ST. MARY'S COLLEGE (Autonomous)
(Re-accredited with 'A^{+}' Grade by NAAC)
Thoothukudi-628001, Tamil Nadu
(Affiliated to Manonmaniam Sundaranar University)

B.Sc. Physics
School of Physical Sciences
Outcome Based Curriculum
(W.e.f.2023)

<h1 style="text-align:center">B.Sc., PHYSICS SYLLABUS</h1>

Preamble

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

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

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

VISION

To build a foundation for excellence by igniting and promoting enthusiasm, interest and passion in learning physics and thus create globally competent Physicists.

MISSION

The Physics department is committed to impart quality education to awaken the young minds both in theoretical as well as experimental Physics with special emphasis on 'learning by doing' for socio-economic growth.

Programme Outcome

PO No.	After completion of the Undergraduate programme the students of St. Mary's College will be able to
PO 1	acquire an in-depth domain knowledge and a comprehensive knowledge of various disciplines to become skilled professionals
PO 2	enrich their communicative skills, and enhance their creative, numerical, analytical and problem solving skills
PO 3	gain potential skills to excel in digital literacy, team management, scientific reasoning, research and self-directed life-long learning to emerge as entrepreneurs
PO 4	be aware of the environment with a social responsibility for the well-being of humanity and the planet at large
PO 5	be an empowered, economically independent woman with a global perspective to emerge holistically in the egalitarian society

Programme Specific Outcome

PSO No.	After completion of the Undergraduate programme in Physics the students of St. Mary's College will be able to
PSO 1	**Theoretical Proficiency:** Demonstrate a comprehensive understanding of diverse Physics topics.
PSO 2	**Experimental Proficiency:** Develop hands-on skills through laboratory work, enabling students to design, conduct, and interpret experiments to validate theoretical concepts and explore real -world applications.
PSO 3	**Critical Thinking and Problem- Solving:** Cultivate the capacity to analyse and solve complex problem in physics, fostering critical thinking skills and the ability to apply theoretical knowledge to practical situations.
PSO 4	**Effective Communication:** Communicate scientific concepts and findings effectively, both orally and in writing, demonstrate the ability to convey complex ideas to diverse audiences.
PSO 5	**Scientific Inquiry:** Cultivate a curiosity-driven approach to scientific inquiry, encouraging students to explore, question, and critically analyse information while developing a mindset for lifelong learning.

Department of Physics

UG Course Structure (2023-2026)

Semester – I

Part	Components	Course Code	Course Title	Hours / Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA11 23ULFA11	இக்கால இலக்கியம் : (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, சிறுகதை) Foundation Course French I	6	3	25	75	100
II	General English	23UGEN11	Poetry, Prose, Extensive Reading and Communicative English I	6	3	25	75	100
III	Core I	23UPHC11	Properties of Matter and Sound	5	5	25	75	100
	Core Practical I	23UPHCR1	Practical I	3	3	40	60	100
	Generic Elective I	23UCHE11	Chemistry for Physical Sciences I	4	4	25	75	100
	Generic Elective Practical I	23UCHER1	Chemistry Practical I	2	1	40	60	100
IV	Skill Enhancement Course I (Discipline Specific)	23UPHSE1	Physics For Everyday Life	2	2	20	30	50
	Foundation Course	23UPHF11	Introductory Physics	2	2	20	30	50
			Total	**30**	**23**			

Part	Components	Course Code	Course Title	Hours / Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA21 / 23ULFA21	சமய இலக்கியங்கள் : (செய்யுள், இலக்கணம், இலக்கிய வரலாறு) Foundation Course: French II	6	3	25	75	100
II	General English	23UGEN21	Poetry, Prose, Extensive Reading, and Communicative English II	6	3	25	75	100
III	Core II	23UPHC21	Heat, Thermodynamics and Mechanics	5	5	25	75	100
	Core Practical II	23UPHCR2	Practical II	3	3	40	60	100
	Generic Elective II	23UCHE21	Chemistry for Physical Sciences II	4	4	25	75	100
	Generic Elective Practical II	23UCHER2	Chemistry Practical II	2	1	40	60	100
IV	Skill Enhancement Course II (Discipline Specific)	23UPHSE2	Astrophysics	2	2	20	30	50
	Skill Enhancement Course III (Discipline Specific)	23UPHSE3	Energy Physics	2	2	20	30	50
			Total	**30**	**23**			

Part	Components	Course Code	Course Title	Hours/ Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA31 23ULFA31	காப்பிய இலக்கியங்கள் : செய்யுள், இலக்கணம், இலக்கிய வரலாறு, புதினம் French Literature and Grammar I	6	3	25	75	100
II	General English	23UGEN31	English Poetry, Prose, Extensive Reading and Communicative English III	6	3	25	75	100
III	Core III	23UPHC31	Optics	5	5	25	75	100
	Core Practical III	23UPHCR3	Practical III	2	2	40	60	100
	Generic Elective III	23UMAE31	Mathematics I	6	4	25	75	100
	NME I	23UPHN31	Applied Physics I	2	2	20	30	50
IV	Skill Enhancement Course IV (Discipline Specific)	23UPHSE4	Physics of Medical Instruments	2	2	20	30	50
	Ability Enhancement Course I	23UAYM31	Yoga and Meditation	1	1	20	30	50
	Self-Study/ MOOC / Internship (Compulsory)	23UPHSS1/ 23UPHI31	History of Mobile Phones		+2		50	50
Total				**30**	**22+2**			

5

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil /	23ULTA41	சங்க இலக்கியங்கள் : செய்யுள், இலக்கணம், இலக்கிய வரலாறு, நாடகம்	6	3	25	75	100
	French	23ULFA41	French Literature and Grammar II					
II	General English	23UGEN41	English Poetry, Prose, Extensive Reading and Communicative English IV	6	3	25	75	100
III	Core IV	23UPHC41	Electricity and Electromagnetism	5	5	25	75	100
	Core Practical IV	23UPHCR4	Practical IV	2	2	40	60	100
	Generic Elective IV	23UMAE41	Mathematics II	6	4	25	75	100
	NME II	23UPHN41	Applied Physics II	2	2	20	30	50
IV	Skill Enhancement Course V (Discipline Specific)	23UPHSE5	Physics for Competitive Examinations	2	2	20	30	50
	Ability Enhancement Course (Entrepreneurial Based)	23UAPH41	Maintenance of Electronic Equipment and Photography	1	1	20	30	50
V	NCC / NSS / Sports				1			
	CDP-Extension Activity				+1			
	Total			30	23+1			

Note: Ability Enhancement course 23UAPH41

Evaluation 20: 30 will be done only by the department.

Internal and External examinations will be in the form of Practical / Presentation of models / Reports.

Semester- V

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
III	Core V	23UPHC51	Analog and Communication Electronics	5	5	25	75	100
	Core VI	23UPHC52	Atomic and Nuclear Physics	5	5	25	75	100
	Core VII	23UPHC53	Numerical Methods and C++ Programming	5	5	25	75	100
	Core Practical V	23UPHCR5	Non Electronics I	3	2	40	60	100
	Core Practical VI	23UPHCR6	Electronics I	3	2	40	60	100
	Core Practical VII	23UPHCR7	C++ Programming	3	2	40	60	100
	Discipline Specific Elective I	23UPHE51/ 23UPHE52	Mathematical Physics / Material Science	4	3	25	75	100
IV	Ability Enhancement Course III	23UAEV51	Environmental Studies	2	1	20	30	50
	Self-Study/ MOOC / Internship (OPTIONAL)	23UPHSS2/ 23UPHI51	Body Mechanics and Sensory Physics		+2	--	50	50
Total				**30**	**25+2**			

Semester- VI

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
III	Core VIII	23UPHC61	Relativity and Quantum Mechanics	4	4	25	75	100
	Core IX	23UPHC62	Digital Electronics	4	4	25	75	100
	Core X	23UPHC63	Solid state Physics	4	3	25	75	100
	Core Practical VIII	23UPHCR8	Non Electronics II	3	2	40	60	100
	Core Practical IX	23UPHCR9	Electronics II	3	2	40	60	100
	Core XI (Project)	23UPHP61	Project and Viva Voce	6	4	40	60	100
	Discipline Specific Elective II	23UPHE61/ 23UPHE62	Advanced Physics / Lasers and Fiberoptics	4	3	25	75	100
IV	Skill Enhancement Course VI (Discipline Specific)	23UPHSE6	Microprocessor 8085 (Practical)	2	2	20	30	50
Total				**30**	**24**			

Semester	Hours	Credits	Extra Credits
I	30	23	--
II	30	23	--
III	30	22	2
IV	30	23	1
V	30	25	2
VI	30	24	--
Total	180	140	5

Courses	Number of Courses	Hours / week	Credits	Extra Credits
Tamil / French	4	24	12	--
English	4	24	12	--
Core Theory	10	47	46	--
Core Practical	9	25	20	
Generic Elective Theory	4	20	16	--
Generic Elective Practical	2	4	2	--
Discipline Specific Elective	2	8	6	--
Group Project	1	6	4	--
Skill Enhancement Course	6	12	12	--
Ability Enhancement Course	3	4	3	--
Foundation Course	1	2	2	--
NME	2	4	4	--
Extension Activities (CDP)				+1
NCC, NSS & Sports		--	1	
Self- Study Papers (Optional)	1	--	--	+2
Self-Study Papers (Compulsory)	1	--	--	+2
Total		**180**	**140**	**5**

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம்			
செய்யுள், இலக்கணம், இலக்கிய வரலாறு, சிறுகதை			
Course Code: 23ULTA11	**Hrs/Week:6**	**Hrs/Semester: 90**	**Credits: 4**

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	காலந்தோறும் வளர்ந்துவரும் தமிழ்க் கவிதைகளின் வடிவினையும், கருத்தோட்டத்தினையும் மாணவியர் அறிந்துகொள்வர்.
2	தமிழ் மொழியைப் பிழையின்றி எழுதவும் பேசவும் முடியும்.
3	படைப்பாற்றலை வளர்த்துக் கொள்வர்.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர். துறைதோறும் தமிழ் மொழியின் வளர்ச்சியை அறிவர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	இப்பாடத்திட்டம் - மாணவியரிடம்	அறிவாற்றல் திறன்
CO-1	பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல்	K1
CO-2	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல்	K3
CO-4	இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுவர். தமிழ் மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்ளுதல்	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	K5

அலகு - 1

மரபுக் கவிதை   (18 மணி நேரம்)

1. தமிழ்த் தெய்வ வணக்கம்   - பெ.சுந்தரனார்
2. பெண்கள் விடுதலைக் கும்மி — பாரதியார்
3. சிறுத்தையே வெளியே வா - பாரதிதாசன்
4. புத்தரும் சிறுவனும்   - கவிமணி
5. ஆதிமந்தி புலம்பல்   - கண்ணதாசன்
6. துறைமுகம்   - சுரதா
7. கடல் - தமிழ் ஒளி

அலகு   - 2

புதுக்கவிதை   (18 மணி நேரம்)

1. வீட்டுக்கொரு மரம் வளர்ப்போம்   -   அப்துல் ரகுமான்
2. சென்றியூ கவிதைகள்   - ஈரோடு தமிழன்பன்
3. பிற்சேர்க்கை   -   வைரமுத்து
4. வாழைமரம்   -   மு.மேத்தா
5. வள்ளுவம் பத்து — அறிவுமதி
6. ஆனந்த யாழை மீட்டுகிறாய் - நா. முத்துக்குமார்
7. சபிக்கப்பட்ட முத்தம் - சுகிர்த ராணி
8. நீ எழுத மறுக்கும் எனது அழகு - இளம்பிறை

அலகு — 3

சிறுகதை   (18 மணி நேரம்)

1. வாய்ச் சொற்கள்   - ஜெயகாந்தன்
2. கடிதம்   -   புதுமைப்பித்தன்
3. கரு — உமாமகேஸ்வரி
4. முள்முடி - தி.ஜானகிராமன்
5. சிதறல்கள் - விழி.பா.இதயவேந்தன்
6. வீட்டின் மூலையில் சமையல் அறை — அம்பை
7. ராசப்பா — முனைவர் மி.சு.எழிலரசி
8. ஆண்டன் செக்காவ் - நாய்க்காரச் சீமாட்டி (மொழிபெயர்ப்புக் கதை)

அலகு   - 4

இலக்கிய வரலாறு   (18 மணி நேரம்)

1. 20 –ஆம் நூற்றாண்டு கவிஞர் பெருமக்கள்
2. கவிதையின் வகையும் வளர்ச்சியும்
3. தமிழ்ச் சிறுகதையின் தோற்றமும் வளர்ச்சியும்
4. மொழிபெயர்ப்புகள் தோற்றமும் வளர்ச்சியும்

அலகு   - 5

மொழித்திறன்   (18 மணி நேரம்)

1. பொருள் பொதிந்த சொற்றொடர் அமைத்தல்
2. ஓர் எழுத்து ஒரு மொழி
3. வேற்றுமை உருபுகள்

4. திணை, பால், எண், இடம்
5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு

துணைநின்ற நூல்கள்

1. பாரதியார் படைப்புகள் - சீனி.விசுவநாதன் (பதிப்பாசிரியர்)
   அலயன்ஸ் கம்பெனி
   64, ராம கிருஷ்ணா சாலை
   மயிலாப்பூர்
   சென்னை -4.

2. பாரதிதாசன் கவிதைகள் - பேரா. இ. சுந்தரமூர்த்தி
   142, ஜானி ஜான் கான் சாலை,
   இராயப்பேட்டை, சென்னை – 17

3. வைரமுத்து கவிதைகள் - வைரமுத்து
   திருமகள் நிலையம்
   55, வெங்கட்நாராயணா சாலை
   தி.நகர் சென்னை – 17.

4. ரகசியப்பூ - அப்துல் ரகுமான்
   நேஷனல் பப்ளிகேஷன்
   2, தியாகராய நகர்
   சென்னை – 17

5. நன்னூல் - பவணந்தி முனிவர்
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

6. தமிழ் இலக்கிய வரலாறு - தமிழ்த்துறை தொகுப்பு
   தூய மரியன்னை கல்லூரி (தன்னாட்சி), தூத்துக்குடி.

பார்வை நூல்கள்

1. நன்னூல் - பவணந்தி முனிவர்
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

2 தமிழ் இலக்கிய வரலாறு - ச.வே.சுப்பிரமணியன்
   மணிவாசகர் பதிப்பகம்
   31, சிங்கர் தெரு
   பாரிமுனை, சென்னை – 18.

3. சிறுகதைக் களஞ்சியம் - அ.சிதம்பரநாதச் செட்டியார் (தொகுப்பாசிரியர்)

   புக்ஸ் (இந்தியா) பிரைவேட்.,
   சென்னை – 1.

இணைய ஆதாரங்கள்

1. Project Madurai –www.projectmadurai.org

2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>

3. Tamil Books on Line – books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	<40%	≥ 40%and<70%	≥70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – I			
Part I French	**Foundation Course French I**		
Course Code: 23ULFA11/ 23ULFB11	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- Identify the basic French sentence structure
- Comprehend various grammatical tenses and use them to communicate in French
- Review various documents and discuss them to understand the vocabulary
- Analyze and interpret expressions used to convey the cause, the effect, the purpose, and the opposition in French
- Perceive the French culture and system.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	Remember the usage of grammatical tenses in constructing sentences.	K1
CO-2	Apply the grammar rules and vocabulary to produce grammatically correct sentences.	K2
CO-3	Appreciate the French culture and civilization.	K3
CO-4	Demonstrate knowledge of various expressions used to express opinions, emotions, cause, effect, purpose, and hypothesis in French	K4
CO-5	Evaluate and summarize with thorough understanding the given texts.	K5

SEMESTER – I			
Part I French	**Foundation Course French I**		
Course Code: 23ULFA11/ 23ULFB11	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Salut, Enchante

1.1 - Saluer

1.2 - Se présenter

1.3 - Présenter quelqu'un

1.4 - En France et ailleurs

1.5 - L'Europe

Unit II – J'adore

2.1 - Exprimer ses gouts

2.2 - Echanger sur ses projets

2.3 - Compléter une fiche d'inscription

2.4 - Remplir un chèque bancaire

2.5 - La famille en France

Unit III – Tu veux bien ?

3.1 - Demander à quelqu'un poliment

3.2 - Parler des actions passées

3.3 - Comprendre le récit d'actions passées

3.4 - Ecrire un message électronique

3.5 - Animaux et compagnie

Unit IV – On se voit quand ?

4.1 - Proposer, accepter ou refuser une invitation

4.2 - Indiquer l'heure et la date

4.3 - Fixer un rendez-vous

4.4 - Comprendre les informations de cartons d'invitation

4.5 - Les français cultivent leur temps libre

Unit V – Bonne idée !

5.1 - Exprimer son point de vue

5.2 - S'informer sur le prix et la quantité

5.3 - Faire des achats dans un magasin

5.4 - Comprendre des offres des cadeaux

5.5 - Quel cadeau offrir ?

