	1	3	2	3	0	2
CO ₅	3	2	1	3	2	3	0	2
	15	10	4	15	10	15	2	8
Scaled to 1, 2, 3	3	2	1	3	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

XCG302 INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY I

COURSE OUTCOMES

CO1. **Cog: (R) and (U)** :*Describe* the key features, shapes and structures of coordination complexes and *understand* the solid state chemistry.

CO2. **Cog: (R):** *Describe* and *Recall* the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.

CO3. **Cog: (U)** :*Understand* the structures and properties of carbohydrates and amino acids.

CO4. **Cog: (U):** *Explain* the kinetic molecular theory of gases and its properties and *Use* of phase rule.

CO5. **Cog: (R):** *Relate* the rate of formation of a product to the rate of disappearance of a reactant for the given experimental data and reaction stoichiometry.

COURSE CODE	COURSE NAME	L	T	P	C
XCG302	INORGANIC, ORGANIC AND PHYSICAL	3	1	0	4
C:P:A = 2.8: 0 : 0.2	CHEMISTRY – I	L	T	P	H
		3	1	0	4
Unit-I : CO-ORDINATION CHEMISTRY AND SOLID STATE CHEMISTRY					9+2
IUPAC nomenclature of mono nuclear coordination compounds, Isomerism, Geometrical isomerism in four co-ordinate and six co-ordinate complexes, Theories of Coordination compounds-Werner's theory, Valence bond theory.					
Amorphous, Crystalline Solid-Lattice- unit cell, crystal systems, types of crystals, packing in solids, ionic crystals, defects in solids, Principles of X-ray diffraction.					
UNIT – II : BASICS OF ORGANIC CHEMISTRY					9+3
Nomenclature of straight chain and closed ring compounds-mono and poly-functional organic compounds. Hybridisation - sp, sp ² and sp ³ . -Bond length, bond angle, dipole moment-inductive effect, mesomeric effect and hyperconjugation. Isomerism - geometrical; and optical isomerism, optical activity, asymmetry, dissymmetry, elements of symmetry, R, S notations.					
UNIT – III : CARBOHYDRATES, AMINO ACIDS & PROTEINS					9+2
Carbohydrates: Classification – glucose and fructose – preparation and properties – Elucidation of structure of glucose – configuration of glucose – Fischer and Haworth cyclic structures.					
Amino acids & proteins : Amino acids – Classification- Preparation and properties –isoelectric point – peptides (elementary treatment) – Proteins – Classification based on physical properties and biological functions. Structures of proteins – primary and secondary (elementary treatment).					
UNIT – IV : GASEOUS STATE AND PHASE RULE					9+4
Gaseous state - Postulates of kinetic theory of gases-derivation of expression for pressure of an ideal gas on the basis of kinetic theory-gaseous laws. Deviation of real gases from ideal behaviour-reasons - derivation for vander Waals gas equation- behaviour of real gases Average, root mean square, and most probable velocities-(equations only-no derivation) relationship between these different velocities.					
Phase rule - Definition -phase, component, degree of freedom, phase rule – application to one component system – water system.					
UNIT –V : CHEMICAL KINETICS AND CHEMICAL EQUILIBRIUM					9+4

Chemical kinetics- Rate of reaction, rate law, order, molecularity, first order reaction, half life period of first order reaction, pseudo first order reaction, zero and second order reactions- experimental determination of order of reactions –Theories of reaction rate -Arrhenius and collision theories-postulates.

Chemical equilibrium - Criteria of homogeneous and heterogeneous equilibria, decomposition of HI, N₂O₄, CaCO₃, PCl₅.

	LECTURE	TUTORIAL	TOTAL
	45	15	60

TEXT BOOKS

1. N.K. Vishnoi, “Textbook of Physical Chemistry”,- Vol 1-Paperback , Jan 2010 .
2. Neeraj Kumar , “Avanced Problems in Physical Chemistry”, 2015.
3. B. Y. Paula, “Organic Chemistry”, 3rd Edition, Pearson Education, Inc.(Singapore), New Delhi, 2002.
4. D. F. Shriver and P. W. Atkins, “Inorganic Chemistry”, 3rd Ed., W. H. Freeman and Co, London, 1999.
5. B. R Puri.B.R., Sharma.L.R., &Kalia.C., “Principles of Inorganic Chemistry” , Vallabh publications, New Delhi, 2003.
6. S.K. Dogra and S. Dogra, “Physical Chemistry Through Problems”, New age international, 4 th edition 1996.

REFERENCE BOOKS

1. Bahl B.S., Tuli G.D. and Arun Bahl, “Essentials of Physical Chemistry”, Chand & Co., Delhi, 2012.
2. Lee.J.D ., “A New Concise Inorganic Chemistry” , ELBS, London, 2010.
3. Morrison R. T, Boyd R.N.,” Organic Chemistry” , 7th edition , Prentice Hall, New Delhi, 2008.
4. Soni. P.L, Chawala H.M., “Text book of Organic Chemistry”, 26th edition, Sultan Chand, Delhi , 2011.
5. Raj.K.Bansal, “Organic Reaction Mechanisms”, 3rd edition, Tata MCGraw-Hill Publishing Company Limited, New Delhi, 2012.
6. Madan.R.D. ., “Modern Inorganic Chemistry” , S.Chand& sons, New Delhi, 2013.
7. Soni P.L., “Textbook of Inorganic Chemistry” , Sultan Chand & Sons, New Delhi,2013.
8. Finar I.L., Organic Chemistry Vol. II, Pearson Education, New Delhi, 2000.

9. Srivastava V.K., Srivastava K.K., "Introduction to Chromatography", 2nd edition, 2000.

E RESOURCES

1. <http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques>

2. <http://freevideolectures.com/Course/2642/Chemistry-51A-Organic-Chemistry>

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1		2	2	2	1	2
CO2	3	2		2	1	1		
CO3	2		1	2		1		1
CO4	2	1		1				
CO5	2	1	1	2	2	2	2	1
Scaled to 0,1,2,3 scale	12	5	2	9	5	6	3	4
	3	1	1	2	2	2	1	1

1 - Low, 2 - Medium, 3 - High

XPH303 HEAT AND THERMODYNAMICS

COURSE OUTCOMES:

CO1. Cog., A: R,U; **Recall** Cp and Cv and basic concepts of specific heat and **Explain** various theories.

CO2. Cog: An, E; **Explain** the nature of heat and heat transmission and **Distinguish** mono- dia- triatomic gases.

CO3. Cog., A: R, U, E; **List** the laws of thermodynamics and **Explain** latent heat and entropy

CO4. Cog: R,E,C; **Define** Coefficient of Thermal Conductivity, **Determine** thermal conductivity of bad conductor and **Discuss** the various laws for heat flow.

CO5. Cog: U, An, E, C; **Analyze** statistical equilibrium, explain various distribution laws and **Compare** the three statistics

COURSE CODE	COURSE NAME	L	T	P	C
XPH303	HEAT AND THERMODYNAMICS	3	1	0	4
		L	T	P	H

			3	1	0	4
UNIT I SPECIFIC HEAT						10+3
Specific Heat – Specific Heat of a Liquid by Joule’s Electrical Method, Specific Heat of a Gas – Mayer’s Relation - Specific Heat of a gas at C_v – Joly’s Steam Calorimeter – C_p Regnault’s Method - Dulong and Petit’s Law – Variation of Specific Heat and Atomic Heat with Temperature – Debye’s theory – Einstein’s Quantum Theory.						
UNIT II NATURE OF HEAT						7+3
Degrees of freedom and Maxwell’s Law of Equipartition of Energy – Atomicity of Gases – Monatomic – Diatomic – Triatomic Gases – Molecular velocity distribution Maxwell’s Derivation – Mean Free Path – Transport Phenomena – Viscosity of Gases – Thermal Conductivity of Gases.						
UNIT III THERMODYNAMICS						8+3
Carnot’s Theorem – Thermodynamic Scale of Temperature – Clapeyron Latent Heat Equation – Entropy – Change of Entropy in a Reversible and Irreversible Process – 3 rd Law of Thermodynamics – T-S Diagram – Entropy of a Perfect Gas – Zero Point Energy And Negative Temperature – Maxwell’s Thermodynamical Relations Derivation.						
UNIT IV TRANSMISSION OF HEAT						10+3
Coefficient of Thermal Conductivity – Lee’s Disc method for bad conductors. Radial and cylindrical flow of heat – Wiedmann – Franz law – Stefan’s law – Mathematical derivation – Newton’s law of cooling from Stefan’s law – Experimental verification – Stefan’s constant – Experimental determination.						
UNIT V STATISTICAL THERMODYNAMICS						10+3
Statistical equilibrium – M.B. distribution law – M.B. distribution law in terms of temperature – application to ideal gas – Quantum Statistics – Phase space – Fermi-Dirac Distribution Law – Electron gas – Fermi energy – Bose – Einstein Distribution Law – Photon gas – Comparison of three statistics.						
		LECTURE	TUTORIAL	TOTAL		
		45	15	60		
TEXT BOOKS						
1. Brijlal and Subramaniam, Heat and Thermodynamics, S.Chand Publishers & Co, New Delhi 2004.						
2. J.B.Rajam, Heat and Thermodynamics, S.Chand Publishers						

3. S. D. S. Mathur, Heat and Thermodynamics, Chand & Co, New Delhi 2004.

REFERENCES

1. Brijlal, N. Subrahmanyam and P.S. Hemne, Thermodynamics and Statistical physics (multi colour edn. 7).
2. Mark W Zemansky, Richard H Dittman, Heat and Thermodynamics (seventh Edn.)
3. Francis W. Sears & Gerhard L Salinger, Thermodynamics, Kinetic Theory, Statistical – Thermodynamics.
4. Arthur Beiser, Concepts of Modern physics (fifth Edn.)

E-RESOURCES :

<https://imran728.files.wordpress.com/2015/05/heat-and-thermodynamics-by-brijlal-n-subrahmanyam-www-euelibrary-com.pdf>

Mapping with Programme Outcomes

Cos	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	3	0	1
CO ₂	3	2	0	2	3	2	0	1
CO ₃	3	2	0	2	3	2	3	2
CO ₄	3	2	0	2	3	2	0	2
CO ₅	3	2	0	2	3	2	0	2
	15	10	0	11	15	11	2	8
Scaled to 1, 2, 3	3	2	0	3	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH304 BASIC ELECTRONICS

COURSE OUTCOMES:

CO1. Cog., A: R, Ap; **Recall** the function of PN junction diode, zener diode LED and **Construct** the full wave rectifier filters, regulated power supply- zener regulator, photo diode.

CO2. Cog: U, E; **Demonstrate** the transistor construction and working characteristics, **Determine** the h- parameters.

CO3. Cog: U, E; **Compare** the FET and Transistor and **Explain** the characteristics & applications of special semiconductor devices.

CO4. Cog: U, C, E; **Classify** Amplifiers, **Discuss** the feedback principle for amplifier, Oscillators and **Explain** the Hartley and Collpitt's oscillators.

CO5. Cog: An., E; **Distinguish** the modulations and **Appraise** the function of detectors.

COURSE CODE	COURSE NAME	L	T	P	C
XPH304	BASIC ELECTRONICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT 1: DIODES AND RECTIFIERS					7+3
PN Junction diode – characteristics- Zener diode – Characteristics- LED- Full wave rectifier - ripple factor - filters - L-section, Π -section filters - zener voltage regulated power supply, Photo Diode and Uses.					
UNIT 2: TRANSISTORS					10+3
Junction Transistors –construction – Mechanism of amplification – Modes of operation – Alpha & Beta of a Transistor – Current expression – Transistor static characteristics in CB and CE modes – Transistor biasing (voltage divider biasing) – Two port representation of a Transistor – Parameters- Determination of h-parameters.					
UNIT 3: SPECIAL DEVICES					9+3
Special semiconductor devices – FET, JFET, MOSFET (Construction And Working) - FET parameters – Comparison between FET and Transistor - Phototransistor – SCR, UJT characteristics- Applications of SCR as relay and UJT as relaxation oscillator.					
UNIT 4: AMPLIFIERS AND OSCILLATORS					9+3
Power amplifier – Class A power amplifier –Class B power amplifier - Push pull – Gain of amplifier with feedback – Effects of negative feedback – Oscillators – Types – Concepts of feedback oscillators – Hartley and Collpitt's oscillators.					

UNIT 5: MODULATORS AND DETECTORS			10+3
Modulation – Amplitude modulation-Modulation factor – Power in AM waves – Limitations of amplitude modulation-Frequency modulation – Phase modulation –Demodulation-Essentials in demodulation- Linear Diode Detector.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. V.K. Mehta, Principles of electronics, S.Chand& Co.- 7 th Rev. Edition (2005).			
2. N.Bhargava, D.Kulshreshtha and S.Gupta,Basic Electronics and Linear Circuits, Tata McGraw-Hill Publishing Co (1983).			
REFERENCES			
1. Sarjeer Gupta, Electronic Devices and circuits, Dhaanpat rai Publications – New Delhi – Reprint – 2008.			
2. A. Ambrose and T.Vincent Devaraj, Elements of solid state electronics, Mera publications - 1993.			
3. R.Muthusubramanian, S. Salivahanan, K.A. Muraleedharan, Basic electrical, Electronics and computer Engineering, Tata McGraw Hill publishing Co. Ltd., New Delhi – Reprint (2004)			
4. Jacob Millman, Christos C. Halkias, Electronic Devices and circuits, Tata McGraw Hill publishing Co., Ltd., New Delhi – Reprint (2002).			

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	2	0	2	3	3	0	1
CO₂	3	2	0	2	3	2	0	1
CO₃	3	2	1	2	3	2	3	2
CO₄	3	2	1	2	3	2	0	2
CO₅	3	2	1	2	3	2	0	2
	15	10	3	10	15	11	2	8
Scaled to 1, 2, 3	3	2	1	2	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

Semester	III	L –T –P –H
Subject Name	DISASTER MANAGEMENT	1- 0 –0- 1
Subject Code	XUM306	C:P:A
Prerequisite		3:0:0
Course Outcome		Domain C or P or A
CO1	<i>Understanding</i> the concepts of application of types of disaster preparedness	C(Application)
CO2	<i>Infer</i> the end conditions & <i>Discuss</i> the failures due to disaster.	C(Analyze)
CO3	<i>understanding</i> of importance of seismic waves occurring globally	C(Analyze)
CO4	<i>Estimate</i> Disaster and mitigation problems.	C(Application)
CO5	Keen <i>knowledge</i> on essentials of risk reduction	C(Application)
COURSE CONTENT		
UNIT I	INTRODUCTION	9 hrs
	Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management–Alternative to dominant approach– disaster – development linkages -Principle of risk partnership	
UNIT II	APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION	9 hrs
	Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video conferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study.	
UNIT III	AWARENESS OF RISK REDUCTION	9 hrs
	Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness	
UNIT IV	DEVELOPMENT PLANNING ON DISASTER	9 hrs
	Implication of development planning – Financial arrangements – Areas of improvement – Disaster preparedness – Community based disaster management	

	– Emergency response.	
UNIT V	SEISMICITY	9 hrs
	Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – ground damage – Tsunamis and earthquakes	
	L - 45 hrs Total-45 hrs	
Text books		
1. Siddhartha Gautam and K Leelakrishna Rao, “Disaster Management Programmes and Policies”, Vista International Pub House, 2012		
2. Arun Kumar, “Global Disaster Management”, SBS Publishers, 2008		
References		
1. Encyclopaedia Of Disaster Management, Neha Publishers & Distributors, 2008		
2. Pardeep Sahni, Madhavi malalgoda and ariyabandu, “Disaster risk reduction in south asia”, PHI, 2002		
3. Amitasinvhal, “Understanding earthquake disasters” TMH, 2010.		
4. Pardeep Sahni, Alka Dhameja and Uma medury, “Disaster mitigation: Experiences and reflections”, PHI, 2000		

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					5	2							
CO2	2					1	2					1		
CO3	1					2	2	1				2		
CO4	1					2	2	1				1		
CO5						5	2	3				1		
	5					15	10	5				5		

1 - Low, 2 – Medium, 3 – High

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH307	PHYSICS PRACTICAL –III	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

1. Sonometer- Determination of unknown frequency and unknown weight.
2. Melde's string Determination of frequency.
3. Transistor characteristics – common Emitter.
4. Newton's law of cooling – Specific heat capacity of the liquid.
5. Junction diode and Zener diode – Characteristics.
6. Carey Foster Bridge - Temperature Coefficient.
7. Lee's disc –specific heat capacity of the bad conductor.
8. Specific heat by Joules calorimeter.
9. Potentiometer- high range voltmeter
10. Zener Regulated Power Supply.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)

3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1	1	2	1	2	3	2
CO ₃	3	1		1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	2	2	2	1	2	2	2
	15	6	3	9	5	10	13	10
Scaled to 1, 2, 3	3	1		2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

XPH401 ELECTRICAL CIRCUIT NETWORK SKILLS

COURSE OUTCOME:

CO1. Cog., A: R,U,An; **Recall** Basic Electricity Principles, **Analyze** electrical circuits and **Distinguish** single phase and three phase

CO2. Cog., A: R,U,E,An; **Recall** symbols, **Explain** circuits and diagram, **Distinguish** capacitance, inductance and impedance

CO3. Cog: R, An; **Describe** DC&AC power sources, **Distinguish** DC/AC Generator and motor.

CO4. Cog., A: U, E; **Classify** all Solid-State Devices, **Explain** response of inductors and capacitors with sources. **Describe** how the electrical components are protected.

CO5. Cog., A: An, C; **Discuss** about electrical wiring and **Distinguish** the types of wiring.

COURSE CODE	COURSE NAME	L	T	P	C
XPH401	ELECTRICAL CIRCUIT NETWORK SKILLS	0	0	3	2
		L	T	P	H
		0	0	3	3
UNIT I Electrical Principles and Circuits					7+3
<p>Basic Electricity Principles: Voltage, current, resistance and power – Ohm’s law - Series, parallel and series-parallel combinations – AC Electricity and DC electricity – Familiarization with multimeter, voltmeter and ammeter.</p> <p>Understanding Electrical Circuits: Main electric circuit elements and their combination – Rules to analyze DC sourced electrical circuits – Current and voltage drop across the DC circuit elements – Single-phase and three-phase alternating current sources – Rules to analyze AC sourced electrical circuits – Relay, imaginary and complex power components of AC source – Power factor – Saving energy and money.</p>					
UNIT II Electrical Drawing and Components					6+3
<p>Drawing symbols – Blueprints – reading schematics – ladder diagrams – electrical schematics – Power circuits – control circuits – Reading of circuit schematics – Tracking the connections of elements and identify current flow and voltage drop. Inductance – capacitance – impedance – Operation of transformers.</p>					
UNIT III Electric Generators and Motors					6+3
<p>DC power sources – AC/DC generators – Single-phase and three-phase DC motors – Basic design</p>					

– Interfacing DC or AC sources to control heater & motors – Speed & power of AC motor.			
UNIT IV Electrical devices and protection			7+3
Solid-State Devices: Resistors – inductors – capacitors – diode and rectifiers – components in series or in shunt – response of inductors and capacitors with DC or AC sources.			
Electrical Protection: Relays – Fuses and disconnect switches – circuit breakers – overload devices – Ground-fault protection – Grounding and isolating – phase reversal – surge protection – interfacing DC or AC sources to control elements (relay protection device).			
UNIT V Electrical Wiring			5+3
Different types of conductors and cables – Basics of wiring – Star and delta connection – Voltage drop and losses across cables and conductors – Instruments to measure current – voltage – power in DC and AC circuits – Insulation – solid and standard cable – Conduit Cable trays – Splices : wire nuts – crimps – terminal blocks – split bolts and solder – Preparation of extension board.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. B.L. Theraja, A text book in Electrical Technology, S Chand & Co. New Delhi.			
2. A. K. Theraja, A text book of Electrical Technology.			
REFERENCES			
1. MG Say, Performance and design of AC machines, ELBS Edn.			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	3	0	1
CO ₂	3	2	0	2	3	2	0	1
CO ₃	3	2	0	2	3	2	3	2
CO ₄	3	2	0	2	3	2	0	2
CO ₅	3	2	0	2	3	2	0	2
	15	10	0	11	15	11	2	8
Scaled to 1, 2, 3	3	2	0	2	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

XCG402 INORGANIC , ORGANIC AND PHYSICAL CHEMISTRY II

COURSE OUTCOMES

CO1. Cog (U and App): *Explain* the ability to describe oxidation-reduction reactions using appropriate chemical equations, to identify oxidation and reduction, and to *apply* those concepts to electrochemical cells

CO2.Cog: (U and R) :*Illustrate* the nuclear reactions and *describe* the extraction of ores.