Textbook: Régine Mérieux & Yves Loiseau, *Latitudes* -1- (A1 /A2), méthode de français, Didier, 2017 (units 1 - 6 only)

Books, Journals and Learning Resources

- J.Girardet & J.Pécheur avec la collaboration de C.Gibble, Echo A1, CLE international, Paris, 2012.
- Carlo Catherine, Causa Mariella, Civilisation Progressive du Français – I, Paris : CLE International, 2003.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, Dupleix Dorothée, Cocton Marie-Noëlle, *Saison 1 Niveau 1, Méthode de français et cahier d'exercices*, Paris : Didier, 2015

Web Resources:

https://www.lawlessfrench.com/faq/lessons-by-level/

https://bonjourdefrance.com/
www.francaisfacile.com/exercices /

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	2	1	1	3	3	2	1	1
CO-2	2	3	2	1	1	3	3	2	1	1
CO-3	2	2	1	3	3	1	2	3	3	3
CO-4	3	3	1	3	2	2	3	3	2	3
CO-5	3	2	1	1	2	2	2	2	2	2
Ave.	2.6	2.4	1.4	1.8	1.8	2.2	2.6	2.4	1.8	2

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER-I			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English-I**		
Course Code: 23UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Learning Objectives:
- To enable learners to acquire self-awareness and positive thinking required in various life situations.
- To help them acquire the attribute of empathy
- To assist them in acquiring creative and critical thinking abilities
- To enable them to learn the basic grammar
- To assist them in developing LSRW skills

Course Outcomes			
Course Outcomes	**Upon completion of the course, the students will be able to**	**PSOs Addressed**	**K Level**
CO 1	acquire self-awareness and positive thinking required in various life situations	1,2,3	1
CO 2	acquire the attribute of empathy.	2,3,5	2
CO 3	acquire creative and critical thinking abilities.	2,3,4	3
CO 4	learn basic grammar	4,5	4
CO 5	development and integrate the use of four language skills i.e., listening, speaking, reading and writing.	2,3,4,5	5

SEMESTER- I			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English –I**		
Course Code: 23UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

I SELF-AWARENESS(WHO) & POSITIVE THINKING(UNICEF)
Life Story

1.1 MalalaYousafzai	- Chapter 1 from I am Malala
1.2 M.K.Gandhi	**-** An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3)

Poem

1.3 Rabindranath Tagore	- Where the Mind is Without Fear – Gitanjali 35
1.4 Chinua Achebe	- Love Cycle

II EMPATHY
Poem

2.1 David Roth	- Nine Gold Medals
2.2 William Wordsworth	- Alice Fell or poverty
2.3 E.V. Lucas	- The School for Sympathy
2.4 William Faulkner	- Barn Burning

III CRITICAL & CREATIVE THINKING
Poem

3.1 Edgar Guest	- The Things That Haven't Been Done Before
3.2 Robert Frost	- Stopping by the Woods on a Snowy Evening

Readers Theatre

3.3 A Tale of China	- The Magic Brocade
3.4 Aaron Shepard	- Stories on Stage – (Three Sideway Stories from Wayside School" by Louis Sachar)

IV Part of Speech
4.1 Articles
4.2 Noun
4.3 Pronoun
4.4 Verb
4.5 Adverb
4.6 Adjective
4.7 Preposition

V Paragraph and Essay Writing
5.1 Descriptive
5.2 Expository
5.3 Persuasive
5.4 Narrative Reading Comprehension

Textbook:

Units I-III, V – To be compiled by the PG and Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole
        Imprints Private Limited, 2006.

Reference Books:

Martin Hewings. *Advanced English Grammar*. Cambridge University Press, 2000.

Web Resources:
1. MalalaYousafzai. I am Malala (Chapter 1) https://archive.org/details/i-am-malala
2. M.K Gandhi. An Autobiography or The Story of My Experiments with Truth(Chapter-1)- Rupa Publication, 2011 https://www.indiastudychannel.com/resources/146521Book-Review-An-Autobiography-or-The-story-of-my-experiments-withTruth.aspx
3. Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings)https://www.poetryfoundation.org/poems/45668/gitanjali-35
4. Aaron Shepard.Stories on Stage, Shepard Publications, 2017 https://amzn.eu/d/9rVzlNv
5. J C Nesfield. Manual of English Grammar and Composition. https://archive.org/details/in.ernet.dli.2015.44179

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	2	3	2	3	2	3	3	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	2	3	3	3	3	2	3	2
CO-5	3	3	3	2	3	3	3	2	2	3
Ave.	2.8	3	2.6	2.6	2.8	3	3	2.6	2.8	2.8

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம்			
செய்யுள், இலக்கணம், இலக்கிய வரலாறு, சிறுகதை			
23ULTA11	Hrs/Week:6	Hrs/Semester: 90	Credits: 4

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	காலந்தோறும் வளர்ந்துவரும் தமிழ்க் கவிதைகளின் வடிவினையும், கருத்தோட்டத்தினையும் மாணவியர் அறிந்துகொள்வர்.
2	தமிழ் மொழியைப் பிழையின்றி எழுதவும் பேசவும் முடியும்.
3	படைப்பாற்றலை வளர்த்துக் கொள்வர்.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர். துறைதோறும் தமிழ் மொழியின் வளர்ச்சியை அறிவர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	இப்பாடத்திட்டம் - மாணவியரிடம்	அறிவாற்றல் திறன்
CO-1	பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல்	K1
CO-2	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல்	K3
CO-4	இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுவர். தமிழ் மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்ளுதல்	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	K5

அலகு - 1
மரபுக் கவிதை   (18 மணி நேரம்)
1.   தமிழ்த் தெய்வ வணக்கம்   - பெ.சுந்தரனார்
2.   பெண்கள் விடுதலைக் கும்மி   - பாரதியார்
3.   சிறுத்தையே வெளியே வா   - பாரதிதாசன்
4.   புத்தரும் சிறுவனும   - கவிமணி
5.   ஆதிமந்தி புலம்பல   - கண்ணதாசன்
6.   துறைமுகம்   - சுரதா
7.   கடல்   - தமிழ் ஒளி

அலகு - 2
 புதுக்கவிதை   (18 மணி நேரம்)
1.   வீட்டுக்கொரு மரம் வளர்ப்போம   -   அப்துல் ரகுமான்
2.   சென்றியூ கவிதைகள   - ஈரோடு தமிழன்பன்
3.   பிற்சேர்க்கை   -   வைரமுத்து
4.   வாழைமரம்   -   மு.மேத்தா
5.   வள்ளுவம் பத்து   - அறிவுமதி
6.   ஆனந்த யாழை மீட்டுகிறாய   - நா. முத்துக்குமார்
7.   சபிக்கப்பட்ட முத்தம்   - சுகிர்த ராணி
8.   நீ எழுத மறுக்கும் எனது அழகு   -   இளம்பிறை

அலகு – 3
 சிறுகதை   (18 மணி நேரம்)
1.   வாய்ச் சொற்கள்   - ஜெயகாந்தன்
2.   கடிதம   -   புதுமைப்பித்தன்
3.   கரு   - உமாமகேஸ்வரி
4.   முள்முடி   - தி.ஜானகிராமன்
5.   சிதறல்கள   - விழி.பா.இதயவேந்தன்
6.   வீட்டின் மூலையில் சமையல் அறை   - அம்பை
7.   ராசப்பா   - முனைவர் மி.சு.எழிலரசி
8.   ஆண்டன் செக்காவ்   - நாய்க்காரச் சீமாட்டி (மொழிபெயர்ப்புக் கதை)

அலகு - 4
     இலக்கிய வரலாறு   (18 மணி நேரம்)
1.   20 –ஆம் நூற்றாண்டு கவிஞர் பெருமக்கள்
2.   கவிதையின் வகையும் வளர்ச்சியும்
3.   தமிழ்ச் சிறுகதையின் தோற்றமும் வளர்ச்சியும்
4.   மொழிபெயர்ப்புகள் தோற்றமும் வளர்ச்சியும்

  அலகு - 5
மொழித்திறன்   (18 மணி நேரம்)

1.   பொருள் பொதிந்த சொற்றொடர் அமைத்தல்
2.   ஓர் எழுத்து ஒரு மொழி
3.   வேற்றுமை உருபுகள்
4.   திணை, பால், எண், இடம்
5.   கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு

துணைநின்ற நூல்கள்

7. பாரதியார் படைப்புகள்   - சீனி.விசுவநாதன் (பதிப்பாசிரியர்)
                                அலயன்ஸ் கம்பெனி
                                64, ராம கிருஷ்ணா சாலை
                                மயிலாப்பூர்
                                சென்னை -4.

8. பாரதிதாசன் கவிதைகள்   - பேரா. இ. சுந்தரமூர்த்தி
                                142, ஜானி ஜான் கான் சாலை,
                                இராயப்பேட்டை, சென்னை — 17

9. வைரமுத்து கவிதைகள்   - வைரமுத்து
                                திருமகள் நிலையம்
                                55, வெங்கட்நாராயணா சாலை
                                தி.நகர் சென்னை — 17.

10. ரகசியப்பூ   - அப்துல் ரகுமான்
                                நேஷனல் பப்ளிகேஷன்
                                2, தியாகராய நகர்
                                சென்னை — 17

11. நன்னூல்   - பவணந்தி முனிவர்
                                திருநெல்வேலி தென்னிந்திய
                                சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                திருநெல்வேலி — 6.

12. தமிழ் இலக்கிய வரலாறு   - தமிழ்த்துறை தொகுப்பு
                                தூய மரியன்னை கல்லூரி (தன்னாட்சி), தூத்துக்குடி.

பார்வை நூல்கள்

2.   நன்னூல்   - பவணந்தி முனிவர்
                                திருநெல்வேலி தென்னிந்திய
                                சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                திருநெல்வேலி — 6.

3   தமிழ் இலக்கிய வரலாறு   - ச.வே.சுப்பிரமணியன்
                                மணிவாசகர் பதிப்பகம்
                                31, சிங்கர் தெரு
                                பாரிமுனை, சென்னை — 18.

3. சிறுகதைக் களஞ்சியம்   - அ.சிதம்பரநாதச் செட்டியார் (தொகுப்பாசிரியர்)
                                புக்ஸ் (இந்தியா) பிரைவேட்.,
                                சென்னை — 1.

இணைய ஆதாரங்கள்

1. Project Madurai –www.projectmadurai.org

2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>

3. Tamil Books on Line – books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
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Ave	2.4	2.1	2.3	1.8	2.4

Maping	<40%	≥ 40%and<70%	≥70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – I			
Part I French	**Foundation Course: Paper I – French – I**		
Course Code: **23ULFA11/ 23ULFB11**	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- Identify the basic French sentence structure

- Comprehend various grammatical tenses and use them to communicate in French

- Review various documents and discuss them to understand the vocabulary

- Analyze and interpret expressions used to convey the cause, the effect, the purpose, and the opposition in French

- Perceive the French culture and system.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	Remember the usage of grammatical tenses in constructing sentences.	K1
CO-2	Apply the grammar rules and vocabulary to produce grammatically correct sentences.	K2
CO-3	Appreciate the French culture and civilization.	K3
CO-4	Demonstrate knowledge of various expressions used to express opinions, emotions, cause, effect, purpose, and hypothesis in French	K4
CO-5	Evaluate and summarize with thorough understanding the given texts.	K5

SEMESTER – I			
Part I French	**Foundation Course: Paper I – French - I**		
Course Code: 23ULFA11/ 23ULFB11	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Salut, Enchante
1.6 - Saluer

1.7 - Se présenter

1.8 - Présenter quelqu'un

1.9 - En France et ailleurs

1.10   - L'Europe

Unit II – J'adore
2.6 - Exprimer ses gouts

2.7 - Echanger sur ses projets

2.8 - Compléter une fiche d'inscription

2.9 - Remplir un chèque bancaire

2.10   - La famille en France

Unit III – Tu veux bien ?
3.6 - Demander à quelqu'un poliment

3.7 - Parler des actions passées

3.8 - Comprendre le récit d'actions passées

3.9 - Ecrire un message électronique

3.10   - Animaux et compagnie

Unit IV – On se voit quand ?
4.6 - Proposer, accepter ou refuser une invitation

4.7 - Indiquer l'heure et la date

4.8 - Fixer un rendez-vous

4.9 - Comprendre les informations de cartons d'invitation

4.10   - Les français cultivent leur temps libre

Unit V – Bonne idée !
5.6 - Exprimer son point de vue

5.7 - S'informer sur le prix et la quantité

5.8 - Faire des achats dans un magasin

5.9 - Comprendre des offres des cadeaux

5.10 - Quel cadeau offrir ?

Textbook: Régine Mérieux & Yves Loiseau, *Latitudes* -1- (A1 /A2), méthode de français, Didier, 2017 (units 1 - 6 only)

Books, Journals and Learning Resources

- J.Girardet & J.Pécheur avec la collaboration de C.Gibble, Echo A1, CLE international, Paris, 2012.
- Carlo Catherine, Causa Mariella, Civilisation Progressive du Français – I, Paris : CLE International, 2003.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, Dupleix Dorothée, Cocton Marie-Noëlle, *Saison 1 Niveau 1, Méthode de français et cahier d'exercices*, Paris : Didier, 2015

Web Resources:

https://www.lawlessfrench.com/faq/lessons-by-level/

https://bonjourdefrance.com/
www.francaisfacile.com/exercices /

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	2	1	1	3	3	2	1	1
CO-2	2	3	2	1	1	3	3	2	1	1
CO-3	2	2	1	3	3	1	2	3	3	3
CO-4	3	3	1	3	2	2	3	3	2	3
CO-5	3	2	1	1	2	2	2	2	2	2
Ave.	2.6	2.4	1.4	1.8	1.8	2.2	2.6	2.4	1.8	2

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER-I			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English-I**		
Course Code: 23UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Learning Objectives:
- To enable learners to acquire self-awareness and positive thinking required in various life situations.
- To help them acquire the attribute of empathy
- To assist them in acquiring creative and critical thinking abilities
- To enable them to learn the basic grammar
- To assist them in developing LSRW skills

Course Outcomes			
Course Outcomes	**Upon completion of the course, the students will be able to**	**PSOs Addressed**	**K Level**
CO 1	acquire self-awareness and positive thinking required in various life situations	1,2,3	1
CO 2	acquire the attribute of empathy.	2,3,5	2
CO 3	acquire creative and critical thinking abilities.	2,3,4	3
CO 4	learn basic grammar	4,5	4
CO 5	development and integrate the use of four language skills i.e., listening, speaking, reading and writing.	2,3,4,5	5

SEMESTER- I			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English –I**		
Course Code: 23UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

I SELF-AWARENESS(WHO) & POSITIVE THINKING(UNICEF)

Life Story

1.1 MalalaYousafzai   - Chapter 1 from I am Malala

1.2 M.K.Gandhi   **-** An Autobiography or The Story of My Experiments with Truth
(Chapters 1, 2 & 3)

Poem

1.3 Rabindranath Tagore   - Where the Mind is Without Fear – Gitanjali 35

1.4 Chinua Achebe   - Love Cycle

II EMPATHY

Poem

2.1 David Roth   - Nine Gold Medals

2.2 William Wordsworth   - Alice Fell or poverty

2.3 E.V. Lucas   - The School for Sympathy

2.4 William Faulkner   - Barn Burning

III CRITICAL & CREATIVE THINKING

Poem

3.1 Edgar Guest   - The Things That Haven't Been Done Before

3.2 Robert Frost   - Stopping by the Woods on a Snowy Evening

Readers Theatre

3.3 A Tale of China   - The Magic Brocade

3.4 Aaron Shepard   - Stories on Stage – (Three Sideway Stories from Wayside School"
by Louis   Sachar)

IV Part of Speech

4.1 Articles

4.2 Noun

4.3 Pronoun

4.4 Verb

4.5 Adverb

4.6 Adjective

4.7 Preposition

V Paragraph and Essay Writing

5.1 Descriptive

5.2 Expository

5.3 Persuasive

5.4 Narrative Reading Comprehension

Textbook:

Units I-III, V – To be compiled by the PG and Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole
        Imprints Private Limited, 2006.

Reference Books:

  Martin Hewings. *Advanced English Grammar*. Cambridge University Press, 2000.

Web Resources:

6. MalalaYousafzai. I am Malala (Chapter 1) https://archive.org/details/i-am-malala
7. M.K Gandhi. An Autobiography or The Story of My Experiments with Truth(Chapter-1)- Rupa Publication, 2011 https://www.indiastudychannel.com/resources/146521Book-Review-An-Autobiography-or-The-story-of-my-experiments-withTruth.aspx
8. Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings)https://www.poetryfoundation.org/poems/45668/gitanjali-35
9. Aaron Shepard.Stories on Stage, Shepard Publications, 2017 https://amzn.eu/d/9rVzlNv
10. J C Nesfield. Manual of English Grammar and Composition. https://archive.org/details/in.ernet.dli.2015.44179

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	2	3	2	3	2	3	3	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	2	3	3	3	3	2	3	2
CO-5	3	3	3	2	3	3	3	2	2	3
Ave.	2.8	3	2.6	2.6	2.8	3	3	2.6	2.8	2.8

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

	SEMESTER- I		
	Core I - Properties of Matter and Sound		
Course Code: 23UPHC11	**Hours/Week: 5**	**Hrs/ Semester: 75**	**Credits: 5**

Objectives:

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

Course outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the basic concepts related to properties of matter and sound.	K1
CO-2	Relate the theory of elasticity, bending of beams, fluid dynamics and interpret the concepts of sound.	K2
CO-3	Apply the knowledge of the determined values of rigidity modulus, Young's modulus, terminal velocity, AC frequency and acoustic intensity.	K3
CO-4	Examine the experimental part of torsional pendulum, cantilever, stokes method, Melde's string and acoustics of buildings.	K4
CO-5	Evaluate the experimental work done with the help of calculated values.	K5

SEMESTER- I			
Core I - Properties of Matter and Sound			
Course Code: 23UPHC11	**Hours/Week: 5**	**Hrs/ Semester: 75**	**Credits: 5**

Unit I: Elasticity

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

Unit II: Bending of Beams

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

Unit III: Fluid Dynamics

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

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

Unit IV: Waves and Oscillations

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance. Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer – determination of frequency using Melde's string apparatus.