CO3. Cog:(U); *Illustrate* the bonding and molecular orbital theory.

CO4. Cog (R and Appl) &Aff: (Rece) :*Describe* the basic laws of thermodynamics and to *apply* those laws to chemical reactions.

CO5. Cog (R and U) :*Explain* the structure of organic molecules using various spectral data and *recognize* the use of chemicals in industries and their impacts on environment.

COURSE CODE	COURSE NAME	L	T	P	C
XCG402	INORGANIC, ORGANIC AND PHYSICAL	3	1	0	4
C:P:A = 2.8: 0 : 0.2	CHEMISTRY II	L	T	P	H
		3	1	0	4
UNIT - I REDOX REACTIONS AND ELECTROCHEMISTRY					9+3
Concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number. Electrolytic and metallic conduction, conductance in electrolytic solutions, molar Conductivities and their variation with concentration, Kohlrausch's law and its applications. Electrochemical cells, Electrolytic and Galvanic cells, different types of electrodes, Electrode potentials including standard electrode potential, half cell and cell reactions. EMF of a Galvanic cell and its measurement, Nernst equation and its applications. Relationship between cell potential and Gibbs energy change.					
UNIT - II NUCLEAR CHEMISTRY					9+3
Radio activity -Half life period - Group displacement law - Radioactive series. Nuclear Fission and Fusion - Application of nuclear chemistry in Medicine, agriculture, industries - C14 dating. Extraction of Radioactive Minerals - Uranium and Thorium.					
UNIT – III CHEMICAL BONDING					10+2
Overlapping of atomic orbitals - s-s, s-p and p-p overlap-principle of hybridization-sp,sp ² and sp ³ hybridization- Valence Bond theory -postulates of Valence Bond theory-application to the formation of simple molecules like H ₂ and O ₂ --VSEPR theory. Molecular Orbital theory-					

bonding, anti bonding and non bonding orbitals. M.O. diagram for H ₂ , He, N ₂ and F ₂ .			
UNIT –IV THERMODYNAMICS AND CHEMICAL KINETICS			9+4
Importance of thermodynamics-terms used in thermodynamics-open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes, statement and mathematical form of first law of thermodynamics-heat capacity at constant volume and pressure, relation between C _p and C _v . Statement of second law of thermodynamics.			
Chemical kinetics: Reaction rate-law-order and molecularity of reactions. First order reaction-derivation of rate equation.			
UNIT –V SPECTROSCOPY AND INDUSTRIAL CHEMISTRY			8+3
Electromagnetic spectrum, Absorption of radiation, Principles and applications of UV-visible, IR and NMR in the determination of structures of organic molecules.			
Fuel gases – Water gas, producer gas, LPG gas, Gobar gas and natural gas – NPK and mixed Fertilizer, micronutrients and their role in Plant life and Bio Fertilizers soaps and detergents – an elementary idea about preparation and manufacture cleaning action of soap and detergents.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. Bahl B.S., Tuli G.D. and Arun Bahl, Essentials of Physical Chemistry, Chand & Co., Delhi, 2012.			
2. Puri.B.R., Sharma.L.R., &Kalia.C., Principles of Inorganic Chemistry , Vallabh publications, New Delhi, 2013.			
3. Soni. P.L, Chawala H.M., Text book of Organic Chemistry, 26th edition, Sultan Chand, Delhi ,2013.			
4. Madan.R.D. ., Modern Inorganic Chemistry , S.Chand& sons, New Delhi, 2013.			
5. Finar I.L., Organic Chemistry Vol. I , Longman Publishing group, New York, 2007.			
REFERENCE BOOKS			
1. Lee.J.D ., A New Concise Inorganic Chemistry , ELBS, London, 2010.			
2. Morrison R. T, Boyd R.N., Organic Chemistry , 7th edition , Prentice Hall, New Delhi, 2008.			
3. Raj.K.Bansal, Organic Reaction Mechanisms , 3rd edition, Tata MCGraw-Hill Publishing Company Limited, New Delhi, 2012.			
4. Soni P.L., Textbook of Inorganic Chemistry , Sultan Chand & Sons, New Delhi, 2011.			

5. Finar I.L., Organic Chemistry Vol. II, Pearson Education, New Delhi, 2010.
 6. Srivastava V.K., Srivastava K.K., Introduction to Chromatography, 2nd edition, 2000.

E RESOURCES

<http://freevideolectures.com/Course/3001/Chemistry-I>

<http://freevideolectures.com/Course/3001/Chemistry-I/5>

<http://freevideolectures.com/Course/3518/Chemical-Engineering-Thermodynamics>

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2			3	2	2	2	2
CO2	1			3	2	1		2
CO3	2	1				1	1	
CO4	1	3			1		3	1
CO5	1			3	2	2	3	3
	7	4		9	7	6	9	8
Scaled to 0,1,2,3 scale	2	1		2	2	2	2	

1 - Low, 2 – Medium, 3 – High

XPH403 WAVES AND OPTICS

COURSE OUTCOMES:

- CO1. Cog.:R,U;**Define** super position principle and **Relate** the collinear and perpendicular harmonic oscillators.
- CO2. Cog.: R,E;**Recall** transverse wave, **List** the types of waves and **Explain** Group velocity, phase velocity
- CO3. Cog.: R, Ap;**What** is interference and **Identity** various method to produce interference.
- CO4. Cog.: R, An;**Define** diffraction and **Analyze** diffraction effect.
- CO5. Cog.: U, An;**Explain** polarization and **Distinguish** the polarizer and analyser.

COURSE CODE	COURSE NAME	L	T	P	C
XPH403	WAVES AND OPTICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT - I Superposition of Harmonic Oscillations					6+3
<p>Superposition of Two Collinear Harmonic Oscillations: Linearity and Super position Principle (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats) Superposition of Two Perpendicular Harmonic Oscillations : Graphical and analytical methods, Lissajous figures (1:1 and 1:2) and their uses.</p>					
UNIT - II Wave Motion					10+3
<p>General : Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves, Spherical waves, Wave intensity.</p> <p>Wave optics: Electromagnetic nature of light. Definition and properties of wave front Huygens Principle.</p>					
UNIT - III Interference					13+3
<p>Division of amplitude and division of wave front. Young's Double slit experiment. Lloyd's Mirror and Fresnel's Biprism, Phase change on reflection: Stokes' treatment. Interference in Thin films: parallel and wedge shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.</p>					
UNIT - IV Diffraction					14+3
<p>Fraunhofer diffraction: Single slit; Double slit, Multiple slits & Diffraction grating. Fresnel Diffraction: Half period Zones. Zone plate, Fresnel Diffraction pattern of a straight edge, a slit and a wire using half period zone analysis.</p>					
UNIT - V Polarization					5+3
<p>Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization.</p>					
		LECTURE	TUTORIAL	TOTAL	
		45	15	60	
TEXT BOOKS					

1. F.A. Jenkins and H. E. White, Fundamentals of Optics, 1976, McGraw Hill.
2. B.K. Mathur, Principles of Optics, 1995, Gopal Printing.
3. H.R. Gulati and D.R. Khanna, Fundamentals of Optics, 1991, R. Fhand Publication.

REFERENCES

1. F.W. Sears, M.w. Zemansky and H.D.Young, University Physics, 13 / e, 1986 Addison - Wesley.

E-Resources:

https://onlinecourses.nptel.ac.in/noc19_ph18/preview

http://www.gvp.cz/~vinkle/mafynet/fyz_5_6lete/vlnova_optika/WaveOptics.pdf

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	1	0	1
CO ₂	3	3	0	1	2	1	0	1
CO ₃	3	3	0	1	2	1	3	2
CO ₄	3	3	0	1	2	1	0	2
CO ₅	3	3	0	1	2	1	0	2
	15	14	0	7	11	5	2	8
Scaled to 1, 2, 3	3	3	0	2	3	1	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH404 DIGITAL ELECTRONICS

COURSE OUTCOMES:

CO1. Cog.: Ap., An., C; *Analyze* various number semiconductors and diodes and *Discuss* operation of the same.

CO2. Cog.: U; *Show* the conversion of analog to digital vice versa using operation amplifier.

CO3. Cog.:Ap; *Solve* the simplification Boolean algebra and construct circuits using gates

CO4. Cog.:Ap.,C;*Develop*the fundamentals flip flops, registers and counters, and *Design* the sequential logic circuits.

CO5. Cog.: U; *Demonstrate* the operation of the computer register and memory devices and *Classify* various memory devices.