Unit V: Acoustics of Buildings and Ultrasonics

Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings. *Ultrasonic waves*: production of ultrasonic waves – Properties of Ultrasonic Waves– Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves.

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

Reference Books:

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

Web links:

1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3. https://www.youtube.com/watch?v=gT8Nth9NWPM
4. https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s
5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7. http://www.sound-physics.com/
8. http://nptel.ac.in/courses/112104026/

Mapping with program outcomes:

Map course outcomes (CO) for each course with program outcomes (PO)&Programme Specific Outcomes (PSO) in the 3-point scale of HIGH (3, ≥ 70%), MEDIUM (2, ≥ 40% and < 70%) and LOW (1,<40%).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	1	1	1	1	1	1	1	1
CO-2	2	2	2	2	1	1	1	1	2	2
CO-3	3	3	2	2	1	2	3	3	3	3
CO-4	3	3	2	2	2	3	3	3	3	3
CO-5	3	3	2	2	2	3	3	3	3	3
Ave.	2.6	2.4	1.8	1.8	1.4	2	2.2	2.2	2.4	2.4

SEMESTER- I			
Core Practical I – Practical I			
Course Code :23UPHCR1	Hrs/Week: 3	Hrs/ Semester: 45	Credits: 3

Objective:

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

Properties of Matter (Any SEVEN)

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia and g using Bifilar pendulum.
4. Determination of Young's modulus by uniform bending – load elevation graph.
5. Determination of Young's modulus by non-uniform bending – scale & telescope.
6. Determination of Young's modulus by cantilever – load depression graph.
7. Determination of surface tension & interfacial surface tension by drop weight method.
8. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
9. Determination of viscosity by Poiseullie's flow method.
10. Determination of g using compound pendulum.

	SEMESTER I		
Generic Elective I	Chemistry For Physical Sciences I		
Code: 23UCHE11	Hrs./Week:4	Hrs/ Sem: 60	Credits: 4

Objectives

This course aims at providing knowledge on

- Basics of atomic orbitals, chemical bonds, hybridization concepts of thermodynamics and its applications.
- Concepts of nuclear chemistry
- Importance of chemical industries
- Qualitative and analytical methods.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain in-depth knowledge about the nuclear reactions, fuels, hybridization, thermodynamic principles and chromatographic techniques.	K1
CO-2	evaluate the theories of chemical bonding, efficiencies of fertilizers, mechanism involved in the organic reactions, laws of thermodynamics and separation techniques.	K2
CO-3	explain the nuclear chemistry, silicones, electronic effect and Carnot's cycle and analytical techniques.	K3
CO-4	apply carbon and rock dating, gaseous fuels, Heterocyclic compounds, eutectic systems and phase rule and purification techniques.	K4
CO-5	evaluate molecular orbital diagram, role of fertilizers, types of reactions, free energy, various methods to identify an appropriate method for the separation of chemical components.	K5

UNIT I Chemical Bonding and Nuclear Chemistry

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion differences – Stellar energy. Applications of radioisotopes - carbon dating, rock dating and medicinal applications.

Unit II Industrial Chemistry

Fuels: Fuel gases: Natural gas-water gas-semi water gas-carbureted water gas- producer gas, CNG-LPG -oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones.

Fertilizers: Urea-ammonium sulphate-potassium nitrate-NPK fertilizer-superphosphate-triple superphosphate.

UNIT III Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap-hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Electronic effects: Inductive effect and consequences on K_a and K_b of organic acids and bases-electromeric-mesomeric- hyper conjugation and steric - examples.

Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution –nitration-halogenation- Friedel Craft's alkylation and acylation. Heterocyclic compounds: Preparation-properties of pyrrole and pyridine.

UNIT IV Thermodynamics and Phase Equilibria

Thermodynamics: Types of systems- reversible and irreversible processes- isothermal - adiabatic processes -spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine-Entropy and its significance-Free energy change and its importance (no derivation)-Conditions for spontaneity in terms of entropy and Gibbs free energy-Relationship between Gibbs free energy and entropy.

Phase Equilibria: Phase rule - definition of terms in it-Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).

UNIT V Analytical Chemistry

 Introduction to qualitative and quantitative analysis. Principles of volumetric analysis-Separation and purification techniques – extraction, distillation and crystallization.

 Chromatography: principle and application of column, paper and thin layer chromatography.

Recommended Text

1. V. Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.

2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.

3. S. Arun Bahl, B. S. Bahl, Advanced Organic Chemistry; S. Chand and Company, New Delhi, twenty third edition, 2012.

4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninthedition, 2007.

Reference Books

1. P. L. Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.

2. B. R. Puri, L. R. Sharma, M. S. Pathania, Textbook of Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.

3. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	1	1	2	1	3	2	3	2	1
CO-2	1	3	2	2	2	2	3	3	1	1
CO-3	3	1	1	2	2	3	2	3	2	3
CO-4	3	3	2	2	2	1	3	3	2	2
CO-5	1	3	3	3	1	3	1	3	2	3
Ave.	2.2	2.2	1.8	2.2	1.6	2.4	2.1	3	1.8	2.0

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER I			
Generic Elective Practical I	**Chemistry Practical I**		
Code :23UCHER1	**Hrs./Week:2**	**Hrs/ Sem: 30**	**Credits:1**

Objectives

This course aims to provide knowledge on the

- Basics of preparation of solution.

- Principles and practical experience of volumetric analysis

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain an understanding of the use of standard flask and volumetric pipettes, burette.	K1
CO-2	design, carry out, record and interpret the results of volumetric titration.	K2
CO-3	apply their skill and identify the end point of various titrations.	K3
CO-4	analyze the chemical constituents in allied chemical products	K4
CO-4	estimate the concentration of given solution.	K5

VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using standard sodium carbonate.

2. Estimation of hydrochloric acid using standard oxalic acid.

3. Estimation of ferrous sulphate using standard Mohr's salt.

4. Estimation of oxalic acid using standard ferrous sulphate.

5. Estimation of potassium permanganate using standard sodium hydroxide.

6. Estimation of magnesium using EDTA.

7. Estimation of ferrous ion using diphenyl amine as indicator

Reference Books

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
Ave.	3	3	3	3	3	3	3	3	3	3

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER- I			
Skill Enhancement Course I - Physics for Everyday Life			
Course Code: 23UPHSE1	Hrs/Week: 2	Hrs/ Semester: 30	Credits: 2

Objective:

- To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics

Course outcomes

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the basics of spring scales, vision corrective lenses, televisions, solar cells and contributions of Indian physicist.	K1
CO-2	Discuss the principle behind the working of bicycles, polaroid glasses, air conditioners, solar water heaters and the contributions of C.V. Raman to science and technology.	K2
CO-3	Implement the working of rockets, UV protective glasses, microwave ovens, solar cells and present the contributions of A.P.J. Abdul Kalam to science and technology.	K3
CO-4	Examine the working of roller coaster, polaroid camera, vacuum cleaner, solar photovoltaic cells and outline the contributions of Vikram Sarabhai to science and technology.	K4
CO-5	Judge the performance of bouncing balls, vision corrective lenses, television, solar cells and support the contributions of Indian physicist.	K5

SEMESTER- I
Skill Enhancement Course I - Physics for Everyday Life

Course Code: 23UPHSE1	Hrs/Week: 2	Hrs/ Semester: 30	Credits: 2

Unit I: Mechanical Objects

    Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.

Unit II: Optical Instruments and Laser

    Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.

Unit III: Physics of Home Appliances

    Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners.

Unit IV: Solar Energy

    Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.

Unit V: Indian Physicist and their Contributions

    C.V.Raman,   Homi Jehangir Bhabha,   Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.

Text Books

1. The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019.

2. For the love of physics, Walter Lawin, Free Press, New York, 2011

Mapping with program out comes

Map course outcomes (CO) for each course with program outcomes (PO)&Programme Specific Outcomes (PSO) in the 3-point scale of HIGH (3, ≥ 70%), MEDIUM (2, ≥ 40% and < 70%) and LOW (1,<40%).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	2	2	1	2	1	1	1	2
CO-2	3	2	3	3	1	2	1	1	1	2
CO-3	3	2	3	3	1	3	2	2	2	3
CO-4	3	2	3	2	1	3	2	2	2	3
CO-5	3	2	3	1	1	3	2	2	2	3
Ave.	2.8	1.8	2.8	2.2	1	2.6	1.6	1.6	1.6	2.6

SEMESTER- I			
Foundation Course - Introductory Physics			
Course Code: 23UPHF11	**Hrs/Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

Objective:

- To help students get an overview of Physics before learning their core courses.
- To serve as a bridge between the school curriculum and the degree programme.

Course outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	List the examples of scalars and vectors, types of forces, forms of energy, types of motion and types of materials.	K1
CO-2	Distinguish vectors from scalars, centripetal from centrifugal forces, elastic from inelastic collision, light from sound waves and conductors from insulators.	K2
CO-3	Apply the concepts of units and dimensions, cohesive and adhesive forces, alternate energy sources, banking of curved roads and diffusion in real life.	K3
CO-4	Examine the concepts of resolution of vectors, friction, momentum, simple harmonic motion and diffusion.	K4
CO-5	Conclude the understanding about physical quantities of vectors, forces, motion, energy and surface tension.	K5

SEMESTER- I
Foundation Course - Introductory Physics

Course Code: 23UPHF11	**Hrs/Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

Unit I:

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

Unit II:

Different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces.

Unit III:

Different forms of energy– conservation lawsof momentum, energy – typesof collisions –angular momentum– alternate energy sources–real life examples.

Unit IV:

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

Unit V:

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

Text Books
1. D. S. Mathur, 2010, Elements of Properties of Matter, S. Chand & Co
2. Brijlal & N. Subrahmanyam, 2003, Properties of Matter, S. Chand & Co.

Reference Books
1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S. Chand & Co.

Web Links
1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/
2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

Mapping with program outcomes:

Map course outcomes (CO) for each course with program outcomes (PO) & Programme Specific Outcomes (PSO) in the 3-point scale of HIGH (3, ≥ 70%), MEDIUM (2, ≥ 40% and < 70%) and LOW (1,<40%).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	1	1	1	1	1	1	1	1
CO-2	3	2	2	1	1	2	1	1	2	2
CO-3	3	1	3	3	2	3	3	2	3	2
CO-4	3	3	2	1	1	3	3	3	2	3
CO-5	3	3	3	1	1	3	3	3	3	3
Ave.	2.8	2	2.2	1.4	1.2	2.4	2.2	2	2.2	2.2

<table>
<tr><td colspan="4" align="center">**SEMESTER - II**</td></tr>
<tr><td colspan="4">Part -1 Tamil   பொதுத்தமிழ் - தாள் 2 - சமய இலக்கியங்கள்

                                    செய்யுள், இலக்கணம், இலக்கிய வரலாறு</td></tr>
<tr><td>Course Code :23ULTA21</td><td>Hrs/Week:6</td><td>Hrs/ Semester : 90</td><td>Credits :4</td></tr>
</table>

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	இறை ஆற்றலை உணர்ந்துகொள்ள உதவுகிறது
2	தமிழ் மொழியைப் பிழையின்றி எழுதவும் பேசவும் முடியும்.
3	அன்பு, இரக்கம், நற்சொல், நற்செயல் போன்ற நற்பண்புகளோடு வாழ வழி வகுக்கிறது.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர். துறைதோறும் தமிழ் மொழியின் வளர்ச்சியை அறிவர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	இப்பாடத்திட்டம் - மாணவியரிடம்	அறிவாற்றல் திறன்
CO-1	தமிழரின் சமய தத்துவங்களை அறிந்து தெளிவு பெறுவர்	K1
CO-2	பல்வேறு சமய கருத்துகளை அறிவதன் மூலம் சமய ஒற்றுமை உணர்வு பெறுவர்.	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல்	K3
CO-4	இறைவன் முன் அனைவரும் சமம் என்ற சிந்தனையை உருவாக்குகிறது.	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	K5

அலகு – 1   (18 மணி நேரம்)
பக்தி இலக்கியம்
1. திருநாவுக்கரசர் தேவாரம் - நாமார்க்கும் குடியல்லோம் எனத் தொடங்கும்
                                          வரிகள் - 10 பாடல்கள்
2. ஆண்டாள் - திருப்பாவை (முதல் 10 பாசுரம்)

அலகு – 2   (18 மணி நேரம்)
1. வள்ளலார் - அருள் விளக்கமாலை (முதல் 10 பாடல்கள்)
2. எச்.ஏ. கிருட்டிணப்பிள்ளை   - இரட்சணிய மனோகரம் - பால்ய பிரார்த்தனை
3. குணங்குடி மஸ்தான் சாகிபு – பராபரக்கண்ணி (முதல் 10 கண்ணிகள்)

அலகு – 3   (18 மணி நேரம்)

    சிற்றிலக்கியங்கள்

1. தமிழ்விடு தூது - (முதல் 20 கண்ணிகள்)
2. திருக்குற்றாலக் குறவஞ்சி - குறத்தி மலைவளம் கூறுதல்
3. முக்கூடற்பள்ளு - நாட்டு வளம்

அலகு – 4   (18 மணி நேரம்)

    இலக்கணம்

    1. சொல்லின் பொது இலக்கணம்
    2. ஒரெழுத்து ஒரு மொழிகள், சொல்லின் வகைகள்
    3. பெயர்ச்சொல் - அறுவகைப் பெயர்கள்
    4. வினைச் சொல் - இலக்கணம் - வகைகள்
    5. இடைச்சொல் - இலக்கணம் - வகைகள்
    6. உரிச்சொல் - இலக்கணம் - வகைகள்

அலகு - 5   (18 மணி நேரம்)

    இலக்கிய வரலாறு

1. பன்னிரு திருமுறைகள்

2. நாலாயிர திவ்யப் பிரபந்தம்

3. திருமடங்களின் தமிழ்ப்பணி

4. சைவ சித்தாந்த சாத்திரங்கள்

துணைநின்ற நூல்கள்

1. பன்னிரு திருமுறைகள்   -   பேரா. அ. மாணிக்கம் (உரையாசிரியர்)

                              வர்த்தமானன் பதிப்பகம்
                              21, இராமகிருஷ்ணா தெரு
                              தியாகராய நகர்
                              சென்னை – 17.

2. திருக்குறள்   - பரிமேலழகர் (உரையாசிரியர்)
                                          திருநெல்வேலி தென்னிந்திய
                                          சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                          திருநெல்வேலி – 6.

3. நாலடியார்   - தி.சு. பாலசுந்தரம் பிள்ளை

                                          திருநெல்வேலி தென்னிந்திய
                                          சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                          திருநெல்வேலி – 6.

பார்வை நூல்கள்

1. நன்னூல்   - பவணந்தி முனிவர்
                                          திருநெல்வேலி தென்னிந்திய
                                          சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                          திருநெல்வேலி – 6.

2. தமிழ் இலக்கிய வரலாறு   -   தமிழ்த்துறை தொகுப்பு

                                          தூய மரியன்னை கல்லூரி (தன்னாட்சி),
                                          தூத்துக்குடி.

3. பதினெண் கீழ்க்கணக்கு நூல்கள் - எம். நாராயண வேலுப்பிள்ளை

                                          நர்மதா பதிப்பகம், தியாகராய நகர், சென்னை.

இணைய ஆதாரங்கள்

1. Project Madurai –www.projectmadurai.org

2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>

3. Tamil Books on Line – books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	<40%	≥ 40%and<70%	≥70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER - II			
Part I French	**Foundation Course: French II**		
Course Code: 23ULFA21/ 23ULFB21	**Hrs / Week: 6**	**Hrs / Semester : 90**	**Credits:3**

Learning Objectives:

- To revise basic French sentence structure and vocabulary.
- To enumerate the various grammatical tenses and use them to communicate better in French.
- To develop the language proficiency of the learners by practising all for competencies: Reading, writing, listening, and speaking.
- To analyse and interpret verbal expressions of cause, effect, purpose, and opposition in French
- To comprehend text passages and use them to express their opinions.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	Identify the purpose of using various tenses and effectively employ them in speaking and writing	K1
CO-2	Summarize a French document such as posters, bulletins, and infographics	K2
CO-3	Discuss the French culture and the differences.	K3
CO-4	Analyse and utilize the grammatical concepts in drafting sentences and paragraphs	K4
CO-5	Demonstrate knowledge of various expressions used to convey opinion, emotions, cause, effect, purpose, and hypothesis in French	K5

SEMESTER - II			
Part I French	**Foundation Course: French II**		
Course Code: **23ULFA21/ 23ULFB21**	**Hrs / Week: 6**	**Hrs / Semester : 90**	**Credits:3**

Unit I – C'est où ?
    1.1 - Demander et indiquer une direction
    1.2 - Localiser
    1.3 - Comprendre des indications de direction et de lieu
    1.4 - Se repérer sur un plan de ville
    1.5 - Architecture et nature

Unit II – N'oubliez pas
    2.1 - Exprimer l'obligation ou l'interdit
    2.2 - Conseiller
    2.3 - Comprendre une chanson
    2.4 - Comprendre un récit de vacances
    2.5 - La France d'Outre-mer

Unit III - Belle vue sur la mer
    3.1 - Décrire un lieu
    3.2 - Se situer dans le temps
    3.3 - Comprendre la description d'un lieu
    3.4 - Comprendre des pictogrammes
    3.5 - L'Union européenne

Unit IV – Quel beau voyage, Oh Joli
    4.1 - Raconter un souvenir
    4.2 - Exprimer l'intensité et la quantité
    4.3 - Comparer
    4.4 - Francophonie
    4.5 - Mode et société

Unit V – Les compétences communicatifs
    5.1 - Les lettres formelles
    5.2 - Les lettres informelles

Textbook: Régine Mérieux & Yves Loiseau, *Latitudes* -1- (A1 /A2), méthode de français, Didier, 2017 (units 7-11 only)

Books, Journals and Learning Resources

- J.Girardet & J.Pécheur avec la collaboration de C.Gibble, Echo A1, CLE international, Paris, 2012.
- Carlo Catherine, Causa Mariella, Civilisation Progressive du Français – I, Paris : CLE International, 2003.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, Dupleix Dorothée, Cocton Marie-Noëlle, *Saison 1 Niveau 1, Méthode de français et cahier d'exercices*, Paris : Didier, 2015

Web Resources:

https://www.lawlessfrench.com/faq/lessons-by-level/
https://bonjourdefrance.com/

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	2	1	1	3	3	2	1	1
CO-2	2	3	2	1	1	3	3	2	1	1
CO-3	2	2	1	3	3	1	2	3	3	3
CO-4	3	3	1	3	2	2	3	3	2	3
CO-5	3	2	1	1	3	3	3	3	3	3
Ave.	2.6	2.4	1.4	1.8	1.8	2.4	2.8	2.6	2	2.2

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER - II			
Part II English	Poetry, Prose, Extensive Reading, and Communicative English - II		
Course Code: 23UGEN21	Hrs / Week: 6	Hrs / Semester : 90	Credits:3

Learning Objectives:

- To assist the learners to interpret the literary pieces to identify elements of resilience, determination, decision making skills, and problem-solving skills.
- To aid them to demonstrate improved empathy and understanding for diverse life experiences through literary analysis and discussions.
- To develop the language proficiency of the learners by practising the usage of tenses in various contexts.
- To understand the importance of tone, clarity, and formality in workplace communication.
- To enhance the creative and the critical thinking skills of the learners through class discussions and assignments.