COURSE CODE	COURSE NAME	L	T	P	C
XPH404	DIGITAL ELECTRONICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT 1NUMBER SYSTEM AND LOGIC GATES					9+3
Decimal – Binary – Octal – Hexadecimal Number Systems – Inter Conversion – BCD Codes – 8 - 4 - 2 - 1 Codes, Excess – 3 Code – Gray Code – Binary Arithmetic Operations – Addition – Subtraction – Multiplication – Division – 1’s Complement – 2’s Complement Binary Operation. Basic Logic Gates AND, OR, NOT, NAND, NOR, XOR, X – NOR – Universal Building Blocks.					
UNIT2BOOLEAN ALGEBRA AND KARNAUGH MAPS					9+3
Basic law of Boolean algebra – Demorgan’s theorems – Duality Theorem – Reducing Boolean expressions Using Boolean laws – Minterms – Maxterms – Sum of Products – Products of Sums. 3 Variable K – Map – 4 - Variable K – Map sum of product only –Simplification of K-Maps.					
UNIT 3 ARITHMETIC AND COMBINATIONAL CIRCUIT					9+3
Half Adder – Full Adder – BCD Adder – Half Subtractor – Full Subtractor – Multiplexer – 4 to 1 Multiplexer – Demultiplexer – 1 to 4 Demultiplexer. Decoder – Binary to Gray Decoder – BCD to Seven Segment Decoder – Encoder (Introduction only).					
UNIT 4 SEQUENTIALLOGIC DESIGN					9+3
Flip Flops – R/S Flip Flop – D-F/F – T-F/F – JK F/F – Master Slave Flip Flops – Registers –					

Shift Left – Shift Right (4 bit only) – Synchronous Counters - Mod 3, Mod 5, Mod 10 Counters.			
UNIT 5 OPERATIONAL AMPLIFIER			9+3
Op-Amp Characteristics and Parameters – Inverting Summing Amplifier (Adder) - Inverting Difference Amplifier (Subtractor) - Differentiator – Integrator – Comparator. Op-Amp Generators - AstableMultivibrator – Monostable Multivibrator.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. R.S.Sedha, Textbook of Applied Electronics - 3rd ed., S.Chand & Co. (For Unit I)			
2. John D.Ryder, Electronic Fundamentals & Applications - (5th ed., PHI) (For Units – II to IV)			
3. M.Morris Mano Computer System Architecture (3rd ed.,PHI) (For Unit- V).			
REFERENCES			
1. Virendni Kumar, Digital Technology — Principles & Practice (1 st ed. New Age International Pvt. Ltd.)			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	3	0	1
CO ₂	3	1	0	1	3	2	0	1
CO ₃	3	1	0	1	3	2	3	2
CO ₄	3	1	0	1	3	2	0	2
CO ₅	3	1	0	1	3	2	0	2
	15	6	0	7	15	11	2	8
Scaled to 1, 2, 3	3	2	0	2	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XCG405	VOLUMETRIC AND QUALITATIVE ANALYSIS	0	0	3	2
C:P:A		L	T	P	H
1: 0.75 : 0.25		0	0	3	2

COURSE OUTCOMES

CO1. Cog: (U) :*Estimate* the amount of hardness of water, ferrous sulphate, and copper using volumetric method.

CO2.Cog: (U) :*Estimate* the amount of acid and oxalic acid using volumetric method.

CO3 .Cog (U) : *Estimate* the amount of strong acid by conductometric and pH-metric method.

CO4.Cog: (R) and (Apply) : *Use* of qualitative analysis method and *study* of compounds like Carbohydrate Amide, Aldehyde , Ketone, Acid ,Amine and Phenol.

Volumetric Analysis

1. Determination of hardness of water.
2. Conductometric titration of strong acid Vs strong base
3. Determination of HCl by pH metric method.
4. Estimation of ferrous sulphate by Permanganometric method.
5. Estimation of oxalic acid by Permanganometric method.
6. Estimation of copper by Iodometric method.
7. Estimation acid by Potentiometric method.

Organic Qualitative Analysis

A study of the reactions of the following organic compounds.

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine
7. Phenol

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record

their observations.

	LECTURE	PRACTICAL	TOTAL
	0	30	30

TEXTBOOKS

1. Vogel's Textbook of practical Organic Chemistry , B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G Smith and A.R. Tatchell (ELBS), 5th edn., 2009.
2. Vogel's text book of Quantitative Inorganic Analysis (revised), J. Bassett, R.C. Denney, G. H Jeffery and J. Mendham (ELBS), 6th edn., 2007.
3. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry. 5th Edn., Pearson Education, 2005.

REFERENCE BOOKS

1. Advanced Practical Physical Chemistry , J.B. Yadav (Goel Publishing House), 20th edn., 2001.
2. Advanced Experimental Chemistry, Vol. I-Physical , J.N. Gurtu and R. Kapoor (S. Chand & Co), 1st edn., 2000.
3. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.

E RESOURCES

1. www.freebookcentre.net > Chemistry Books
2. <http://www.bookrix.com>

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3			2	1	2	3	3
CO2	3			2	1	2	3	2
CO3	3			1	1	2	2	1
CO4	3			2	1	2	3	2
	12			7	4	6	11	8
Scaled to 0,1,2,3 scale	3			2	1	2	3	2

1 - Low, 2 - Medium, 3 - High

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH406	PHYSICS PRACTICAL –IV	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

1. P.O. Box – resistance of the coil.
2. Spectrometer –grating- minimum deviation.
3. Bridge Rectifier.
4. Convex lens –Focal length – Combination method(two types)
5. Transistor characteristics – Common base.
6. Logic gates IC's verification.
7. Logic gates – Discrete components (AND, OR & NOT).
8. Potentiometer – Calibration of ammeter.
9. Potentiometer – Resistance of a coil
10. Spectrometer – Dispersive Power.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)

3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1		2	1	2	3	2
CO ₃	3	1		1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	2	1	2	1	2	1	2
	15	6	1	9	5	10	12	10
Scaled to 1, 2, 3	3	1		2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

XPH501 BASIC INSTRUMENTATION SKILLS

COURSE OUTCOMES:

CO1: Cog: R, U; *Classify* accuracy, precision, sensitivity, resolution range and Errors and *Relate* DC & AC voltage and current.

CO2: Cog: An; *Distinguish* conventional voltmeter & multimeter and electronically voltmeter & multimeter

CO3: Cog: U, C; *Compare* CRO & CRT and *Explain* operations and specification of CRO.

CO4: Cog: An; *Analyze* various type of generators and rectifiers.

CO5: Cog: U; *Explain* the principle and working of digital meter and *Compare* analog & digital meters.

COURSE CODE	COURSE NAME	L	T	P	C
XPH501	BASIC INSTRUMENTATION SKILLS	0	0	3	2
		L	T	P	H
		0	0	3	3
UNIT - I	Basic of Measurement				7+3
Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects – Multimeter: Principles of measurement of dc voltage and dc current, ac current and resistance – Specifications of a multimeter and their significance.					
UNIT - II	Electronic Voltmeter				8+3
Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity – Principles of voltage, measurement (block diagram only) – Specifications of an electronic Voltmeter / Multimeter and their significance – AC millivoltmeter : Type of AC millivoltmeters Amplifier – rectifier and rectifier – amplifier – Block diagram ac millivoltmeter – specifications of a CRO and their significance.					
UNIT - III	Cathode Ray Oscilloscope				10+3
Block diagram of basic CRO – construction of CRT – Electron gun – electrostatic focusing and acceleration (Explanation only no mathematical treatment) brief discussion on screen phosphor – visual persistence & chemical composition – Time base operation – synchronization – Front panel controls – Specifications of a CRO and their significance.					

Use of CRO for the measurement of voltage (dc and ac) frequency, time period – Special features of dual trace – introduction to digital oscilloscope – probes – digital storage oscilloscope: Block diagram and principle of working.			
UNIT - IV Generators and Bridges			10+3
Signal Generators and Analysis Instruments: Block diagram, explanation and specification of low frequency signal generators – pulse generator and function generator – Brief idea for testing – specifications – Distortion factor meter – wave analysis.			
Impedance Bridge & Q-Meters: Block diagram of bridge – working principles of basic (balancing type) RLC bridge – Specifications of RLC bridge – Block diagram & working principles of a Q-meter – Digital LCR bridges.			
UNIT - V Digital Instruments and Multimeter			10+3
Principle and working of digital meters – Comparison of analog & digital meters – Working principle of time interval – frequency and period measurement using universal counter/frequency counter – time –base stability – accuracy and resolution.			
Test of lab skills will be of the following test items:			
Use of an oscilloscope.			
CRO as a versatile measuring device.			
Use of digital multimeter.			
Winding a coil/transformer.			
Circuit tracing of Laboratory electronic equipment.			
Trouble shooting a circuit			
Balancing of bridges.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. BL Theraja A text book in electrical technology, S Chand and Co.			
2. Venugopal, Digital circuits and systems, 2011, Tata McGraw Hill.			
3. Subrata Ghoshal, Digital Electronics, 2012, Cengage Learning.			
REFERENCES			
1. MG Say, Performance and design of AC machines –ELBS Edn.			
2. Shimon O. Vingron, Logic circuit design, 2012, Springer.			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	2	1	0	1
CO ₂	3	2	0	3	2	1	0	1
CO ₃	3	2	0	3	2	1	3	2
CO ₄	3	2	0	3	2	1	0	2
CO ₅	3	2	0	3	2	1	0	2
	15	10	0	15	10	5	2	8
Scaled to 1, 2, 3	3	2	0	3	2	1	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH502A - SOLID STATE PHYSICS

COURSE OUTCOMES:

CO1: Cog: U,Ap;*Demonstrate* and *apply* knowledge of the crystal studies.

CO2: Cog: U,Ap ,E;*Explain* and *apply* the definition of the Lattice vibrations and Phonons in lattice dynamics.

CO3: Cog : Ap;*Apply* knowledge of Dia, Para, Ferri and ferromagnetic materials.