Course Outcomes			
Course Outcomes	**Upon completion of the course, the students will be able to**	**PSOs Addressed**	**K Level**
CO1	learn to talk about everyday activities confidently	1	1
CO2	be able to write short paragraphs on people, places, and events	1, 2	2
CO3	identify the purpose of using various tenses and effectively employ them in speaking and writing	3, 4	3
CO4	gain knowledge to write subjective and objective descriptions	4, 5,	4
CO5	identify and use their skills effectively in formal contexts.	3, 4, 5	5

SEMESTER - II			
Part II English	**Poetry, Prose, Extensive Reading, and Communicative English - II**		
Course Code: 23UGEN21	**Hrs / Week: 6**	**Hrs / Semester : 90**	**Credits:3**

Unit I – Resilience
Poetry
William Ernest Henley : Invictus
Maya Angelou   : Still I Rise
Prose
Julian Koepcke   : How I Survived a Plane Crash

Unit II – Decision Making Skills
Poetry
Rudyard Kipling   : If
Stanley Kunitz   : The Layers
Short Story
Frank Stockton   : The Lady or the Tiger

Unit III - Problem Solving Skills
Prose- Life Story
Sudha Murthy   : How I taught My Grandmother to Read
Autobiography
A. J. Cronin   : Two Gentlemen of Verona
A.P.J. Abdul Kalam   : Wings of Fire (Chapters 1,2,3)

Unit IV – Language Competency
Tenses
Present Tense
Past Tense
Future Tense

Unit V - **English at the Workplace**
E-mail – Invitation, Enquiry, Seeking Clarification
Formal Letters
Circular
Minutes of the Meeting

Textbook:

Units I-III, V – To be compiled by the PG and Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai:

Vijay Nicole Imprints Private Limited, 2006.

Reference Books:

Martin Hewings. *Advanced English Grammar*. Cambridge University Press, 2000.

Web Resources:

https://www.poetryfoundation.org/

https://www.teachingenglish.org.uk/teaching-resources/teaching-adults/lesson-plans

https://www.perfect-english-grammar.com/support-files/tenses-explanations.pdf

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO- 1	PO-2	PO-3	PO- 4	PO- 5	PSO- 1	PSO- 2	PSO- 3	PSO- 4	PSO- 5
CO-1	3	2	3	3	2	3	2	3	2	2
CO-2	2	3	3	3	3	2	3	2	2	3
CO-3	3	3	3	3	3	3	3	2	2	3
CO-4	2	3	3	3	2	2	3	3	2	2
CO-5	3	3	3	2	2	3	3	3	3	2
Ave.	2.6	2.8	3	2.8	2.4	2.6	2.8	2.6	2.2	2.4

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER- II			
Core II - Heat, Thermodynamics and Mechanics			
Course Code: 23UPHC21	**Hours/Week: 5**	**Hrs/ Semester: 75**	**Credits :5**

Objectives:

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

Course outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Define specific heat capacity, laws of thermodynamics, thermal conductivity and collision.	K1
CO-2	Summarise the knowledge about Joule Kelvin effect, P-V diagram, T-S diagram, distribution of energy in black body radiation and fundamental principles of impact.	K2
CO-3	Demonstrate the concepts of calorimetry, thermodynamics, heat transfer, collision and projectiles in everyday life.	K3
CO-4	Examine Renault's method, Carnot's engine,T-S diagram, Newton's law of cooling, direct and indirect impact.	K4
CO-5	Calculate specific heat capacity, efficiency of heat engine, entropy change, thermal conductivity and loss of kinetic energy in an indirect impact.	K5

SEMESTER- II
Core II - Heat, Thermodynamics and Mechanics

Course Code: 23UPHC21	Hours/Week: 5	Hrs/ Semester: 75	Credits :5

Unit I: Calorimetry

Specific heat capacity – specific heat capacity of gases C_P & C_V – Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P.
Low Temperature Physics: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.

Unit II: Thermodynamics-I

Zeroth law and first law of thermodynamics – P-V diagram – heat engine –efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.

Unit III: Thermodynamics-II

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

Unit IV: Heat Transfer

Modes of heat transfer: conduction, convection and radiation.
Conduction: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method.
Radiation: black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.

Unit V: Collision and Projectiles

Collision – impulse and linear momentum – elastic and inelastic collision – fundamental principles of impact – direct and indirect impact – velocities and kinetic energy in direct impact – loss of k. e in an indirect impact – transfer of energy in collision between two equal masses – projectile – expression for time of flight and horizontal range of a projectile – path of a projectile – range of a projectile on an inclined plane.

Text Books

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

Reference Books

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

Web links
1. https://youtu.be/M_5KYncYNyc
2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

Mapping with program out comes:
Map course outcomes (CO) for each course with program outcomes (PO)&Programme Specific Outcomes (PSO) in the 3-point scale of HIGH (3, $\geq$ 70%), MEDIUM (2, $\geq$ 40% and < 70%) and LOW (1,<40%).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	1	1	1	3	1	2	2	2
CO-2	3	2	2	1	1	3	1	2	2	2
CO-3	3	3	3	2	1	3	3	2	3	3
CO-4	3	3	2	2	1	3	3	3	3	3
CO-5	3	3	2	2	1	3	3	3	3	3
Ave.	2.8	2.4	2	1.6	1	3	2.2	2.4	2.6	2.6

SEMESTER- II			
Core Practical II - Practical II			
Course Code: 23UPHCR2	Hours/Week: 3	Hrs/ Semester: 45	Credits: 3

Objectives:

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

Any SEVEN:

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of bad conductor by Lee's disc method.
3. Determination of Latent heat of a vaporization of a liquid.
4. Velocity of sound through a wire using Sonometer.
5. Determination of velocity of sound using Kundts tube.
6. Determination of frequency of an electrically maintained tuning fork
7. To verify the laws of transverse vibration using sonometer.
8. To verify the laws of transverse vibration using Melde's apparatus.
9. To compare the mass per unit length of two strings using Melde's apparatus.
10. Frequency of AC by using sonometer.
11. Determination of refractive index of the solid prism
12. Thickness of a thin wire using Airwedge

SEMESTER II			
Part III:	Generic Elective II	Chemistry For Physical Sciences II	
Code : 23UCHE21	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Objectives

This course aims at providing knowledge on the

- Co-ordination Chemistry and Water Technology

- Carbohydrates and Amino acids

- Basics and applications of electrochemistry

- Basics and applications of kinetics and catalysis

- Various photochemical phenomenon

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain knowledge on coordination compounds, water technology, carbohydrate, amino acids, nucleic acids, corrosion, kinetics and photochemical process.	K1
CO-2	explain the biological role of complexes buffer solutions and catalyst, preparation of carbohydrate, amino acids nucleic acids and photosynthesis.	K2
CO-3	demonstrate the water purification techniques, property of carbohydrate, amino acids nucleic acids, electrochemistry principles in corrosion, electroplating and fuel cells, Haber's process and reactions of hydrogen chloride.	K3
CO-4	identify the application of qualitative and quantitative analysis open ring structures of carbohydrate, ionic product of water, reaction rate and photosensitization process	K4
CO-5	outline the purification techniques, properties of carbohydrates, various reference electrodes, energy of activation and various type of photochemical process.	K5

UNIT I Co-ordination Chemistry and Water Technology

Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$,$[Co(CN)_6]^{3-}$ Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water- determination of hardness of water using EDTA method- zeolite method-Purification techniques BOD- COD.

Unit II Carbohydrates and Amino acids

Carbohydrates: Classification- preparation and properties of glucose- fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose – fructose interconversion. Properties of starch and cellulose.

Amino acids: Classification -. RNA and DNA (elementary idea only).

UNIT III Electrochemistry

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water - pH- pKa- pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.

UNIT IV Kinetics and Catalysis

Order and molecularity. Integrated rate expression for I and II (2A Products) order reactions. Pseudo first order reaction- methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous- catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.

UNIT V Photochemistry

Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence- Quantum yield - Hydrogen-chloride reaction. Phosphorescence- fluorescence-chemiluminescence and photosensitization and photosynthesis (definition with examples).

Recommended Text

1. V. Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai,

   first edition, 2009.

2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.

3. Arun Bahl, B. S. Bahl, Advanced Organic Chemistry; S. Chand and Company, New

   Delhi, twenty third edition, 2012.

4. P. L. Soni, H. M. Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, NewDelhi, twenty ninth edition, 2007.

Reference Books

1. P. L. Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.

2. R. Puri, L. R. Sharma, M. S. Pathania, Text book Physical Chemistry; Vishal Publishing

Co., New Delhi, forty seventh edition, 2018.

3. B. K. Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	1	1	2	1	3	2	3	2	1
CO-2	1	3	2	2	2	2	3	2	1	1
CO-3	3	1	1	2	2	3	2	3	2	3
CO-4	3	3	2	2	2	1	3	3	2	2
CO-5	1	1	3	2	1	3	1	2	2	3
Ave.	2.2	1.8	1.8	2.0	1.6	2.4	2.1	2.3	1.8	2.0

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER II			
Part III Generic Elective Practical II		**Chemistry Practical II**	
Code: 23UCHER2	**Hrs/Week:2**	**Hrs/Sem: 30**	**Credits: 1**

Objectives

This course aims to provide knowledge on

- Identification of organic functional groups

- Different types of organic compounds with respect to their properties.

- Determination of elements in organic compounds.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	gain an understanding of the physical state, odour, colour and solubility of the given organic compound.	K1
CO-2	identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.	K2
CO-3	compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, aldehyde, glucose and explain the reactions behind it.	K3
CO-4	analyze the aliphatic and aromatic compound.	K4
CO-5	assess the elements such as nitrogen, sulphur and halogens.	K5

SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS

The analysis must be carried out as follows:

(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehyde and glucose].

(b) Detection of elements (N, S, Halogens).

(c) To distinguish between aliphatic and aromatic compounds.

(d) To distinguish – Saturated and unsaturated compounds.

Reference Books

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

Level of Correlation between PO's, PSO's and CO's

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	3	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
Ave.	3	3	3	3	3	3	3	3	3	3

Mapping	<40%	$\geq$ 40% and < 70%	$\geq$ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER- II			
Skill Enhancement Course II - Astrophysics			
Course Code: 23UPHSE2	**Hrs/ Week :2**	**Hrs/ Semester: 30**	**Credits:2**

Objectives:

- This course intends to introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provide an understanding of the physical nature of celestial bodies along with the instrumentation and techniques used in astronomical research

Course outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the basics of telescopes, planetary distances, eclipses and stellar evolution.	K1
CO-2	Differentiate magnifying power and resolving power, meteors and meteorites, solar and lunar eclipses and birth and death of low mass.	K2
CO-3	Apply the understanding of the nature of heavenly bodies in astronomical research.	K3
CO-4	Compare reflecting with refracting telescopes, comets with asteroids, physical with orbital data and dark matter with superclusters.	K4
CO-5	Judge the principle of astrophysics through case study.	K5

SEMESTER- II			
Skill Enhancement Course II - Astrophysics			
Course Code: 23UPHSE2	**Hrs/ Week :2**	**Hrs/ Semester: 30**	**Credits:2**

Unit I: Telescopes

Optical telescopes – magnifying power, brightness, resolving power and f/a ratio – types of reflecting and refracting telescopes – detectors and image processing – radio telescopes – Hubble space telescope.

Unit II: Solar System

Bode's law of planetary distances – meteors, meteorites, comets, asteroids – Kuiper belt – Oort cloud – detection of gravitational waves – recent advances in astrophysics.

Unit III: Eclipses

Types of eclipses – solar eclipse – total and partial solar eclipse – lunar eclipse – total and partial lunar eclipse – transits

The Sun: physical and orbital data – solar atmosphere – photosphere – chromosphere – solar corona – prominences – sunspots – 11year solar cycle – solar flares.

Unit IV: Stellar Evolution

H-R diagram – birth & death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae.

Galaxies: Classification of galaxies – galaxy clusters –interactions of galaxies, dark matter and super clusters – evolving universe

Unit-V: Activities In Astrophysics (Any three activities to be done compulsorily)

  (i)   Basic construction of telescope

  (ii) Develop models to demonstrate eclipses/planetary motion

  (iii) Night sky observation

  (iv) Conduct case study pertaining to any topic in this paper

  (v)   Visit to any one of the National Observatories

Text Books

  1. BaidyanathBasu, (2001). An introduction to Astrophysics, Second printing, Prentice –

  2. Hall of India (P) Ltd, New Delhi

3. K.S.Krishnaswamy, (2002), Astrophysics – a modern perspective, New Age International (P) Ltd, New Delhi.Shylaja, B.S. &Madhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient BlackSwan,

Mapping with program out comes:
Map course outcomes (CO) for each course with program outcomes (PO)&Programme Specific Outcomes (PSO) in the 3-point scale of HIGH (3, ≥ 70%), MEDIUM (2, ≥ 40% and < 70%) and LOW (1,<40%).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	1	1	1	1	3	1	1	2	1
CO-2	3	1	3	1	1	3	1	1	2	2
CO-3	3	3	3	2	1	3	2	2	3	3
CO-4	3	2	2	1	1	3	1	2	3	3
CO-5	3	3	3	2	1	3	1	1	3	3
Ave.	2.8	2	2.4	1.4	1	3	1.4	1.4	2.6	2.4

SEMESTER- II			
Skill Enhancement Course III – Energy Physics			
Course Code: 23UPHSE3	Hrs/ Week :2	Hrs/ Semester: 30	Credits:2

Objectives:

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

Course outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Explain the basis of energy sources and its storage.	K1
CO-2	Relate the various types of energy sources and summarise the importance of energy storage.	K2
CO-3	Apply the knowledge about energy sources to harness, store and utilise energy, considering emerging technology and trends.	K3
CO-4	Analyse the impact of energy choices, encouraging sustainable and responsible approaches to energy utilisation.	K4
CO-5	Judge the availability, accessibility and environmental impact of renewable energy sources.	K5

SEMESTER- II			
Skill Enhancement Course III – Energy Physics			
Course Code : 23UPHSE3	**Hrs/ Week :2**	**Hrs/ Semester: 30**	**Credits:2**

Unit I: Introduction To Energy Sources

Energy consumption as a measure of prosperity – world energy future – energy sources and their availability – conventional energy sources – non-conventional and renewable energy sources – comparison – merits and demerits.

Unit II: Solar Energy

Solar energy Introduction – solar constant – solar radiation at the Earth's surface – solar radiation geometry – Solar radiation measurements – solar radiation data –solar energy storage and storage systems – solar pond – solar cooker – solar water heater – solar greenhouse – types of greenhouses – solar cells.

UNIT III: Wind Energy

Introduction –nature of the wind – basic principle of wind energy conversion – wind energy data and energy estimation – basic components of Wind Energy Conversion Systems (WECS) – advantages and disadvantages of WECS – applications – tidal energy.

UNIT IV: Biomass Energy

Introduction – classification – biomass conversion technologies –photosynthesis – fermentation - biogas generation –classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.

UNITV: Energy Storage

Importance of energy storage- batteries - lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – advantages and disadvantages of fuel cells – applications of fuel cells - hydrogen storage.

Text Books

1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4[th]Edn.
2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3[rd]Edn.
3. D P Kothari, K P Singal, RakeshRajan, PHI Learning Pvt Ltd, 2011, 2[nd]Edn.

Reference Books

1. John Twidell & Tony Weir, Renewable Energy Resources, Taylor & Francis, 2005, 2ndEdn.
2. S.A. Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008.
3. M. P. Agarwal, Solar Energy, S. Chand & Co. Ltd., New Delhi,1982
4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.

Mapping with program out comes:

Map course outcomes (CO) for each course with program outcomes (PO)& Programme Specific Outcomes (PSO) in the 3-point scale of HIGH(3, $\geq$ 70%), MEDIUM (2, $\geq$ 40% and < 70%) and LOW (1,<40%).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	1	1	1	1	2	1	1	2	2
CO-2	3	2	3	3	1	2	1	2	2	2
CO-3	3	2	3	3	2	3	3	2	3	3
CO-4	3	2	3	3	2	3	3	2	3	3
CO-5	3	3	3	3	2	3	3	3	3	3
Ave.	3	2	2.6	2.6	1.6	2.6	2.2	2	2.6	2.6

<table>
<tr><td colspan="5" align="center">SEMESTER – III</td></tr>
<tr><td colspan="5" align="center">Part-I Tamil   Paper - 3 காப்பிய இலக்கியங்கள்</td></tr>
<tr><td colspan="5" align="center">செய்யுள், இலக்கணம், இலக்கிய வரலாறு, புதினம்</td></tr>
<tr><td>23ULTA31</td><td colspan="2" align="center">Hrs / Week:6</td><td align="center">Hrs / Semester: 90</td><td align="center">Credits: 4</td></tr>
</table>

நோக்கங்கள்

	கற்றல் நோக்கங்கள்
1	நம் தாய்மொழியில் உள்ள அரிய பொக்கிசங்களான காப்பியங்களை, அவற்றின் உட்கருத்தை மாணவியர் அறிந்துகொள்வர்.
2	சங்ககாலம் முதல் இக்காலம் வரை பல்வேறு சமயங்களின் வளர்ச்சி நிலைகள் பற்றியும் இக்காப்பியங்கள் வழி அறிந்து கொள்வர்.
3	வாழ்வுக்கு இலக்கணம் கூறும் அகப்பொருள் இலக்கணம் பற்றி அறிந்து கொள்வர்.
4	இலக்கிய வரலாற்றின் வழி மொழியின் வளர்ச்சியையும் காலந்தோறும் மாறிவரும் இலக்கியங்களின் பல்வேறு வகைகளையும் தெரிந்து கொள்வர்.
5	தன்னம்பிக்கை உருவாக்கி, வேலை வாய்ப்பிற்கான தேர்வுகளில் திறமையுடன் பங்கேற்பர்.

பாடத்திட்டத்தின் பயன்கள்

CO.NO	இப்பாடத்திட்டம் - மாணவியரிடம்	அறிவாற்றல் திறன்
CO-1	இலக்கிய அறிவையும், காப்பிய அறிமுகம் மற்றும் கருத்து நலம் குறித்த புலமையை வளர்க்கிறது	K1
CO-2	கடல் போன்ற தமிழ் இலக்கியக் கனிச் சாற்றை மேன்மேலும் பருக வேண்டும் என்னும் ஆவலை வளர்க்கிறது.	K2
CO-3	மொழியறிவோடு சிந்தனைத்திறனையும், படைப்பாற்றலையும் வளர்க்கிறது.	K3
CO-4	சங்க கால மக்களின் வாழ்க்கைச் சுவடு, மற்றும் வாழ்வியல் பண்பாட்டு நெறிகளின் தாக்கம் பெற்று தங்களின் எதிர்கால வாழ்வைச் செம்மையுடன் அமைக்கும் திறனைப் பெறுகிறார்கள்.	K4
CO-5	தனிமனித, சமுதாய வாழ்க்கைச் சிக்கல்களை எதிர்கொண்டு வெற்றியோடு பயணிக்கும் திறனைப் பெறுகிறார்கள்.	K5

அலகு 1   (18 மணி நேரம்)

பெருங்காப்பியங்கள்

1. சிலப்பதிகாரம் - வழக்குரைகாதை - இளங்கோவடிகள்
2. மணிமேகலை – ஆதிரை பிச்சையிட்ட காதை – சீத்தலைச் சாத்தனார்
3. சீவக சிந்தாமணி – பூமகள் இலம்பகம் - திருத்தக்கத்தேவர்
4. வளையாபதி – நாதகுத்தனார்

அலகு – 2   (18 மணி நேரம்)

சமய காப்பியங்கள்

1. பெரியபுராணம் - பூசலார் நாயனார் புராணம் - சேக்கிழார்
2. கம்பராமாயணம் - மந்தரை சூழ்ச்சிப் படலம் - கம்பர்
3. இயேசு காவியம் - மலைப் பொழிவு – கண்ணதாசன்
4. சீறாப்புராணம் - புலி வசனித்த படலம் - உமறுப் புலவர்

அலகு – 3   (18 மணி நேரம்)

இலக்கணம்

1. அகப்பொருள்:
    1. ஏழு திணை விளக்கம்
    2. முதல், கரு, உரிப் பொருள் - விளக்கம்

2. புறப்பொருள்:
    1. வெட்சி முதல் பாடாண் திணை வரை - விளக்கம

3. யாப்பின் இலக்கணம்

அலகு – 4   (18 மணி நேரம்)

இலக்கிய வரலாறு

1. ஐம்பெருங் காப்பியங்கள்
2. ஐஞ்சிறு காப்பியங்கள்
3. சிற்றிலக்கியங்கள்

அலகு – 5   (18 மணி நேரம்)

புதினம்

1. வஞ்சிமாநகரம் (வரலாற்றுப் புதினம்) – நா.பார்த்த சாரதி

துணைநின்ற நூல்கள்

1. சிலப்பதிகாரம்   - புலவர் பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

2. மணிமேகலை   - புலவர் பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.

3. .சீவகசிந்தாமணி   -   புலவர் பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
                                திருநெல்வேலி தென்னிந்திய
                                சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                திருநெல்வேலி – 6.

4. கம்பராமாயணம்   -   பேரா. பூவண்ணன்(உரையாசிரியர்)
                                வர்த்தமானன் பதிப்பகம்
                                21, இராமகிரு‘ணா தெரு
                                தியாகராய நகர்
                                சென்னை – 17.

5. பெரியபுராணம் -   பன்னிரு திருமுறைகள்
                                ச.வே.சுப்பிரமணியன்
                                மணிவாசகர் பதிப்பகம்
                                31, சிங்கர் தெரு
                                பாரிமுனை, சென்னை – 18.

6. இயேசு காவியம் -   கவிஞர் கண்ணதாசன்,
                                கண்ணதாசன் பதிப்பகம்
                                கலைக்காவிரி வெளியீடு,
                                திருச்சி .

7. ஐஞ்சிறுகாப்பியங்கள் (மூலமும் உரையும்) – தமிழ் நிலையம்
                                        40, சரோஜினி தெரு
                                        தியாகராய நகர்
                                        சென்னை – 17
8. புறப்பொருள் வெண்பாமாலை   -   பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
                                திருநெல்வேலி தென்னிந்திய
                                சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                திருநெல்வேலி – 6.

பார்வை நூல்கள்

1. தொல்காப்பியம் - பொருளியல் உரைவளம்   - க. வெள்ளைவாரணன்
                                        பதிப்:புத் துறை,
                                        மதுரை காமராசர் பல்கலைக் கழகம்,
                                        மதுரை- 625 021.
                                        முதற்பதிப்பு - 1983

13. நன்னூல்   -   பவணந்தி முனிவர்
                                திருநெல்வேலி தென்னிந்திய
                                சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                திருநெல்வேலி – 6.

14. தமிழ் இலக்கிய வரலாறு   -   தமிழ்த்துறை தொகுப்பு
                                தூய மரியன்னை கல்லூரி (தன்னாட்சி), தூத்துக்குடி.

இணைய ஆதாரங்கள்

1. Project Madurai - www.projectmadurai.org

2. Tamil Universal Digital Library – www.ulib.prg<http://www.ulib.prg>

3. Tamil Books on Line –   books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	<40%	≥ 40%and<70%	≥70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – III			
Part I French	**French Literature and Grammar I**		
Course Code: 23ULFA31/ 23ULFB31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- To get a gist of the French Literature.
- To appreciate the essence in the literary texts
- To develop an interest in the French literature that will encourage her to pursue higher studies in French.
- To identify the grammar used in the literary texts and advance into complicated grammar.

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	comprehend the history of the French literature.	K1
CO-2	interpret the values and morals through literary texts.	K2
CO-3	imbibe the basic grammatical structures of the French language	K3
CO-4	compare literary texts of different centuries to note the difference in writings.	K4
CO-5	estimate the humanistic value about author's ideas and transform her own personality	K5

<table>
<tr><td colspan="4" align="center">SEMESTER – III</td></tr>
<tr><td>Part I French</td><td colspan="3">French Literature and Grammar I</td></tr>
<tr><td>Course Code:
23ULFA31/ 23ULFB31</td><td>Hrs / Week: 6</td><td>Hrs / Semester: 90</td><td>Credits:3</td></tr>
</table>

Unit I – Moyen Age
  1.1 – Estula   -   Auteur Anonyme
  1.2 – Balade des pendues   –   François Villon
  1.3 – Les pronoms COD et COI

Unit II – XVIᵉ siècle
  2.1 – Regrets   -   Joachim du Bellay
  2.2 – Gargantua   -   François Rabelais
  2.3 – Le futur proche/ Passe récent

Unit III – XVIIᵉ siècle
  3.1 - La cigale et la fourmi   -   Jean de la Fontaine
  3.2 – Sur la mort de son fils   -   François de Malherbe
  3.3 – Le passe compose avec avoir et être

Unit IV – Francophonie - Québec
  4.1 – Une saison dans la vie d'Emmanuel -   Marie Claire Blais
  4.2 – L'imparfait
  4.3 – Le passe compose et l'imparfait

Unit V – Francophonie – Afrique Noire
  5.1 – L'enfant noir   -   Camara Laye
  5.2 – L'impératif
  5.3 – Le futur simple

Textbook:
- Textes complié par le département de français
- Clémence Fafa, Yves Loiseau, Violette Petitmengin, *Grammaire Essentielle Du Français A1*, Didier, 2018

Books, Journals and Learning Resources

- K. Madanagobalane, N.C.Mirakamal. *Le Francais par les Textes*. Chennai : Samhita Publications, 2019.
- Ludivine Glaud, Muriel Lannier, Yves Loiseau*, Grammaire Essentielle Du Français A1 A2*, Didier, 2015

- Blondeau Nicole, Allouache Ferroud jà, Ne Marie-Françoise. *Littérature Progressive du Français*. Paris : CLE International, 2004.
- Akyuz Anne, Bazelle-Shahmaei Bernadette, Bonenfant Joelle, Gliemann Marie-Francoise. *Les 500 exercices de grammaire*. Paris : Hachette livre, 2005
- Grégoire Maria. *Grammaire Progressive du français*. Paris : CLE International, 2002.
- Sirejols Evelyne, Tempesta Giovanna,Grammaire. *Le Nouvel Entrainez-vous avec 450 Nouveaux Exercices*. Paris : CLE International, 2002
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.conte-moi.net/node/120

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	1	3	2	2	1	2	3	3
CO-2	3	2	2	2	2	2	2	3	3	3
CO-3	3	3	1	2	2	3	3	2	2	3
CO-4	3	3	2	2	1	1	2	2	3	3
CO-5	2	1	2	3	3	1	2	3	3	3
Ave.	2.8	2.2	1.6	2.4	2	1.8	2	2.4	2.8	3

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

	SEMESTER – III		
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - III**		
Course Code: 23UGEN31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Objectives:

- To enable the learners, experience the literary works.
- To use English effectively for study purpose across the curriculum.
- To develop interest in the appreciation of Literature.
- To develop and integrate the use of LSRW skills.

Course Outcomes:

CO. No.	Upon completion of the course, the students will be able to	PSO Addressed	K Level
CO -1	identify the central themes of the literary texts.	1,3	1
CO - 2	express the correct usage of English Grammar in writing and speaking.	2,3	2
CO - 3	show their reading fluency skills through extensive reading.	2,3	3
CO - 4	analyse and appreciate literary works.	3,4	4
CO - 5	evaluate and integrate the use of the four language skills.	5	5

SEMESTER - III			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - III**		
Course Code: 24UGEN31	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Poem
William Wordsworth (1770- 1850)   : The Stolen Boat

William Blake (1757- 1827)   : Auguries of
Innocence Rabindranath Tagore (1861-1941)   : Fairyland

W.H. Davies (1871-1940)   : Leisure

Unit II – Prose
A.G. Gardiner (1865- 1946)   :   On Cats and Dogs

Wangari Maathaai (1940 – 2011)   : Nobel Prize Acceptance Speech

Unit III – Short Story
Leo Tolstoy (1828 – 1910)   : How Much Land Does a Man Need

O' Henry (1862- 1910)   : The Gift of the Magi

Washington Irving (1783 – 1859) : Rip Van Wrinkle

Unit IV – Grammar
Phrasal Verbs &
Idioms Modals and
Auxiliaries

Verb Phrases – Gerund, Participle and Infinitives

Unit V – Composition / Writing Skills
Brochures for Programmes and Events (Drafting Invitations)

Official Correspondence – Leave Letter, Letter of Application & Permission Letter

Text Books (Latest Editions)
1.Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole
Imprints Private Limited, 2006.

2. Green, David. *Contemporary English Grammar Structures and Composition*. 2nd Edition.

Bengaluru: Trinity Press, 1971.

Web Resources

WangariMaathai – Nobel Lecture. Nobel Prize Outreach AB 2023. Jul 2023. https://www.thoughtco.com/usage-grammar-1692575
https://grammar.yourdictionary.com/

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO- 1	PO-2	PO-3	PO- 4	PO- 5	PSO- 1	PSO- 2	PSO- 3	PSO- 4	PSO- 5
CO-1	3	2	3	3	2	3	2	3	2	2
CO-2	2	3	3	3	3	2	3	2	2	3
CO-3	3	3	3	3	3	3	3	2	2	3
CO-4	2	3	3	3	2	2	3	3	2	2
CO-5	3	3	3	2	2	3	3	3	3	2
Ave.	2.6	2.8	3	2.8	2.4	2.6	2.8	2.6	2.2	2.4

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER- III
Core III - Optics

Course Code: 23UPHC31	Hours/Week: 5	Hrs/ Semester: 75	Credits: 5

Objectives:

- To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics
- To explain the behaviour of light in different mediums
- To understand the differences in the important phenomena namely interference diffraction and Polarization and apply the knowledge in day to day life
- To understand the design of optical systems and methods to minimises aberrations

Course outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the fundamental principles of wave nature of light and optical tools enabling them to analyze and predict the behavior of light rays in different optical systems such as lenses and prisms.	K1
CO-2	Explain the principles of diffraction, including Fresnel and Fraunhofer diffraction, the behavior of zone plates and diffraction gratings, and methods for determining the wavelength of light and resolving power of optical instruments, facilitating the design and optimization of optical systems.	K2
CO-3	Apply experimental techniques such as Newton's rings, grating method and Laurent's half shade polarimeter to verify optical theories and determine parameters such as wavelength of light and refractive index of materials.	K3
CO-4	Analyze the polarization, diffraction and interference of light enabling students to understand the nature of light for various applications	K4
CO-5	Assess various types of aberrations in lenses, revolving power in telescope and grating in optical systems.	K5

SEMESTER- III			
Core III - Optics			
Course Code: 23UPHC31	**Hours/Week: 5**	**Hrs/ Semester: 75**	**Credits: 5**

Unit I: Lens

Fermat's Principle of Least Time – Postulates of Geometrical Optics – Thick and Thin Lenses – Focal Length, Critical Thickness, Power and Cardinal Points of a Thick Lens – Narrow Angled Prisms.

Lens: Aberrations: Spherical Aberration, Chromatic Aberrations, Coma, and Astigmatism– Curvature Of The Field – Distortion – Chromatic Aberrations Methods.

Unit II: Prisms

Dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope.

Eyepieces: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces, construction and working –merits and demerits of the eyepiece.

Resolving power: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of(i) Prism (ii) grating (iii) telescope.

Unit III: Interference

Interference – conditions for sustained interference – interference by reflected systems – production of colours in thin films– air wedge – determination of diameter of a thin wire by air wedge – test for optical flatness – Newton's rings – determination of wavelength of sodium light by Newton's rings – determination of refractive index of a liquid by Newton's rings.

Unit IV: Diffraction

Fresnel's diffraction – half period zones – zone plate – multiple foci in a zone plate comparison of zone plate with a convex lens – Fraunhofer diffraction – plane transmission diffraction grating – grating at normal incidence –determination of wavelength of light by normal incidence method and minimum deviation method– dispersive power of grating –grating at oblique incidence – resolving power of optical instruments – Rayleigh's criterion for resolution – resolving power of a grating.

Unit V: Polarisation

Polarisation of light – double refraction – Nicol prism – Hugen's explanation of double refraction in uniaxial crystals - polarizer and analyzer – quarter wave plate and half wave plate– plane, elliptically and circularly polarized light:production and detection – optical activity – Fresnel's theory of optical activity – experimental verification of Fresnel's theory – specific rotation – Laurent's half shade polarimeter.

Text Books:

1. Murugeshan Kiruthiga Sivaprasath R. *Optics and Spectroscopy*. S. Chand & Company Ltd. Revised edition 2014.
2. Subramaniam. N andBrijlal, 2014, Optics, 25th Ed, S.Chandand Co.
3. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi.

Books for Reference:

1. Sathyaprakash, 1990, Optics, VII edition, Ratan Prakashan Mandhir, New Delhi.
2. Ajoy Ghatak, 2009, Optics, 4thedition, PHI Pvt Ltd, New Delhi.
3. D. Halliday, R. Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York.
4. Jenkins A. Francis and White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi.