CO4: Cog: Ap;*Solve* problems concerning the definition of the dielectric properties of materials

CO5: Cog: U, AP;*Explain* and *apply* the knowledge of energy bands of solids and their application to modern electrical devices.

COURSE CODE	COURSE NAME	L	T	P	C
XPH502A	SOLID STATE PHYSICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT - I Crystal Structure					7+3
Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements, Unit cell, Miller Indices, Reciprocal Lattice, Types of Lattices, Brillouin Zones					
UNIT - II Elementary Lattice Dynamics					8+3
Lattice vibrations and Phonons, Linear Monoatomic and Diatomic Chains. Acoustical and optical phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids, T^3 law.					
UNIT - III Magnetic Properties of Matter					10+3
Dia, Para, Ferri and ferromagnetic materials, Classical Langevin theory of dia- and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve, Hysteresis and Energy Loss.					
UNIT - IV Dielectric Properties of Materials					10+3
Polarization: Local Electric field at an Atom, Depolarization Field, Electric Susceptibility, Polarizability. Clausius Mosotti Equation, Classical theory of electric polarizability, Normal and Anomalous Dispersion - Langevin-Debye equation.					

UNIT - V	Elementary band theory	10+3
Krong Penny model, Band gaps, conductors, Semiconductors and insulators, P and N type Semiconductors, conductivity of semiconductors, mobility, Hall effect, Hall coefficient.		
Superconductivity:		
Superconducting Phenomena, Critical temperature, critical magnetic field, Meissner effect, Type I and Tupe II superconductors. London's equation and Peneration Depth, Isotope effect.		
	LECTURE	TUTORIAL
	45	15
		TOTAL
		60
TEXT BOOKS		
1. Charless Kittel, Introduction to Solid State Physics, 8 th Ed., 2004, Wiley India Pvt.Ltd.		
2. J.P. Srivastava, Elements of solid state physics, 2 nd Ed., 2006, Prentice-Hall of India.		
3. Leonid V. Azaroff, Introduction to solids, 2004, Tata Mc-Graw Hill		
REFERENCES		
1. Neil W. Ashcroft and N. David Mermin, Solid State Physics, 1976, Cengage Learning.		
2. 1/e M. Ali Omar, Elementary Solid State Physics, 1999,		
3. M.A. Wahab, Pearson India. Solid State Physics, 2011, Narosa Publications.		

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	3	0	1
CO ₂	3	2	0	2	3	2	0	1
CO ₃	3	2	0	2	3	2	3	2
CO ₄	3	2	0	2	3	2	0	2
CO ₅	3	2	0	2	3	2	0	2
	15	10	0	11	15	11	2	8
Scaled to 1, 2, 3	3	2	0	3	3	3	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH502B- Atomic & Molecular Spectroscopy

COURSE OUTCOMES:

CO1:Cog: U;*Explain* various atomic models and give the corresponding principles.

CO2:Cog: U;*Extend* their knowledge of interaction of electrons with external fields.

CO3:Cog :Ap; *Develop* their knowledge about rotational spectra of molecules.

CO4:Cog: An; *Analyze* the rotational Spectra of diatomic and polyatomic Molecules.

CO5:Cog: U, C; *Explain* Basic principles of Raman spectroscopy and *Discuss* structural determination of molecules

COURSE CODE	COURSE NAME	L	T	P	C
XPH502B	ATOMIC & MOLECULAR SPECTROSCOPY	3	1	0	4
		L	T	P	H
		3	1	0	4
Unit 1 : Basic atomic models					7+3
Optical spectrum of Hydrogen atom - Bohr's Postulates – Quantitative conclusions –Principal quantum number - Spectra of hydrogen-like atoms – Sommerfeld's extension of the Bohr model – Orbital quantum number –Lifting of orbital degeneracy - Limits of the Bohr-Sommerfeld theory – The Correspondence principle – Rydberg atoms –Lifting of orbital degeneracy in the spectra of Alkali atoms - Magnetic moment of orbital motion – Spin and magnetic moment of electron –Spin-orbit splitting in the Bohr model – Fine structure in Hydrogen atom					
Unit 2: Interactions with external fields and many-electron atoms					8+3
Zeeman effect – Normal and anomalous – Stark effect - Paschen-Back effect – Double resonance and Optical pumping – The spectrum of Helium – Electron repulsion and Pauli principle – Angular momentum coupling – X-ray from outer shell & Bremsstrahlung spectra – Emission line spectra – Fine structure of X-rays – Absorption spectra – Auger effect					
Unit 3: Rotational Spectroscopy					10+3
The rotation of molecules – Rotational spectra – Diatomic molecules – Rigid molecule – Intensities of spectral line – isotopic substitution – Non-rigid rotator – Polyatomic molecules – Techniques and Instrumentation – Chemical analysis					
Unit 4: Vibrational Spectroscopy					10+3

Vibrating diatomic molecule – Diatomic vibrating rotator –Vibration – Rotation spectrum of Carbon Monoxide – Breakdown of the Born-Oppenheimer approximation – Vibration of Polyatomic molecules – Analysis by infra-red techniques - Techniques and Instrumentation			
Unit 5: Raman Spectroscopy			10+3
Classical theory & Quantum theory of Raman scattering – Pure rotational Raman spectra – Vibrational Raman spectra – Polarization of Light and the Raman effect – Structure determination from Raman and IR spectroscopy - Techniques and Instrumentation – Near IR – FT Raman spectroscopy.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
<ol style="list-style-type: none"> 1. Haken, Wolf, Springer-Verlag, <i>Atomic and Quantum Physics</i>, Second edition (1987). 2. Colin Banwell& Elaine McCash, <i>Fundamentals of Molecular spectroscopy</i>, Tata McGraw-Hill Publishing Company, Fourth edition (2005). 			
REFERENCES			
<ol style="list-style-type: none"> 1. 1 Arthur Beiser, <i>Concepts of Modern Physics</i>, Tata McGraw Hill Publishing company, Sixth edition (2005). 2. Aruldas, <i>Molecular structure and Spectroscopy</i>, Prentice-Hall of India, First edition (2004). 			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	2	1	0	1
CO ₂	3	2	0	3	2	1	0	1
CO ₃	3	2	0	3	2	1	3	2
CO ₄	3	2	0	3	2	1	0	2
CO ₅	3	2	0	3	2	1	0	2
	15	10	0	15	10	5	2	8
Scaled to 1, 2, 3	3	2	0	3	2	1	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH503A NUCLEAR AND PARTICLE PHYSICS

COURSE OUTCOMES:

CO1:Cog: R,U;**Recall** the general properties of nucleus and **Discuss** the angular momentum and magnetic moment.

CO2:Cog: R, U,E;**List** and **Explain**the various models of nuclear

CO3:Cog :U, An; **Distinguish** and **Demonstrate** the various radioactivity decay of nucleus

CO4:Cog: Ap U, C; **Classify** the type of reaction and **discuss** the concepts

CO5:Cog: U;**Classify** the elementary particles.

COURSE CODE	COURSE NAME	L	T	P	C
XPH503A	NUCLEAR AND PARTICLE PHYSICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT - I General Properties of Nuclei					7+3
Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments nuclear excites states.					
UNIT - II Nuclear Models					8+3
Liquid drop model approach – Semiempirical mass formula and significance of various terms – condition of nuclear stability – Two nucleon separation energies – Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas) evidence for nuclear shell structure – nuclear magic numbers – basic assumption of shell model – concept of mean field – residual interaction – concept of nuclear force.					
UNIT - III Radioactivity decay					10+3
Alpha decay: basics of α -decay processes, theory of α -emission, Gamow factor, Geiger Nuttal law, α -decay spectroscopy - β -decay: energy kinematics for β -decay, positron emission, electron capture, neutrino hypothesis – Gamma decay: Gamma rays emission & kinematics , internal conversion.					
UNIT - IV Nuclear Reactions					10+3
Types of reactions – conservation laws – kinematics of reaction – Q-value – reaction rate, reaction cross section – Concept of compound and direct reaction, resonance reaction – Coulomb					

scattering (Rutherford scattering).			
UNIT - V Particle physics			10+3
Particle interactions: basic features, types of particles and its families - Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. Kenneth S. Krane, Introductory nuclear physics, wiley India Pt. Ltd., 2008. 2. Bernard L. Cohen, Concepts of nuclear physics, Tata Mcgraw Hill, 1998. 3. R.A. Dulap, Introduction to the physics of nuclei & particles, Thomson Asia, 2004.			
REFERENCES			
1. D. Griffith, Introduction to Elementary Particles, Hohn Wiley & Sons. 2. F.Halzen and A.D. Martin, Quarks and Leptons, Wiley India, New Delhi. 3. J.M. Blatt & V.F. Weisskopf, Theoretical Nuclear Physics, (Dover Pub. Inc., 1991)			
E-RESOURCES			
https://nptel.ac.in/courses/115/103/115103101/ https://physik.uni-graz.at/~axm/ktla2016.pdf https://qa.ff.up.pt/rq2020/Bibliografia/Books/Martin%20-%20Nuclear%20and%20Particle%20Physics%20-%20An%20Introduction.pdf			

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	2	0	3	3	1	0	1
CO₂	3	2	0	2	0	2	0	1
CO₃	3	2	0	2	0	0	3	2
CO₄	3	2	0	0	3	0	0	2
CO₅	3	2	0	0	2	1	0	2
	15	10	0	7	8	4	2	8
Scaled to 1, 2, 3	3	2	0	2	2	1	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH503B- PRINCIPLE OF MODERN PHYSICS

COURSE OUTCOMES:

CO1:Cog: R,Ap, C;**Recall**Planck's constant and knowledge about photons and **Solve** the problems of stability and instability of atoms.

CO2:Cog: U,E;**Infer**theuncertainty principle and**Estimate** minimum energy of a confined particle using uncertainty principle

CO3:Cog :U, E; **Explain** particle in box, energy eigenvalues and eigenfunctions, normalization and tunneling across a rectangular potential barrier.

CO4:Cog: R,U;**Recall**Size and structure of atomic nucleus and **Demonstrate** nuclear force and binding energy

CO5:Cog:R,U, E;**Define** radioactive decay, Mean life and half-life and **Explain** γ decay, β decay and α emission.

COURSE CODE	COURSE NAME	L	T	P	C
XPH503B	PRINCIPLE OF MODERN PHYSICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT – I					7+3
Planck's quantum, Planck's constant and light as a collection of photons; Photoelectric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment.Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability.					
UNIT – II					8+3
Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle.					
UNIT – III					10+3
One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunneling in one dimension - across a step potential and across a rectangular potential barrier.					
UNIT – IV					10+3
Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an					

electron being in nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy			
UNIT –V			10+3
Radioactivity: stability of nucleus; Law of radioactive decay; Mean life and half-life; γ decay - energy released, spectrum and Pauli's prediction of neutrino; β decay; α emission.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. J.R.Taylor, C.D.Zafiratos, M.A.Dubson, Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill Modern Physics, 2009, PHI Learning			
REFERENCES			
1. Thomas A. Moore, Six Ideas that Shaped Physics: Particle Behave like Waves, 2003,			
2. E.H. Wichman, McGraw Hill Quantum Physics, Berkeley Physics, Vol.4. 2008, Tata McGraw-Hill Co.			
3. R.A. Serway, C.J. Moses, and C.A.Moyer, Modern Physics, 2005, Cengage Learning			

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	2	0	3	3	1	0	1
CO₂	3	2	0	3	2	2	0	1
CO₃	3	1	0	2	2	0	3	2
CO₄	3	1	0	0	2	0	0	2
CO₅	3	2	0	0	2	0	0	2
	15	8	0	8	11	3	2	8
Scaled to 1, 2, 3	3	2	0	2	3	1	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH504A MICROPROCESSOR AND C PROGRAMMING

COURSE OUTCOMES:

CO1: Cog: U;*Explain* the basic concepts of digital computer, evolution of microprocessors.

CO2: Cog Ap;*Develop* their knowledge about the architecture and instruction set of an eight bit 8085 microprocessor.

CO3: Cog: Ap; *Organize* assembly language to write programs for an 8085 microprocessor.

CO4: Cog:U;*Summarize* Structure of C language, operators and library function

CO5: Cog: Ap;*Utilize* various input, out statement, loop statements, while do else statements and basic functions for programme.

COURSE CODE	COURSE NAME	L	T	P	C
XPH504A	MICROPROCESSOR AND C PROGRAMMING	3	1	0	4
		L	T	P	H
		3	1	0	4
Unit 1 BASICS OF DIGITAL COMPUTER					9+3
Basic components of a digital computer - Evolution of microprocessors - Important INTEL microprocessors - Buses - Hardware, Software and Firmware - Memory - Semiconductor memories - RAM,ROM - Flash memory.					
Unit 2 INTEL 8085 AND ITS ARCHITECTURE					9+3
INTEL 8085 - Pin Diagram - Architecture - Various registers - Status Flags - Interrupts and their order of priority - Addressing modes - Direct, Register, Register indirect, Immediate and implicit addressing - Instruction set - Data transfer group - Arithmetic Group - Logical group - Branch control group and stack and I/O- Machine control group.					
Unit 3 ASSEMBLY LANGUAGE PROGRAMMING					9+3
Addition - Subtraction - Multiplication -Division of two 8- bit numbers - Finding the largest number in a data array - Finding the smallest number in a data array-Arranging a list of numbers in ascending or descending order.					
Unit 4 Introduction to C					9+3
Structure of 'C' – Fundamentals of C – Character set – identifiers and key words – data types constants – variables – declarations – expressions – symbolic constants – arithmetic operators- Relational, Logical and assignment operators, Unary, Bitwise and Ternary operators – conditional operators – I/O function – library function.					

Unit 5 Preliminaries and Functions			9+3
<p>Data input and output – getchar, putchar, scanf, printf, gets, puts functions – Control statements- while, do... While, for nested loops, if ... else, switch, break, continue and goto statements.</p> <p>Basic functions – Return values and their types- Calling functions – storage class- automatic variables- External Variables- Static Variables- Recursion.</p>			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
<ol style="list-style-type: none"> 1. B.Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai publication pr. Ltd., New Delhi 2. Ramesh S.Goankar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing (India) Pvt. Ltd. 3. Kenneth J.Ayala, The 8051 microcontroller Architecture, Programming and applications', second edition ,Penram international. 			
REFERENCES			
<ol style="list-style-type: none"> 1. Yn-cheng Liu, Glenn A. Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India, 2006. 2. Douglas V. " Microprocessors and Interfacing : Programming and Hardware", Hall, second edition , Tata McGraw Hill, 2006. 3. A.K.Ray& K.M Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Tata McGraw Hill , 2006. 4. Mohamed Ali Mazidi, Janice GillispieMazidi, "The 8051 microcontroller and embedded systems using Assembly and C", second edition, Pearson education /Prentice hall of India, 2007. 5. Venugopal, K.R. And Sudep, R.P. Programming with C, Tata McGraw Hill Pub. Co. Ltd. 6. E. Balagurusamy, Programming in C, Tata McGraw Hill Pub. Co.(2008). 			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	3	3	0	1
CO ₂	3	2	0	3	2	2	0	1
CO ₃	3	2	0	3	2	0	3	2
CO ₄	3	2	0	3	2	0	0	2
CO ₅	3	2	0	3	2	1	0	2
	15	10	0	15	11	6	2	8
Scaled to 1, 2, 3	3	2	0	3	3	2	1	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	Category			
		L	T	P	CREDITS
XPH504B	MICROPROCESSOR AND MICROCONTROLLER	3	1	0	4

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

		Domain	Level
CO ₁	To study the basic concepts of digital computer, evolution microprocessors, semiconductor memories RAM and ROM	Cog	Understanding
CO ₂	To study the architecture and instruction set of an eight bit 8085 microprocessor	Cog	Remembering
CO ₃	To write assembly language programs for an 8085 microprocessor.	Cog	Evaluating
CO ₄	To study Structure of C language, operators, library function	Cog	Understanding
CO ₅	To study various input and out statement loop statements while do else statements	Cog	Analyzing

SYLLABUS:

UNIT I	BASICS OF DIGITAL COMPUTER Basic components of a digital computer - Evolution of microprocessors - Important INTEL microprocessors - Buses - Hardware, Software and Firmware - Memory - Semiconductor memories - RAM,ROM - Flash memory.	9
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UNIT II	INTEL 8085 AND ITS ARCHITECTURE INTEL 8085 - Pin Diagram - Architecture - Various registers - Status Flags - Interrupts and their order of priority - Addressing modes - Direct ,Register, Register indirect, Immediate and implicit	9
UNIT III	INSTRUCTION SET Instruction set - Data transfer group - Arithmetic Group - Logical group - Branch control group and stack and I/O- Machine control group.	9
UNIT IV	ASSEMBLY LANGUAGE PROGRAMMING Addition - Subtraction - Multiplication -Division of two 8- bit numbers - Finding the largest number in a data array - Finding the smallest number in a data array-Arranging a list of numbers in ascending or descending order.	9
UNIT V	MICROCONTROLLERS Architecture of 8051 Microcontroller – signals – I/O ports – memory – counters and timers – serial data I/O – interrupts Interfacing -keyboard, LCD, ADC & DAC	9

Books for Study:

1. Fundamentals of Microprocessors and Microcomputers- B.Ram.
2. Microprocessor Architecture, Programming and Applications with the 8085, Ramesh. S.Goankar, Penram International Publishing (India) Pvt. Ltd.
3. ‘The 8051 microcontroller Architecture, Programming and applications’Kenneth J.Ayala, second edition ,Penram international.

Books for Reference:

1. “Microcomputer systems: The 8086 / 8088 Family architecture, Yn-cheng Liu,Glenn A.Gibson, Programming and Design”, second edition, Prentice Hall of India , 2006 .
2. “ Microprocessors and Interfacing : Programming and Hardware”, Douglas V.Hall, second edition , Tata Mc Graw Hill ,2006.
3. “Advanced Microprocessor and Peripherals – Architecture, A.K.Ray & K.M Bhurchandi, Programming and Interfacing”, Tata Mc Graw Hill , 2006.
4. “The 8051 microcontroller and embedded systems using Assembly and C”, Mohamed Ali Mazidi,Janice Gillispie Mazidi,second edition, Pearson education /Prentice hall of India , 2007.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	2	3	0	2	3	2	0	1
CO ₂	2	2	0	2	2	1	0	1
CO ₃	2	2	0	2	2	0	3	2
CO ₄	2	2	0	0	2	0	0	2
CO ₅	2	0	0	0	2	0	0	2
	10	9	0	6	11	3	2	8
Scaled to 1, 2, 3	2	2	0	2	3	1	1	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH505	PHYSICS PRACTICAL –V A	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

1. Spectrometer – Grating –normal incidence
2. Field along the axis of a coil- H determination.
3. Demorgan’s theorem verification using IC gates.
4. Voltage Doublers and Tripler.
5. Deflection magnetometer – M & H.
6. Air wedge – Determine the thickness of a thin wire.
7. Carey Foster Bridge – Specific Resistance.
8. Potentiometer – E.M.F of a Thermocouple.
9. Spectrometer – Refractive index of the prism.
10. Half adder and full adder using basic logic gates IC’s.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)

2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1		2	1	2	3	2
CO ₃	3	1		1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	2		2	1	2	3	2
	15	6		9	5	10	14	10
Scaled to 1, 2, 3	3	1		2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH506	PHYSICS PRACTICAL –VB	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

- Operational Amplifier – Differentiator, Integrator.
- Tan C – determination of M & BH.
- Focal length – Concave lens – Combination method (Two types)
- Half subtractor and full subtractor using basic logic gates.
- FET Characteristics and constants determination.
- B.G – Figure of Merit – Voltage and Current Sensitiveness.
- Newton's rings – Determination of radius of curvature of the lens R.
- Half Adder, Full Adder using NAND/NOR gate
- Spectrometer – i-d curve.