Web Resources:

1. https://science.nasa.gov/ems/
2. https://www.youtube.com/watch?v=tL3rNc1G0qQandlist=RDCMUCzwo7UlGkb-8Pr6svxWo-LAandstart_radio=1andt=2472
3. https://science.nasa.gov/ems/
4. https://imagine.gsfc.nasa.gov/educators/gammaraybursts/imagine/index.html
5. http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

Mapping with program outcomes and programme specific outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	1	1	1	2	3	1	1	1
CO-2	3	3	3	2	2	3	2	3	1	1
CO-3	3	3	3	2	2	3	3	3	2	3
CO-4	3	3	3	3	2	2	3	3	3	3
CO-5	3	3	3	2	3	2	3	3	3	2
Ave.	2.8	2.6	2.6	2	2	2.4	2.4	2.6	2	2

SEMESTER- III
Core Practical III - Practical III

Course Code: 23UPHCR3	**Hrs/Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

Objectives:

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

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

Minimum of Seven Experiments from the list:

1. Calibration of low range and high range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Determination of field along the axis of a current carrying circular coil.
4. Determination of specific conductance of an electrolyte.
5. Determination of figure of merit of BG or spot galvanometer.
6. Comparison of E1/E2 & C1 /C2 –B.G
7. Determination of refractive index of prism using spectrometer.
8. Determination of refractive index of liquid using hollow prism and spectrometer
9. Determination of dispersive power of a prism.
10. Determination of radius of curvature of lens by forming Newton's rings.

	SEMESTER – III		
Part III Generic Elective III- Mathematics – I			
Code : 23UMAE31	Hrs / Week: 6	Hrs / Semester: 90	Credits: 4

Objectives:

- To help physical science students to achieve their goals and to develop their mathematical skills.
- To help students to appreciate the uses of derivatives and integrals in day today life and solve real life problems

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	recall and demonstrate the fundamental concepts in the theory of equations, including the formation of equations, the relation between roots and coefficients, and the manipulation of reciprocal equations.	K1
CO-2	understand the transformation of equations, methods for obtaining approximate solutions (such as Newton's method and Homer's method), and the principles underlying these techniques.	K2
CO-3	apply matrix algebra concepts, including the formation of characteristic equations, determination of eigenvalues and eigenvectors, and application of Cayley Hamilton theorem to solve simple problems.	K3
CO-4	analyze differential equations of first order with higher degrees, understand solvable equations for various variables (p, x, y), and recognizing and solving partial differential equations in their four standard forms.	K4
CO-5	create solutions using Laplace transformation, demonstrate an understanding of the process and apply the inverse Laplace transformation to revert transformed equations back to their original forms.	K5

Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	1	2	2	1	2	3	2	2
CO-2	2	2	2	2	3	2	3	2	2	3
CO-3	3	2	2	2	2	2	2	2	2	3
CO-4	3	3	2	2	2	2	3	3	2	2
CO-5	2	2	2	2	2	2	2	2	2	3
Ave.	2.6	2.2	1.8	2.0	2.2	1.8	2.4	2.4	2	2.6

SEMESTER – III			
Part III Generic Elective III - Mathematics - I			
Code : 23UMAE31	Hrs / Week: 6	Hrs / Semester: 90	Credits: 4

Unit I

Theory of equations - Formation of equations - Relation between roots and coefficients-Reciprocal equations.

Unit II

Transformation of equations -Approximate solutions to equations-Newton's method and Homer's method

Unit III

Matrices-Characteristic equation of a matrix-Eigen values and Eigen vectors-Cayley Hamilton theorem and simple Problems.

Unit IV

Differential equation of first order but of higher degree - Equations solvable for p,x,y-Partial differential equations – Formations – Four Standard forms.

Unit V

Laplace transformation-Inverse Laplace transformation.

Text Book

1. S. Arumugam & Issac, Allied Mathematics, New Gamma Publishing House (2012), Palayamkottai.

Reference Books

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., **Ancillary Mathematics Vol. - I**, S.Viswanathan (Printers & Publishers), Pvt., Ltd., 2010

2. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., **Ancillary Mathematics Vol. - II**, S.Viswanathan (Printers & Publishers), Pvt., Ltd., 2010.

SEMESTER- III			
NME I - Applied Physics I			
Course Code: 23UPHN31	Hours/Week: 2	Hrs/ Semester: 30	Credits: 2

Objectives:

- To apprise and educate students about the fundamentals of Physics like force, work, power etc and get the knowledge in basics.

Course outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Understand the fundamental concepts distance, force, energy, reflection and the concept of temperature	K1
CO-2	Compare the scalar and vector product, kinetic and potential energy, reflection and refraction and emission and absorption of radiation	K2
CO-3	Explain the concepts of gravitational force, Binding Energy, diffractions of sound and Black body radiation	K3
CO-4	Categorise the Units and Dimensions, Kepler's laws, Interference and diffractions of sound and various temperature scale	K4
CO-5	Evaluate the frictional force, Binding Energy, Velocity of longitudinal waves, conduction and convection	K5

SEMESTER- III			
NME I - Applied Physics I			
Course Code: 23UPHN31	**Hours/Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

Unit I: Introduction

Time – Distance – SI units – Units and Dimensions – Vectors – Sum of vectors – Components of a vector – Scalar product – Vector product.

Unit II: Force

Motion along a straight line – Force – Centripetal force – Weight of a body – gravitational force – Kepler's laws–Planetary motion – Newton's third law of motion - Frictional force.

Unit III: Work, Power and Energy

Work – Kinetic energy – Potential energy – Power – Mass and Energy - Binding Energy.

Unit IV: Sound Waves

Velocity of longitudinal waves – Intensity of sound – Reflection, Refraction, Interference and diffractions of sound.

Unit V: Temperature and Heat Transfer

Concept of temperature – Measurement of temperature –Choosing temperature scale – Conduction – Convection – Radiation – Black body – Emission and absorption of radiation – Black body radiation or temperature radiation.

Text Books:

1. R.S. Gambhir, D. Banerjee and M.C. Durgapal, *Foundations of Physics ,* Volume 1. Willey Eastern Ltd Publications,1992.

Book for Reference:

1. Jay Orear,. *Fundamental Physics, John Willey & Sons, Inc.,* 1960.

Mapping with program outcomes and programme specific outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	1	1	1	3	2	1	2	2
CO-2	3	3	2	1	1	3	1	1	2	2
CO-3	3	2	3	1	1	3	3	3	2	2
CO-4	3	3	3	2	3	3	3	3	2	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.8	2.4	2.4	1.4	1.8	3	2.4	2.2	2.2	2.4

SEMESTER- III			
Skill Enhancement Course IV - Physics of Medical Instruments			
Course Code: 23UPHSE4	**Hours/Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

Objective:
- The students will be exposed to instruments like ECG, EEG, EMG, medical imaging, diagnostic specialties, operation theatre and its safety which will kindle interest to specialize in instrument servicing.

Course outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Understand the fundamental principles governing bio-medical instruments for monitoring physiological signals.	K1
CO-2	Demonstrate proficiency in the operation of equipment commonly used in operation theatres for monitoring physiological system.	K2
CO-3	Apply instrumentation techniques in real world scenarios.	K3
CO-4	Analyze and interpret bio-potential based instrumentation techniques	K4
CO-5	Evaluate the principles and applications of various medical imaging techniques	K5

SEMESTER- III

Skill Enhancement Course IV - Physics of Medical Instruments

Course Code: 23UPHSE4	Hours/Week: 2	Hrs/ Semester: 30	Credits: 2

Unit I: Measurement and Error

Definition – Accuracy and precision – Significant figures - Types of error (Gross error, Systematic error, Random error) – Statistical analysis (Arithmetic mean, Deviation from the mean, Average deviation, Standard deviation)

Unit II: Bio-Potentials and Electrodes

Transport of ions through cell membrane- resting and action potential - characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode

Unit III: Microscope

Optical microscope - Electron microscope – Comparison between optical and electron microscope – Resolving and Magnification power – Depth of focus –Types of electron microscope – TEM – SEM – Comparison between TEM and SEM.

Unit IV: Specialized and Advances in Medical Instruments

Angiography – Endoscopes – Computed Tomography (CT scan) – X-ray machine – Comparison of Fluoroscopy and Radiography – Computers in medicine – Lasers in medicine – Cryogenic surgery.

Unit V: Displays and Oscilloscope

Classification of displays – Display devices – Liquid crystal diode – Incandescent display
–Oscilloscope – Basic principle – CRT features – Block diagram of oscilloscope.

Text Books:

1. Albert D. Helfrick and William D. Cooper. *Modern Electronic Instrumentation and Measurement Techniques.* Prentice-Hall of India Pvt Limited. Reprint, 8th edition 2002**.**
2. Arumugam M. *Biomedical Instrumentation*. Anuradha Agencies. Reprint, 2002.
3. Kalsi H. S. *Electronic Instrumentation*. Tata Mc Graw Hill Education Pvt. Limited. Reprint 2012.

Books for Reference:

1. Mani P. *A textbook of Engineering Physics-I.* Dhanam Publications. Reprint, 2013.
2. Jose Robin G and Ubald Raj A. *Applied Physics*. Marthandam: Indira Publications. 3rd edition 1998
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Mapping with program outcomes and programme specific outcomes:
    Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	1	1	1	1	2	1	1	1	1
CO-2	3	3	3	2	2	3	1	3	1	1
CO-3	3	3	3	2	2	3	3	3	2	3
CO-4	3	3	3	3	2	2	3	3	3	3
CO-5	3	3	3	2	3	2	3	3	3	3
Ave.	2.8	2.6	2.6	2	2	2.4	2.2	2.6	2	2.2

SEMESTER –III			
Ability Enhancement Course	**Yoga and Meditation**		
Course Code: 23UAYM31	**Hrs/Week: 1**	**Hrs/Semester: 15**	**Credits: 1**

Objectives

This course aims at providing knowledge on

- self -awareness and concentration.

- yoga and benefits of yoga asanas.

- the power of positive attitude.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Acquire knowledge in Meditation, awareness, different types of yoga mindfulness and attitude to life.	K1
CO-2	Gain knowledge on Major types of meditation, self-awareness, basic asanas and three components of mindfulness, positive and negative attitude.	K2
CO-3	Explain health benefits of meditation, concentration, asanas for healthy life, mindfulness and Brainwave patterns, heartfullness	K3
CO-4	Understand better meditation, levels of concentration, surya namaskar, Myths about mindfulness, feat and its types.	K4
CO-5	Evaluate the psychological benefits of meditation, ways to develop Presence, benefits of doing in regular life, Scientific Facts about Mindfulness and anger styles.	K5

Unit I Meditation

Meditation — Major types of meditations: Zazen, Mindfulness, Vipasana, Yoga, Self-inquiry, Listening, – Health benefits of meditation: physical, psychological, spiritual–Tips for better meditation. **Exercises:** Practicing Zazen meditation – Self-enquiry meditation exercises

Unit II Self-Awareness

Awareness – Self-awareness – Importance of self-awareness –Difference between Awareness and Concentration – Power of concentration – Levels of concentration – How to increase concentration? – Ways to develop your presence
Exercises: Body Scan exercise

Unit III Yoga

Different types of yoga- Pranayama – Surya namaskara– Basic asanas for healthy life- Pranam asana, Hasta Uttan Asana- Pada Hasta Asana- Adhomukha Svanasana - Danda Asana -Vajra Asana, Padmasana, Parvat Asana, Utthita Padasana, Navasana, Bujang Asana- Dhanur Asana- Savasana **Exercises**: Practicing basic Asanas – Doing Sun Salutation

Unit IV Mindfulness

Definition of mindfulness – Three components of mindfulness– Mindfulness and Brainwave patterns – Myths about mindfulness – Scientific Facts about mindfulness – Formal and Informal methods method to practice mindfulness
Exercises: Practice Mindful Walking –Practice Mindful Talking

Unit V Heartfulness

Attitude to life – Power of positive attitude– Techniques to develop positive attitude– Positive vs negative people – Forms of negative attitude – Heartfulness – Managing fear: Basic 5 fears, way's to overcome fear– Handling anger: Anger styles, Tips to tame anger
Exercises: Practice Loving-Kindness meditation– Doing compassionate actions.

SEMESTER- III
Self-Study Course (Compulsory) - History of Mobile Phones

Course Code: 23UPHSS1	Credits :2

Objectives:
- To explore the technological advancements that led to the development of mobile phones
- To understand the evolution of mobile phone designs, features and functionalities over time

Course outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Understand the historical development and evolution of cell phones, including the transition from analog to digital technology	K1
CO-2	Demonstrate knowledge of cell phones channels, codes and the call process, essential for understanding how call phone communication functions	K2
CO-3	Explain the principles and technologies behind 2G, 3G and other network technologies such as FDMA, TDMA, GSM and CDMA	K3
CO-4	Analyse the cell phone block diagram and identify various components and their functions, enabling a deeper understanding of cell phone hardware	K4
CO-5	Evaluate the advantages and disadvantages of cell phone technology including surface mount technology in manufacturing and design.	K5

	SEMESTER- III
Self-Study Course (Compulsory) - History of Mobile Phones	
Course Code: 23UPHSS1	**Credits :2**

Unit I: Fundamentals of cell phone

Introduction – Cell phone channels – Cell phone codes – Call process- Analog cell phones – Analog comes digital.

Unit II: Network Technology

2G – FDMA – TDMA – GSM – CDMA – Mutli band Vs Multi mode cell phones- 3G – Cell phone towers – Making a call.

Unit III: Chip Level Study

Cell phone block diagram - The parts of a cell phone – Advantages – Disadvantages – Surface mount technology - Advantages – disadvantages.

Unit IV: Trouble Shooting I

Causes for problems with cell phone – Problems while talking – Dialing issues - Network problems – display problems

Unit V: Trouble Shooting II

SIM card problems – Charging problems – Battery problems – Blacklist of stolen devices – problems related to mobile phone handsets.

Text Book:

1. Prof.B. Kanickairaj, . *Cell phone servicing,* Revised second edition 2012.

Mapping with program outcomes and programme specific outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	1	1	1	1	3	2	1	2	2
CO-2	3	3	2	1	1	3	1	1	2	2
CO-3	3	2	3	1	1	2	2	3	2	2
CO-4	3	3	3	2	3	2	2	3	2	3
CO-5	3	3	3	2	3	3	2	2	2	3
Ave.	2.8	2.4	2.4	1.4	1.8	2.6	1.8	2	2	2.2

SEMESTER – IV			
Part-I Tamil Paper - 4		சங்க இலக்கியங்கள் செய்யுள், இலக்கணம், இலக்கிய வரலாறு, நாடகம்	
Course Code 23ULTA41	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

நோக்கங்கள்

	Learning Objectives
1	சங்க இலக்கியத்தின் சிறப்பையும் நாடகம் என்னும் இலக்கிய வகையின் தன்மைமையையும், அகத்திணை புறத்திணை இலக்கணங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்
2	இலக்கியங்களின் சிறப்பினை உணர்த்துதல். சங்கம் வைத்துத் தமிழாய்ந்த மன்னர், புலவர், மக்கள் இவர்களின் வாழ்வியல் அறங்களைக் கண்டறிவர்.
3	மொழியைப் பிழையின்றி பேசவும் எழுதவும் பயன்படுகிறது. படைப்பாற்றல் திறனை வளர்க்க உதவுகிறது.
4	பழந்தமிழர் வாழ்வியல் முறைகளை கற்று பயனடைய உதவுகிறது பண்பாட்டுச் சிறப்பினை மொழியின் வழி அறிந்து தம் வாழ்வில் கடைப்பிடிக்க வழிகாட்டுகிறது.
5	தமிழ் இலக்கியம் சார்ந்த போட்டித்தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

பாடத்திட்டத்தின் பயன்கள்

CO.No.	**இப்பாடத்தைக் கற்பதால் மாணவிகள் பின்வரும் பயனை அடைவர்**	**Cognitive Level**
CO-1	சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர்	K1
CO-2	தமிழின் தொன்மையையும் செம்மொழித் தகுதியையும் அறிந்து கொள்ளுதல்	K2
CO-3	நாடக இலக்கியம் மூலம் நடிப்பாற்றலையும், கலைத்தன்மையையும், படைப்பாற்றலையும் வளர்த்தல்	K4
CO-4	பழந்தமிழர் வாழ்வியல் முறைகளை கற்று பயனடைய உதவுகிறது.	K4
CO-5	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்த்து வேலைவாய்ப்பினையும் பெறுவர்.	K5

அலகு – 1   (18 மணி நேரம்)

I. எட்டுத்தொகை

1. நற்றிணை – பாடல்கள் 10, 14, 16
2. குறுந்தொகை – பாடல்கள் 16, 17, 19, 20, 25, 29, 38, 440
3. கலித்தொகை – பாடல்கள் 38, 51
4. அகநானூறு - பாடல்கள் 15, 33
5. புறநானூறு - பாடல்கள் 37, 86, 112
6. பரிபாடல் - பாடல் - 55

அலகு – 2   (18 மணி நேரம்)

பத்துப்பாட்டு – நெடுநல்வாடை – நக்கீரர்

அலகு - 3   (18 மணி நேரம்)

இலக்கணம்

பா வகைகள்

1. ஆசிரியப்பா, வெண்பா பொது இலக்கணம்

அணி இலக்கணம்

1. உவமை அணி
2. உருவக அணி
3. வேற்றுமை அணி
4. வஞ்சப் புகழ்ச்சி அணி
5. சிலேடை அணி
6. தற்குறிப்பேற்றணி

அலகு - 4

இலக்கிய வரலாறு   (18 மணி நேரம்)

1. எட்டுத்தொகை
2. பத்துப் பாட்டு
3. சங்க இலக்கியச் சிறப்பியல்புகள்

அலகு - 5   (18 மணி நேரம்)

நாடகம் : சபாபதி - பம்மல் சம்பந்த முதலியார்

துணை நின்ற நூல்கள்

1. பத்துப்பாட்டு   -   பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
                                        திருநெல்வேலி தென்னிந்திய
                                        சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                        திருநெல்வேலி – 6.

2. எட்டுத்தொகை   -   பொ.வே. சோமசுந்தரனார் (உரையாசிரியர்)
                                          திருநெல்வேலி தென்னிந்திய
                                        சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
                                        திருநெல்வேலி – 6.

பார்வை நூல்கள்

1. நன்னூல் - பவணந்தி முனிவர்
   திருநெல்வேலி தென்னிந்திய
   சைவசித்தாந்த நூற்பதிப்புக் கழகம், லிமிடெட்,
   திருநெல்வேலி – 6.
2. தமிழ் இலக்கிய வரலாறு - தமிழ்த்துறை தொகுப்பு
   தூய மரியன்னை கல்லூரி (தன்னாட்சி),
   தூத்துக்குடி.
3. பத்துப்பாட்டு - முனைவர் நாகராசன் (உரையாசிரியர்)
   நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்
   41, அம்பத்தூர்
   சென்னை – 98.
4. பத்துப்பாட்டு - முனைவர் கு.வெ. பால சுப்பிரமணியன்(உரையாசிரியர்)
   நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்
   41, அம்பத்தூர்
   சென்னை – 98.

இணைய ஆதாரங்கள்

1. Tamil Heritage Foundation- www.tamilheritage.org <http://www.tamilheritage.org>
2. Tamil virtual University Library- www.tamilvu.org/ library http://www.virtualvu.org/library
3. Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <http://www.chennailibrary.com>.
5. Tamil Universal Digital Library- www.ulib.prg <http://www.ulib.prg>.
6. Tamil E-Books Downloads- tamilebooksdownloads. blogspot.com
7. Tamil Books on line- books.tamil cube.com
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

Course Outcomes (PO)	Programme Specific Outcomes (PSO)				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	2	3
CO-2	2	3	2	1	1
CO-3	3	2	2	2	3
CO-4	1	3	3	2	2
CO-5	3	1	2	2	3
Ave	2.4	2.1	2.3	1.8	2.4

Maping	**<40%**	**≥ 40%and<70%**	**≥70%**
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – IV			
Part I French	**French Literature and Grammar II**		
Course Code: 23ULFA41/ 23ULFB41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Learning Objectives:

- To explore the French Literature.

- To appreciate the values imbibed in the literary texts

- To develop an interest in the French literature that will encourage her to pursue higher studies in French.

- To analyse and interpret verbal expressions of cause, effect, purpose, and opposition in French

Course Outcomes		
Course Outcomes	**On completion of this course, students will be able to**	**Cognitive Level**
CO-1	comprehend the French literary background and inculcate the values imparted through the literary texts	K1
CO-2	interpret a literary text, with the perspective of analyzing the content and manner of writing	K2
CO-3	imbibe the basic grammatical structures of the language to demonstrate knowledge of various expressions used to convey opinion, emotions, cause, effect, purpose, and hypothesis in French	K3
CO-4	analyze simple literary texts to acquire literary knowledge and enhance aesthetic perception	K4
CO-5	evaluate and reflect on the humanistic value by reflecting upon the author's ideas and transform her own personality	K5

SEMESTER – IV			
Part I French	**French Literature and Grammar II**		
Course Code: 23ULFA41/ 23ULFB41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – XVIIIᵉ siècle
  1.1 – Candide : il faut cultiver notre jardin -   Voltaire
  1.2 – Le Barbier de Séville   -   Beaumarchais
  1.3 – Les pronoms relatifs

Unit II – XIXᵉ siècle
  2.1 – Le lac   -   Alphonse de Lamartine
  2.2 – La mare au diable (extrait)   -   Georges Sand
  2.3 – Le présent du conditionnel

Unit III – XXᵉ siècle
  3.1 – Pour faire le portrait d'un oiseau   -   Jacques Prévert
  3.2 – Mémoires d'une jeune fille rangée (extrait)- Simone de Beauvoir
  3.3 – Le subjonctif présent

Unit IV Francophonie - Belge
  4.1 – Monsieur friquet   –   Camille Lemonnier
  4.2 – Le discours indirect
  4.3 – La comparaison

Unit V – Francophonie – Afrique noire
  5.1 – Le Mandat (La carte d'identité)   -   Ousmane Sembène
  5.2 – L'expression de la cause et conséquence
  5.3 - L'expression de but et opposition

Textbook:
- Textes complié par le département de français
- Clémence Fafa, Yves Loiseau, Violette Petitmengin, *Grammaire Essentielle Du Français A1*, Didier, 2018

Books, Journals and Learning Resources

- K. Madanagobalane, N.C.Mirakamal. *Le Francais par les Textes*. Chennai : Samhita Publications, 2019.
- Ludivine Glaud, Muriel Lannier, Yves Loiseau, *Grammaire Essentielle Du Français A1 A2*, Didier, 2015
- Blondeau Nicole, Allouache Ferroud jà, Ne Marie-Françoise. *Littérature Progressive du Français*. Paris : CLE International, 2004.

- Akyuz Anne, Bazelle-Shahmaei Bernadette, Bonenfant Joelle, Gliemann Marie-Francoise. *Les 500 exercices de grammaire*. Paris : Hachette livre, 2005
- Grégoire Maria. *Grammaire Progressive du français*. Paris : CLE International, 2002.
- Sirejols Evelyne, Tempesta Giovanna,Grammaire. *Le Nouvel Entrainez-vous avec 450 Nouveaux Exercices.* Paris : CLE International, 2002
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.conte-moi.net/node/120

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	1	3	2	2	1	2	3	3
CO-2	3	2	2	2	2	2	2	3	3	3
CO-3	3	3	1	2	2	3	3	2	2	3
CO-4	3	3	2	2	1	1	2	2	3	3
CO-5	2	1	2	3	3	2	2	3	3	3
Ave.	2.8	2.2	1.6	2.4	2	2	2	2.4	2.8	3

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER – IV			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - IV**		
Course Code: 23UGEN41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits: 3**

Objectives:

- To enable the learners to experience the aesthetics of literary works.
- To make them use English effectively for academic purpose.
- To develop interest in the appreciation of Literature.
- To develop and integrate the use of LSRW skills.

Course Outcomes:

CO. No.	Upon completion of the course, the students will be able to	PSO Addressed	K Level
CO -1	identify and comprehend the general themes of the given works.	1,2	1
CO – 2	explain the text within their historical and cultural contexts.	1,2,3	2
CO – 3	present scholarly conversation and show their capabilities in literary competitions.	3	3
CO – 4	examine their educational and career goals.	2,4	4
CO – 5	test their understanding level in the literary development.	5	5

SEMESTER – IV			
Part II English	**Poetry, Prose, Extensive Reading and Communicative English - IV**		
Course Code: 23UGEN41	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits:3**

Unit I – Poems

Lord Byron (1788 – 1824)   : The Darkness

Robert Frost (1874 – 1963)   : Home Burial

John Masefield (1878 -1967)   : Laugh and Be Merry

Edgar A. Guest (1881-1959)   : Don't Quit

Unit II –Prose

R.K. Narayan (1906 – 2001)   : An Astrologer's Day

Stephen Leacock (1869- 1944)   : How to be a Doctor

Unit III – Scenes from Literature

Christopher Marlowe (1564-1503) : The Parade of Seven Deadly Sins
                                                   (Act 2 Scene 3 in *Doctor Faustus)*

William Shakespeare (1564- 1616): *Julius Caesar* – Assassination Scene (Act III – Scene I)

Unit IV – Grammar

Synthesis of Sentences
Direct and Indirect Speech

Unit V – Communication Skills

Narrative Report
Newspaper Report

Reference Books

1. Malathi, *Functional English*. New Century Book House (P) Ltd., 2007.
2. Joseph, K.V. *A Text book of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited.

Web Resources

http:/www.gradesaver.com/George-orwell-essays/study/summary
https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf The Quality of Mercy, https://poemana1ysis.com
https://learnodo-newtonic.com/famous-indian-poem

PSO Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	3	2	3	2	3	2	2
CO-2	3	2	2	3	2	3	2	2	3	2
CO-3	2	3	2	3	3	2	3	2	2	3
CO-4	3	2	2	3	3	3	2	2	2	3
CO-5	2	2	3	3	3	2	2	3	2	3
Ave.	2.6	2.2	2.4	3	2.6	2.6	2.2	2.4	2.2	2.6

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

SEMESTER- IV			
Core IV - Electricity and Electromagnetism			
Course Code: 23UPHC41	**Hrs./Week :5**	**Hrs./Sem: 75**	**Credits: 5**

Objectives:
- To deal with the basic concept of electricity
- To discuss the laws of electromagnetic induction
- To extend the fundamental concepts to AC bridges

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Define Current, Magnetic induction, induced current, alternating current and transformer	K1
CO-2	Summarise the concept of the Principle of Potentiometer, Moving coil Ballistic galvanometer, Mutual inductance, growth and decay of charge in an LCR circuit and Transformer	K2
CO-3	Apply Kirchhoff's laws to Wheatstone's network, Moving coil Ballistic galvanometer to Measure Charge sensitiveness, Rayleigh's method to determine the self inductance, LCR series circuit to calculate Power in A.C circuit and Robinson's bridge for determining the frequency of an a.c source.	K3
CO-4	Differentiate Seebeck effect and Peltier effect, Magnetic susceptibility and Magnetic permeability, Self induction and Mutual induction, LCR in series and parallel and step-up and step-down transformer.	K4
CO-5	Determine the Resistance of a coil with a Potentiometer, Absolute capacitance of a capacitor, Mutual inductance between two coaxial solenoids, the impedance of an A.C circuit containing L and R in series, capacitance using DeSauty's bridge.	K5

SEMESTER- IV			
Core IV - Electricity and Electromagnetism			
Course Code: 23UPHC41	**Hrs./Week :5**	**Hrs./Sem: 75**	**Credits: 5**

Unit I: Steady Currents and Thermo-Electricity

Current and Current density – Expression for current density –Equation of Continuity – Ohm's law and Electrical Conductivity – Kirchoff's laws – Applications to Wheatstone's network –Potentiometer: Principle, Calibration of Ammeter, Voltmeter (Low & High range), Measurement of Resistance of a coil with a Potentiometer – Seebeck effect – Law of Thermo emf – Peltier effect – Thomson effect – Thermodynamics of Thermocouple.

Unit II: Magnetic Properties and Magnetostatics

Magnetic induction (B) – Magnetization (M) – Relation between B, H and M – Magnetic susceptibility – Magnetic permeability – Relation connecting them.
Moving coil Ballistic galvanometer: Principle, Construction, Theory – Correction for damping – Measurement of Charge sensitiveness – Absolute capacitance of a capacitor.

Unit III: Electromagnetic Induction

Faraday's laws of induction – Lenz law – Expression for induced current – Self-induction–Self-inductance of a long solenoid –Determination of self-inductance by Rayleigh's method – Self-inductance of a toroidal coil of rectangular and circular cross- section – Mutual induction – The Neumann formula for mutual inductance – Mutual inductance between two coaxial solenoids – Experimental determination of mutual inductance- Eddy currents.

Unit IV: Transient and Alternating Currents

Growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit (expressions for charge only) – peak, average and rms values of ac – LCR series and parallel circuits – resonance condition – Q factor – power factor.

Unit V: Transformers and A.C Bridges

Coupled circuit – Transformers – Detailed theory of transformer – Transformer losses – A.C bridges – A.C bridges for the measurement of inductances: Maxwell's bridge, Owen bridge, Anderson's bridge – A.C bridges for the measurement of capacitance: DeSauty's bridge, Wein's bridge, Schering bridge – Robinson's bridge for determining the frequency of an A.C source.

Text Books:

1. Murugeshan R. *Electricity and Magnetism*. New Delhi: S. Chand &company Ltd. Reprint, 2019.
2. Dr. Tewari K.K. *Electricity and Magnetism with Electronics*. New Delhi: S. Chand & company Ltd. Reprint,2018.

Books for Reference:

1. Brijlal and Subramanium. *Electricity and Magnetism*. Ratan Prakash mandir. 7th edition 1994.
2. Tayal D.C. *Electricity and Magnetism*. Himalaya Publishing House. 3rd revised edition 1998.

3. David Halliday, Robert Resnick and Jearl Walker. *Fundamentals of Physics.* Wiley &Sons Inc. 6th edition 2006.

Web Resources:
   1. https://www.edx.org/course/electricity
   2. https://www.udemy.com/courses/ electricity
   3. https://www.edx.org/course/magnetism
   4. http://www.hajim.rochester.edu/optics/undergraduate/courses.html

Mapping with program outcomes and programmespecific outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	1	1	1	1	2	1	1	1	1
CO-2	3	3	3	2	2	3	2	3	1	1
CO-3	3	3	3	2	2	3	3	3	2	3
CO-4	3	3	3	3	2	2	3	3	3	3
CO-5	3	3	3	2	3	2	3	3	3	2
Ave.	2.8	2.6	2.6	2	2	2.4	2.4	2.6	2	2

SEMESTER- IV			
Core Practical IV - Practical IV			
Course Code: 23UPHCR4	**Hrs/Week: 2**	**Hrs/ Semester: 30**	**Credits: 2**

Objectives:
- Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit. Set up experiments, observe, analyse and assimilate the concept
- Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

Minimum of Seven Experiments from the list:

1. Determination of thickness of a wire using air wedge.

2. Determination of Cauchy's Constants.

3. Determination of resolving power of grating

4. Determination of resolving power of telescope

5. Verification of Newton's formula for a lens separated by a distance.

6. Determination of wavelengths, particle size using Laser/Monochromatic source.

7. Determination of resolving power of Diffraction grating using Laser

8. Measurement of low resistances using potentiometer.

9. Determination of earth's magnetic field using field along axis of current carrying coil.

10. Determination of specific resistance of the material of the wire using PO box.

11. Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone.

12. Determination of resistance and specific resistance using Carey Foster's bridge.

SEMESTER – IV			
Part III Generic Elective IV - Mathematics - II			
Code :23UMAE41	Hrs/week : 6	Hrs/Sem : 90	Credits : 4

Objectives:
- To know the concepts of vector differentiation and vector integration.
- To help students to appreciate the uses of derivatives and integrals in day today life and solve real life problems.

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	recall and list the fundamental concepts of vector differentiation, including the definitions and properties of gradient, divergence, and curl.	K1
CO-2	demonstrate a clear understanding of the principles underlying the evaluation of double and triple integrals, illustrating the relationships between variables and integrals.	K2
CO-3	apply vector integration techniques to solve problems involving line, surface, and volume integrals, showcasing their ability to use these concepts in practical scenarios.	K3
CO-4	analyse and interpreting the implications of Green's, Stoke's, and Divergence theorems (without proof), solving problems that require the application of these theorems.	K4
CO-5	create solutions utilizing Fourier series, demonstrating an ability to identify even and odd functions, and construct half-range Fourier series from given functions.	K5

Relation Matrix

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	1	2	2	1	2	3	2	2
CO-2	2	2	2	2	3	2	3	2	2	3
CO-3	3	2	2	2	2	2	2	2	2	3
CO-4	3	3	2	2	2	2	3	3	2	2
CO-5	2	2	2	2	2	2	2	2	2	3
Ave.	2.6	2.2	1.8	2.0	2.2	1.8	2.4	2.4	2	2.6

SEMESTER – IV			
Part III Generic Elective IV- Mathematics - II			
Code : 23UMAE41	Hrs/week : 6	Hrs./Sem : 90	Credits : 4

UNIT I

Vector differentiation–Gradient–Divergence and curl.

UNIT II

Evaluation of double and triple integrals

UNIT III

Vector integration–Line, surface and volume integrals.

UNIT IV

Green's, Stoke's and Divergence theorems(without proof)– simple problems.

UNIT V

Fourier series–Even and odd functions–Half range Fourier series.

Text Book

1. S. Arumugam&Issac, Allied Mathematics, New Gamma Publishing House (2012), Palayamkottai.

Reference Books

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., ManicavachagomPillay T.K.,

 Ancillary Mathematics Vol. - I, S.Viswanathan (Printers & Publishers), Pvt., Ltd., 2010

2. Narayanan S., Kandaswamy P., Hanumantha Rao R., ManicavachagomPillay T.K.,

Ancillary Mathematics Vol. - II, S.Viswanathan (Printers & Publishers), Pvt., Ltd., 2010.

SEMESTER- IV			
NME II	**Applied Physics II**		
Course Code: 23UPHN41	**Hrs./Week : 2**	**Hrs./Sem : 30**	**Credits : 2**

Objectives:
- To enlighten students to be aware of laser and its applications
- To make students understand the working of windmills, OTEC and Geothermal process used for power generation and biomass energy conversion
- To make students knowledgeable on nanophysics

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Define Population inversion, Spot welding, conventional energy sources, Biomass energy and nanophase materials	K1
CO-2	Understand the principles of stimulated absorption, how lasers are utilized in environmental monitoring, the distinction between conventional and non-conventional energy sources, the principles behind ocean thermal energy, the unique characteristics of nanomaterials and their significance in various fields.	K2
CO-3	Recognise the characteristics that make lasers suitable for various applications, advantages and limitations of using lasers in different applications, the importance of renewable energy sources in mitigating climate change and promoting sustainability, the role of renewable energy in reducing dependence on fossil fuels and mitigating climate change, the potential impact of nanotechnology on various industries including healthcare, electronics, and energy.	K3
CO-4	Explain the concept of a laser and how it achieves coherence and monochromaticity, various applications of lasers in drilling, cutting, welding, and spot welding, advantages and limitations of different forms of renewable energy sources, properties and applications of nanophase materials.	K4
CO-5	Evaluate the potential of solar energy as a viable alternative to conventional energy sources, properties and applications of nanophase materials.	K5

SEMESTER- IV			
NME II	**Applied Physics II**		
Course Code: 23UPHN41	**Hrs./Week: 2**	**Hrs./Sem: 30**	**Credits: 2**

Unit I: Laser

Introduction– Stimulated Absorption – Principle of spontaneous emission and stimulated emission – Concept of laser - Population inversion – Pumping action – Characteristics of laser – Basic components of laser.