10. Construction Dual power supply 5-0-5 or 9-0-9v.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1		2	1	2	3	2
CO ₃	3	1		1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	2		2	1	2	3	2
	15	6		9	5	8	14	10
Scaled to 1, 2, 3	3	1		2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

XPH601 RENEWABLE ENERGY

COURSE OUTCOMES:

CO1:Cog: Ap;**Identify** the various alternate Sources of energy.

CO2:Cog:U;**Explain** Solar energy and applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell absorption air conditioning.

CO3:Cog :U;**Demonstrate** the fundamentals of wind energy.

CO4:Cog: C;**Discuss** Ocean Energy and Tide energy technologies

CO5:Cog: U, R;**Explain** Geothermal Energy, Geothermal resources, geothermal technologies and Hydro energy, hydropower technologies and **Relate** the environmental impact.

COURSE CODE	COURSE NAME	L	T	P	C	
XPH601	RENEWABLE ENERGY	0	0	4	2	
		L	T	P	H	
		0	0	4	4	
UNIT - I	Alternate Sources of energy					7+3
Fossil fuels and Nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.						
UNIT - II	Solar energy					8+3
Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.						
UNIT - III	Wind Energy					10+3
Fundamentals of wind energy, wind Turbines and different electrical machines in wind turbines, Power electronic interfaces and grid interconnection topologies.						

UNIT - IV Ocean Energy				10+3
Ocean Energy Potential against wind and solar, wave characteristics and statistics, wave energy devices. Tide characteristics and Statistics, Tide energy technologies, Ocean Thermal energy, Osmotic power, ocean Bio-mass				
UNIT - V Geothermal and Hydro Energy				10+3
Geothermal Energy: Geothermal resources, geothermal technologies. Hydro energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.				
		LECTURE	TUTORIAL	TOTAL
		45	15	60
TEXT BOOKS				
1. G.D.Rai, Non conventional energy sources, Khanna publisher, New Delhi. 2. M.P. Agarwal, Solar energy, S Chand and Co. Ltd. 3. Suhas P Sukhative, Solar energy, Tata McGraw – Hill Publishing Company Ltd.				
REFERENCES				
1. Godfrey Boyle, Renewable energy, Power for a sustainable future, Oxford University Press, in association with The open University (2004). 2. Dr. P, Jayakumar, Solar energy Resource Assessment Handbook, (2009)				

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	3	2	2	0	1
CO ₂	2	1	0	3	2	1	0	1
CO ₃	2	1	0	3	2	1	3	2
CO ₄	2	1	0	3	2	0	0	2
CO ₅	2	1	0	3	2	0	0	2
	11	6	0	15	10	4	2	8
Scaled to 1, 2, 3	3	2	0	3	2	1	1	2

XPH602A- RELATIVITY & QUANTUM MECHANICS

COURSE OUTCOMES:

CO1:Cog: U,E;**Recall** the properties of wave function and **Interpret** the wave function probability and probability current densities in three dimensions.

CO2:Cog: U,E;**Explain** the time dependent Schrodinger equation and its **influence**.

CO3:Cog : Ap;**Identify** the continuity of wave function, boundary condition and emergence of energy levels and **Applied** in square well potential.

CO4:Cog: C; **Discuss** the time independent Schrodinger equation in spherical polar coordinates and Orbital angular momentum quantum numbers l and m ; s, p, d,.. shell.

CO5:Cog: U;**Explain** electron spin and spin angular momentum and Electron Magnetic Moment and Magnetic Energy.

COURSE CODE	COURSE NAME	L	T	P	C
XPH602A	RELATIVITY & QUANTUM MECHANICS	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT - I Time dependent Schrodinger Equation					7+3
Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of wave function – Interpretation of wave function probability and probability current densities in three dimensions – Conditions for Physical Acceptability of wave functions – Normalization – Linearity and Superposition Principles – Eigenvalues and Eigenfunctions – Position – momentum & Energy operators; Expectation values of position and momentum – Wave function of a free particle.					
UNIT - II Time independent Schrodinger Equation					8+3
Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wave function as a linear combination of energy eigenfunctions – General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states – Application to the spread of Gaussian wave packet for a free particle in one dimension – wave packets – Fourier transforms and momentum space wave function – position – momentum uncertainty principle.					
UNIT - III General discussion of bound states in an arbitrary potential					10+3
Continuity of wave function, boundary condition and emergence of discrete energy levels – application to one – dimensional problem – square well potential, - Quantum mechanics of					

simple harmonic oscillator –energy levels and energy eigenfunctions using – Frobenius method.			
UNIT - IV Quantum theory of hydrogen-like atoms			10+3
Time independent Schrodinger equation in spherical polar coordinates – separation of variables for the second order partial differential equation – angular momentum operator and quantum numbers – Radial wavefunctions from Frobenius method – Orbital angular momentum quantum numbers l and m; s, p, d,.. shell (idea only).			
UNIT - V Atoms in Electric and Magnetic Fields			10+3
Electron Angular momentum – space quantization – Electron spin and spin angular momentum - Larmor’s Theorem – Spin Magnetic Moment – Stern-Gerlach Experiment – Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1.A Text Book of Quantum Mechanics, P.M. Mathews & K. Venkatesan, 2 nd Ed., 2010, McGraw Hill.			
2. Quantum Mechanics, Robert Eisberg and Robert Resnick, 2 nd Edn., 2002, Wiley.			
3. Quantum Mechanics, G. Aruldas, 2 nd Edn 2002, PHI Learning of India.			
REFERENCES			
1. Quantum Mechanics, Leoard I. Schiff, 3 rd Edn, 2010, Tata McGraw Hill.			
2. Quantum Mechanics, Bruce Cameron Reed, 2008, Jone and Bartlett Learning.			
3. Quantum Mechanics for Scientists & Engineers, DA.B. Miller, 2008, Cambridge University Press.			

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	2	0	2	3	1	0	1
CO₂	3	2	0	2	3	2	0	1
CO₃	3	2	0	2	3	0	3	2
CO₄	3	2	0	2	3	0	0	2
CO₅	3	2	0	0	0	0	0	2
	15	10	0	8	12	3	2	8
Scaled to 1, 2, 3	3	2	0	2	3	1	1	2

XPH602B- MATERIAL SCIENCE

Course Outcome: <i>On the successful completion of the course, students will be able to</i>		Domain & Level
CO1:	Recall and distinguish various crystal structures.	Cognitive (Remember, Analyze)
CO2:	Know about the impacts of defects at the atomic and microstructure scales.	Cognitive (Remember, Understand)
CO3:	Describe the various Ceramic, Electrical & Electronic Materials.	Cognitive (Remember, Analyze)
CO4:	Describe the basics of mechanical properties of material and identify how they can be tested.	Cognitive (Remember, Analyze)
CO5:	Recognize and Describe various Magnetic Materials and Nano Materials.	Cognitive (Remember)

SUBCODE	MATERIALS SCIENCE	L	T	P	C
XPH602B		3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT - I	Crystal Structure	9 + 3			
Atomic structure and inter-atomic bonding; Structure of crystalline solids; Lattices, unit cells; Crystal systems, Bravais lattices; Indexing of directions and planes, notations, Inter-planar spacings and angles, co- ordination number, packing factors.					
UNIT – II	Defects in Crystals	9 + 3			
Point defects; Dislocations, Types of dislocations, Burgers vector and its representation; Planar defects, stacking faults, twins, grain boundaries.					
UNIT - III	Ceramic, Electrical & Electronic Materials	9 + 3			
Ceramic Materials:Introduction, ceramic structures, silicate structures, processing of ceramics; Properties, glasses; Composite Materials- Introduction, classification, concrete, metal-matrix and ceramic –matrix composites.Electrical& Electronic Properties of Materials: Electrical Conductivity, Electronic and Ionic Conductivity, Intrinsic and Extrinsic Semi conductivity, Semiconductor Devices, Dielectric Properties, Piezo-electricity.					

UNIT – IV	Mechanical Properties of Materials	9 + 3	
Concepts of stress and strain, Stress-Strain diagrams; Properties obtained from the Tensile test; Elastic deformation, Plastic deformation. Impact Properties, Strain rate effects and Impact behavior. Hardness of materials.			
UNIT - V	Magnetic Materials and Nano Materials	9 + 3	
Magnetic Materials: Introduction, Magnetic fields or quantities, types of magnetism, classification of magnetic materials, soft magnetic materials, H magnetic materials, Ferrites, Ferro, Para Magnetic materials. Nano Materials: Introduction – Nano material preparation, purification, sintering nano particles of Alumina and Zirconia, Silicon carbide, nanop, nano-magnetic, nano-electronic, and other important nano materials.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
Text Books:			
1	Askeland D.R., & P. P. Fullay (2007), The Science and Engineering of Materials – 7 th Cengage Learning Publishers.		
2	William D. Callister, Jr (2008), Callister's Materials Science and Engineering, (Adopted by R. Balasubramaniam) Wiley-Eastern		
Reference books :			
1	A.S. Edelstein and R.C. Cammarata Ed.(1998), Nano Materials: Synthesis, Properties and Applications, Inst. Of Physics Publishing, UK.		
2	Raghavan V (2007), Materials Science and Engineering - A First Course, Prentice Hall, India		
3	James F. Shackelford (1996), Introduction to Materials Science for Engineers, Prentice Hall, India		
E-Resources:			
1	https://nptel.ac.in/courses/112/108/112108150/		
2	http://www.issp.ac.ru/ebooks/books/open/Materials_Science_and_Technology.pdf		

Mapping with Programme Outcomes

Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈
CO₁	3	2	0	2	3	1	0	1
CO₂	3	2	0	2	3	2	0	1
CO₃	3	2	0	2	3	0	3	2
CO₄	3	2	0	2	3	0	0	2
CO₅	3	2	0	0	0	0	0	2
	15	10	0	8	12	3	2	8
Scaled to 1, 2, 3	3	2	0	2	3	1	1	2

3 – Strong: 2 – Medium: 1 – Low

XPH603A MICRO ELECTRO MECHANICAL SYSTEM

COURSE OUTCOMES

CO1:Cog: U; *Understand process of MEMS and their applications.*

CO2:Cog: U,Ap ,E ; *understand processes for fundamental devices and apply* their knowledge for basic mechanics and electrostatics.

CO3:Cog : U;*Summarize* MUMPs processing sequence and design rules. MUMPs and SUMMIT: design rules.

CO4:Cog: Ap; *Develop* CMOS foundry processes and *Utilize* their knowledge in various applications.

CO5:Cog: U, An; *Infer knowledge of the scaling laws and MEMSs Assembly of future applications.*

COURSE CODE	COURSE NAME	L	T	P	C
XPH603A	MICRO ELECTRO MECHANICAL SYSTEM	3	1	0	4
		L	T	P	H
		3	1	0	4
UNIT - I	INTRODUCTION				7+3
history of MEMS, market for MEMS, overview of MEMS processes, properties of silicon, a sample MEMS process. Basics of Microtechnology: definitions and terminology, a sample process, lithography and etching. MEMS Biosensors: Bio Flow Sensors, MEMS Images. Introduction to MEMS Pro design software.					
UNIT - II	MICROMACHINING				8+3
Subtractive processes (wet and dry etching), additive processes (evaporation, sputtering, epitaxial growth). Fundamental Devices and Processes: basic mechanics and electrostatics for MEMS, parallel plate actuators, pull-in point, comb drives.					
UNIT - III	FUNDAMENTAL DEVICES AND PROCESSES				10+3
More electrostatic actuators; MEMS foundries, Cronos MUMPs (multi user MEMS process). MUMPs Multi User MEMS Process: JDS Uniphase MUMPs processing sequence and design rules. MUMPs and SUMMIT: design rules; applications; micro hinges and deployment					

actuators.			
UNIT - IV CMOS MEMS			10+3
CMOS foundry processes, integrated IC/MEMS, MEMS postprocessing, applications. Cleanroom lab techniques: clean rooms, gowning procedures; safety, fire, toxicity; acids and bases; photolithography.			
UNIT – V SCALING LAWS AND MEMS ASSEMBLY			10+3
Scaling Laws. Wireless MEMS: mechanical and electrical resonators, Q-factor, switches, filters. Power for MEMS: thin film batteries, micro fuel cells, energy fields. MEMS Packaging and Assembly: microassembly: serial and parallel, deterministic and stochastic; microgrippers: HexSil process; packaging techniques. The Future of MEMS: bioMEMS – neural implants, gene chips, diagnostic chips; MEMS in space; mechanical computers; invisible and ubiquitous computing.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
<ol style="list-style-type: none"> 1. HSU, TAI RAN, Mems And Microsystems Design And Manufacture, Tata McGraw-Hill,2002. 2. Rai-Choudhury, Prosenjit; MEMS and MOEMS Technology and Applications SPIE 2000. 			
REFERENCES			
<ol style="list-style-type: none"> 1. Mohamed Goad-el-Hak, "MEMS: Introduction and Fundamentals",CRC Press edition 2005 2. Vijay K. Varadan, K. J. Vinoy, S. Gopalakrishnan, "Smart Material Systems and MEMS: Design and Development Methodologies". 			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	2	3	0	3	3	2	0	1
CO ₂	2	2	0	2	2	1	0	1
CO ₃	2	2	0	2	2	0	3	2
CO ₄	2	2	0	1	2	0	0	2
CO ₅	2	0	0	0	2	0	0	2
	10	9	0	8	11	3	2	8
Scaled to 1, 2, 3	2	2	0	2	3	1	1	2

XPH603B - NUMERICAL METHODS IN PHYSICS

COURSE OUTCOMES:

CO1: Cog: E,Ap;*Identify* errors and *Measure* errors using General formula.

CO2: Cog: R,E;*Define* various iteration method and *Determine* the false position using these method.

CO3: Cog :R, Ap;*Find* the unequal intervals*Applying* various interpolation formula.

CO4: Cog: U, Ap, E;*Explain* numerical differentiation and integration and *Solve* problems by Newton’s forward, trapezoidal, Simpson’s rule.

CO5:Cog: U, AP;*Explain*th order ordinary differential equations and **apply** the knowledge to Solve the differential equation.

COURSE CODE	COURSE NAME	L	T	P	C
XPH603B	NUMERICAL METHODS IN PHYSICS	3	1	0	4
		L	T	P	H
		3	1	0	4
Unit I : Measurements and errors					7+3
Errors and the measurements General formula for errors – Errors of observation and measurement – Empirical formula – Graphical method – Method of averages – Least square fitting – curve fitting – parabola, exponential.					
Unit II : Iteration methods					8+3
Numerical solution of algebraic and transcendental equations The iteration method – The method of false position – Newton – Raphson method – Convergence and rate of convergence – C program for finding roots using Newton – Raphson method. Simultaneous linear algebraic equations Gauss elimination method – Jordon’s modification – Gauss – Seidel method of iteration.					
Unit III : Interpolation formula					10+3

Interpolation Linear interpolation – Lagrange interpolation Gregory – Newton forward and backward interpolation formula – Central difference interpolation formula – Gauss forward and backward interpolation formula – Divided differences – Properties – Newton’s interpolation formula for unequal intervals.			
Unit IV : Numerical differentiation and Integration			10+3
Numerical differentiation and integration, Newton’s forward and backward difference formula to compute derivatives – Numerical integration: the trapezoidal rule, Simpson’s rule – Extended Simpson’s rule.			
Unit V : Differential equations for Numerical solutions			10+3
Numerical Solutions of ordinary differential equations Nth order ordinary differential equations – Power series approximation – Pointwise method – Solutions of Taylor series – Euler’s method – Improved Euler’s method – Runge-Kutta method – second and third order – Runge-Kutta method for solving first order differential equations.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXT BOOKS			
1. S.S. Sastry, Introductory Methods of Numerical analysis, Prentice, Hall of India, New Delhi (2003) 3rd Edition.			
2. M. K. Venkatraman, Numerical methods for Physicists.			
REFERENCES			
1. Numerical Methods in Science and Engineering – The National Publishing Co., Madras (2001).			
2.W.H. Press, B.P.Flannery, S.A.Teukolsky, W.T.Vetterling,Numerical Recipes in C, Cambridge University (1996).			
3. K.P.N. Murthy, Monte Carlo : Basics ISRP, Kalpakkam, 2000.			

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	2	0	2	3	1	0	1
CO ₂	2	2	0	2	2	0	0	1
CO ₃	2	2	0	2	2	0	3	2
CO ₄	2	2	0	3	1	0	0	2

CO ₅	2	2	0	3	0	2	0	2
	11	10	0	12	6	3	2	8
Scaled to 1, 2, 3	3	2	0	3	2	1	1	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH604	PHYSICS PRACTICAL –VI A	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

1. NAND, NOR Universal gates – Verification.
2. RC Coupled Transistor Amplifier – Band width.
3. UJT relaxation oscillator.
4. RS- Flip Flop.
5. Operational amplifier – Adder and subtractor.
6. Emitter Follower.
7. Astable Multivibrator.
8. Monostable multivibrator using transistor.
9. Microprocessor – 8 bit addition and subtraction.
10. Microprocessor – 8 bit multiplication and division.

TEXT BOOKS

1. B.Sc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1		2	1	2	3	2
CO ₃	3	1		1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	2	1	2	2	3	2	2
	15	6	1	9	6	11	13	10
Scaled to 1, 2, 3	3	1	1	2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low

COURSE CODE	SUBJECT NAME	L	T	P	C
XPH605	PHYSICS PRACTICAL –VI B	0	0	3	2
		L	T	P	H
		0	0	3	3

COURSE OUTCOMES:

CO1: Cog: Ana; Aff: Rec.; Psy: Mech; *Use* laboratory techniques such as accuracy of **measurements** and data **analysis**.

CO2: Cog: U; Aff: Rec.; Psy: Set, GR; *Explain the concepts* that are learnt in the lecture sessions and *follow* hands-on learning experience in the laboratory sessions.

CO3: Cog: R; Aff: Rec.; Psy: Mech; Gain *knowledge* in the scientific methods and *identify* the process of **measuring** different Physical variables

CO4: Cog: R; Ap, Psy: Mech; Compare theoretical output value with experimental output value.

CO5: Cog: Ap; Aff: Rec, Org; Psy: Mech; *Manipulate* and *complete* all the experiments with excellent *application* knowledge.

LIST OF EXPERIMENTS

1. JK-Flip Flop.
2. Decade counter 7490.
3. Wien's bridge oscillator.
4. FET Amplifier – Band width.
5. Feedback Amplifier - Transistor.
6. B.G. – Comparison of mutual inductance.
7. Half Subtractor and Full Subtractor using NAND/NOR gates.

8. Microprocessor – Decimal to Octal and Octal to Decimal Conversion.
9. Microprocessor –Study of DAC Interfacing.
10. Microprocessor – Decimal to Hexadecimal and Hexadecimal to Decimal Conversion.

TEXT BOOKS

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping with Programme Outcomes

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈
CO ₁	3	1		2	1	2	3	3
CO ₂	3	1		2	1	2	3	2
CO ₃	3	1		1	1	2	2	1
CO ₄	3	1		2	1	2	3	2
CO ₅	3	2	1	2	2	3	2	2
	15	6	1	9	6	11	13	10
Scaled to 1, 2, 3	3	1	1	2	1	2	3	2

3 – Strong: 2 – Medium: 1 – Low