Unit II: Applications of Laser

Laser drilling – Laser cutting– Laser welding – Spot welding – Air pollution monitoring – Water pollution monitoring – Laser remote sensing.

Unit III: Energy Physics – I

Conventional and non-conventional energy sources (Introduction) – Solar energy – Solar cooker (box type) – Solar ponds – Solar Crop Dryers – Solar Water Heater - Water Desalination.

Unit IV: Energy Physics – II

Biomass energy – Biomass conversion process digestion - Ocean Thermal energy - Geothermal Energy – Wind Energy.

Unit V: Nanomaterials

Introduction– Definition – Special features of nanophase materials – Different forms of nanomaterials – Synthesis of nanomaterials (basics) – Preparation of nanomaterials: Pulsed laser deposition – Properties of nanophase materials - Applications of nanophase materials.

Text Books:

1. Jose Robin G and Ubald Raj A, *Energy Physics*. Marthandam: Indira Publications. First edition 2014.
2. Dr. Sr. GerardinJayam. *Physics Every day*. First Edition2008.
3. Dr. Mani P. *A text book of Engineering Physics –I*. Dhanam Publication. Tenth Edition2013.
4. Dr. Mani P. *A text book of Engineering Physics –II*. Dhanam Publication. Tenth Edition2016.

Book for Reference:

1. Rai G.D. *Nonconventional Energy Sources*. Khanna Publishers. Reprint,2014.
2. Ubald Raj A and Jose Robin G. *Solid State Physics*. Marthandam: Indira Publications. second edition2018.
3. Murugeshan R and Kiruthiga Sivaprasath. *Optics and Spectroscopy*. S. Chand and Company Ltd. Ninth edition2019.
4. Arumugam M. *Biomedical Instrumentation*. Anuradha Agencies. Reprint, 2002.

Mapping with program outcomes and Programme Specific Outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	1	1	1	1	3	2	1	2	2
CO-2	3	3	2	1	1	3	1	1	2	2
CO-3	3	2	3	1	1	3	3	3	2	2
CO-4	3	3	3	2	3	3	3	3	2	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.8	2.4	2.4	1.4	1.8	3	2.4	2.2	2.2	2.4

SEMESTER- IV			
Skill Enhancement Course V - Physics for Competitive Examinations			
Course Code: 23UPHSE5	**Hrs./Week :2**	**Hrs./Sem: 30**	**Credits :2**

Objectives:

- To prepare the students for competitive exams and make them competent in facing the challenges with confidence
- To motivate students to face and pursue higher education through competitive Examinations
- To equip students with the basic principles of physics and apply the same in solving problems

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the Gravitation, Elasticity, Laws of thermodynamics, Interference and Kirchhoff's laws	K1
CO-2	Relate the concepts of Escape velocity, Youn's modulus, isothermal process, Diffraction, and Ohm's law in various problems	K2
CO-3	Solve the problems in Gravitational potential, Hooke's law, isochoric process, Polarisation, and thermal dependency of resistance	K3
CO-4	Simplify the problems in Binding energy, bulk modulus, zeroth laws of thermodynamics, interference and resistivity.	K4
CO-5	Explain the problems related to satellites motion, change in length, isobaric process, Interference and Kirchhoff's laws	K5

SEMESTER- IV
Skill Enhancement Course V - Physics for Competitive Examinations

Course Code: 23UPHSE5	Hrs./Week :2	Hrs./Sem: 30	Credits :2

Unit I: Gravitation

Newton's Law of Gravitation – Gravitational potential energy, Gravitational potential – Escape velocity, Orbital velocity, satellites motion, binding energy.

Unit II: Mechanical properties of solids

Elasticity, stress, strain and Hooke's law – Young's modulus and bulk modulus and change in length.

Unit III: Thermodynamics

First and Zeroth law of thermodynamics – change of state, type of system – thermodynamic process – isobaric process – isochoric process – isothermal process – adiabatic process.

Unit IV: Wave optics

Interference due to thin film – diffraction (diffraction due to single slit) – Polarisation of light.

Unit V: Current Electricity

Electric current, current density and drift velocity – Ohm's law, resistance, conductivity and thermal dependency of resistance – resistivity – Kirchoff's law and combination of resistance.

Text Books:

1. A.K. Mahajan, Gravitaion and Thermodyanmics, Physics - Vol.2, YCT publications Pvt Ltd, UP.

2. A.K. Mahajan, Optics and modern Physics, Physics - Vol.5, YCT publications Pvt Ltd, UP.

3. A.K. Mahajan, current electricity and Magnetism, Physics - Vol.4, YCT publications Pvt Ltd, UP.

Book for Reference:

1. Satya Prakash and Er. Vibhav Saluja. *Objective Physics*. Meerut: Prakashan publications. 27th revised edition 2010.

Mapping with program outcomes and Programme Specific Outcomes:

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	1	1	3	2	1	1	2
CO-2	3	3	3	1	1	2	2	3	3	2
CO-3	3	3	3	2	2	2	1	3	2	3
CO-4	3	3	3	3	3	2	1	3	2	3
CO-5	3	3	3	2	3	2	1	3	3	3
Ave.	2.8	2.8	2.8	1.8	2	2.2	1.4	2.6	2.2	2.6

SEMESTER- IV			
Ability Enhancement Course II – Maintenance of Electronic Equipment and Photography			
Course Code: 23UAPH41	Hrs./Week: 1	Hrs./Sem: 15	Credits: 1

Objectives:

- To know the students how to apply the electronic components in physics laboratory
- To make the students to measure the physical quantities using measuring instruments
- To enhance the students to know about photography

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Identify the Active and passive components, MultiMate, Transducer and Parts of Photographic camera.	K1
CO-2	Classify the Active and passive components, components of Cathode Ray Oscilloscope, Transducers and Camera lens filter and understand its significance in measuring instruments	K2
CO-3	Construct the Printed circuit board and Wheatstone bridge	K3
CO-4	List out the Types of capacitors, Liquid Crystal Display, Basic requirements of transducers, functions of Camera lens and Film speed and demonstrate knowledge of different types of camera lenses and their applications in various photography scenarios	K4
CO-5	Explain the theory of Capacitors, Audio Frequency Oscillator, Resistive transducer, Camera lens and DSLR camera	K5

SEMESTER- IV			
Ability Enhancement Course II– Maintenance of Electronic Equipment and Photography			
Course Code: 23UAPH41	**Hrs./Week: 1**	**Hrs./Sem: 15**	**Credits: 1**

Unit I: Electronic Components

Active and passive components – Resistances - Capacitors: Uses, Types of capacitors, Detecting faulty capacitors, Characteristics, Working Voltage – Soldering techniques – Groove board – Bread board – Printed circuit board.

Unit II: Measuring Instruments

Multimeter – Cathode Ray Oscilloscope – Liquid Crystal Display – Audio Frequency Oscillator.

Unit III: Transducers

Transducer: Classification, Basic requirements – Inductive transducer – Piezoelectric transducer – Capacitive transducer – Resistive transducer: Potentiomentric type, Wheatstone bridge type.

Unit IV: Photography I

Camera – Photographic camera – Parts and their functions – Camera lens: Types – Camera lens shutters: Types.

Unit V: Photography II

Film structure – Film speed – Exposure triangle – Flash photography - Camera lens filter – DSLR camera – Digital format in DSLR camera.

Text Book:

1. Jose Robin G and Ubald Raj A. *Maintenance of Electronic Equipment & Photography*. Marthandam: India Publications. First Edition 2017.

Mapping with program outcomes and programmed specific outcomes:

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	1	2	1	1	3	1	2	1	1
CO-2	3	2	3	2	2	3	1	2	2	2
CO-3	3	3	3	2	2	3	3	2	2	2
CO-4	3	3	3	2	2	3	2	2	2	2
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	3	2.4	2.8	1.8	1.8	3	2	2.2	2	2

	SEMESTER- V		
	Core V – Analog and Communication Electronics		
Course Code: 23UPHC51	**Hrs./Week: 5**	**Hrs./Sem: 75**	**Credits: 5**

Objectives:
- To study the design, working and applications of semiconducting devices.
- To construct various electronic circuits. To study them in details
- To study the basis of audio and video communication systems and the aspects of satellite and Fibre Optic Communications

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Gain a comprehensive understanding of Linear and non–linear circuit elements, including diodes, transistors and modulation and demodulation techniques.	K1
CO-2	Interpret and explain the operational characteristics and behaviour of various electronic circuits such as rectifiers, amplifiers, oscillators, modulators and demodulators.	K2
CO-3	Apply the knowledge of circuit principles to design and analyse electronic circuits for specific applications, considering factors like efficiency, stability and signal fidelity.	K3
CO-4	Analyse the performance of transistor amplifiers and oscillators using circuits and evaluate the efficiency and effectiveness of different modulation & demodulation techniques.	K4
CO-5	Critically judge the performance of electronic circuits and evaluate the social and ethical implications of electronic communication technologies.	K5

SEMESTER- V
Core V – Analog and Communication Electronics

Course Code: 23UPHC51	**Hrs./Week: 5**	**Hrs./Sem: 75**	**Credits: 5**

Unit I: Linear Circuit Analysis

Linear and non–linear circuit elements – Active and Passive elements – Ideal voltage source and current source – Superposition theorem – Thevenin's theorem – Norton's theorem – Maximum power transfer theorem –h-parameters.

Unit II: Diodes

Diode characteristics – rectifiers - clipper circuits, clamping circuits. half wave rectifier, center tapped and bridge full wave rectifiers, calculation of efficiency and ripple factor. DC power supply: Block diagram of a power supply, qualitative description of shunt capacitor filter, Zener diode as voltage regulator, temperature coefficient of Zener diode.

Unit III: Transistor Amplifiers

Transistor configurations: CB, CE CC modes – I-V characteristics and hybrid parameters – DC load line – Q point self-bias – RC coupled amplifier –power amplifiers – classification of power amplifiers: A, B, C – push pull amplifiers – tuned amplifiers.

Unit III: Transistor Oscillators

Feedback amplifier - principle of feedback, positive and negative feedback of voltage and current gain, advantages of negative feedback - Barkhausen's criterion. Transistor oscillators: Hartley, Colpitt, Phase shift oscillators with mathematical analysis.

Unit V: Modulation and Demodulation

Theory of amplitude modulation - frequency modulation – comparison of AM and FM – phase modulation – sampling theorem – pulse width modulation – pulse modulation systems: PAM, PPM, and PCM – demodulation: AM and FM detection - duper heterodyne receiver (block diagram).

Text Books:
1. V.K.Mehta - Principles of Electronics, S.Chand and Co. Ltd., 2004.
2. V.Vijayendran - Integrated Electronics, S.Vishwanathan Publishers, Chennai.
3. B.L. Theraja - A Text Book of Electrical Technology.
4. John D. Ryder - Electronic fundamentals and Applications.
5. Malvino - Electronic Principles, Tata McGraw Hill.

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

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

Mapping with program outcomes and Programme Specific Outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	1	1	1	3	1	1	1	1
CO-2	3	2	1	1	2	3	2	2	2	1
CO-3	3	3	2	2	2	3	2	2	2	2
CO-4	3	3	3	2	1	3	3	3	2	2
CO-5	3	3	3	3	2	3	3	3	3	3
Ave.	2.8	2.6	2	1.8	1.6	3	2.2	2.2	2	1.8

SEMESTER- V			
Core VI – Atomic and Nuclear Physics			
Course Code: 23UPHC52	**Hrs./Week: 5**	**Hrs./Sem: 75**	**Credits: 5**

Objectives:
- To make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electrons
- To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields
- To get knowledge on radioactive decay;
- To know the concepts used in nuclear reaction;
- To understand the quark model of classification of elementary particles.

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Develop a comprehensive understanding of atomic and molecular Physics including the vector atom model, atomic spectra, radioactivity, nuclear reactions, elementary particles and their properties.	K1
CO-2	Interpret and explain the fundamental concepts and principles underlying the vector atom model, atomic spectra, radioactivity, nuclear reactions and elementary particle physics.	K2
CO-3	Apply the knowledge of atomic and nuclear physics to solve problems related to the behavior of atoms, nuclei and elementary particles.	K3
CO-4	Analyse experimental results and theoretical concepts in atomic and nuclear Physics to understand phenomena such as atomic spectra, radioactivity, nuclear reactions and elementary particle interactions.	K4
CO-5	Evaluate the significance and implications of atomic and nuclear Physics in various fields, including energy production, medical applications and the understanding of the fundamental nature of matter.	K5

SEMESTER- V
Core VI– Atomic and Nuclear Physics

Course Code: 23UPHC52	**Hrs./Week: 5**	**Hrs./Sem: 75**	**Credits: 5**

Unit I: Vector Atom Model

Introduction to atom model – vector atom model – electron spin –spatial quantization– quantum numbers associated with vector atom model – L-S and J-J coupling – Pauli's exclusion principle – magnetic dipole moment due to orbital motion and spin motion of the electron – Bohr magnetron – Stern-Gerlach experiment – selection rules – intensity rule.

Unit II: Atomic Spectra

Origin of atomic spectra – excitation and ionization potentials – Davis and Goucher's method – spectral terms and notations – fine structure of sodium D-lines – Zeeman effect – Larmor's theorem – quantum mechanical explanation of normal Zeeman effect – anomalous Zeeman effect (qualitative explanation) –Paschen-Back effect – Stark effect.

Unit III: Radioactivity

Discovery of radioactivity – natural radio activity – properties of alpha rays, beta rays and gamma rays – Geiger-Nuttal law – alpha particle spectra –Gamow's theory of alpha decay (qualitative study) – beta ray spectra – neutrino theory of beta decay – nuclear isomerism – internal conversion – non-conservation of parity in weak interactions.

Unit IV: Nuclear Reactions

Conservation laws of nuclear reaction – Q-value equation for a nuclear reaction – threshold energy – scattering cross section – artificial radio activity – application of radio isotopes – classification of neutrons – models of nuclear structure – liquid drop model – shell model.

Unit V: Elementary Particles

Classification of elementary particles – fundamental interactions – elementary particle quantum numbers –isospin and strangeness quantum number – Conservation laws and symmetry – quarks – quark model (elementary ideas only) – discovery of cosmic rays – primary and secondary cosmic rays – latitude effect– altitude effect.

Text Books:
 1. R. Murugesan, Modern Physics, S. Chand and Co**.** (All units) (Units I and II-Problems)
 1. Brijlal and N. Subrahmanyam, Atomic and Nuclear Physics, S. Chand and Co. (All units)
 2. J. B. Rajam, Modern Physics, S. Chand and Co.
 3. Sehgal and Chopra, Modern Physics, Sultan Chand, New Delhi
 4. Arthur Beiser– Concept of Modern Physics, McGraw Hill Publication, 6th Edition.

Reference Books:
 1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill.
 2. Modern Physics, S. Ramamoorthy, National Publishing and Co.
 3. Laser and Non-Linear Optics by B. B. Laud, Wiley Easter Ltd., New York, 1985.
 4. Tayal, D.C.2000 – Nuclear Physics, Edition, Himalaya Publishing House, Mumbai.

5. Irving Kaplan (1962) Nuclear Physics, Second Edition, Oxford and IBH Publish and Co, New Delhi.
6. J.B. Rajam– Atomic Physics, S. Chand Publication, 7th Edition.
7. Roy and Nigam, – Nuclear Physics (1967) First edition, Wiley Eastern Limited, New Delhi.

Web Resources:
1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
2. https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx
3. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay
4. https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei

Mapping with program outcomes and Programme Specific Outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	1	2	1	2	1	1	2	2
CO-2	2	2	2	2	1	2	1	1	2	2
CO-3	3	3	3	2	2	3	2	2	2	2
CO-4	3	3	3	2	2	3	3	3	3	2
CO-5	3	3	3	3	2	3	3	3	3	3
Ave.	2.6	2.6	2.4	2.2	1.6	2.6	2	2	2.4	2.2

	SEMESTER- V		
	Core VII – Numerical Methods and C++ Programming		
Course Code: 23UPHC53	**Hrs./Week: 5**	**Hrs./Sem: 75**	**Credits: 5**

Objectives:

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

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Understand the principles and techniques of numerical solutions and the fundamental elements of C++programming.	K1
CO-2	Interpret and explain the principles and applications of numerical methods to solve mathematical problems and the concepts of C++ programming.	K2
CO-3	Apply numerical methods to solve mathematical problems and programming concepts to develop C++ programs using functions, classes, objects, constructors and inheritance	K3
CO-4	Analyse the performance and accuracy of numerical solution obtained using different methods and the structure and execution of C++ programs	K4
CO-5	Evaluate the effectiveness and accuracy of numerical solutions obtained using numerical methods through validation against analytical solutions and assess the implementation of C++ programs to ensure adherence to programming Standards.	K5

SEMESTER- V
Core VII – Numerical Methods and C++ Programming

Course Code: 23UPHC53	**Hrs./Week: 5**	**Hrs./Sem: 75**	**Credits: 5**

Unit I: Numerical Solutions (Problems & Programs)

Solution of algebraic and transcendental equations: bisection and Newton-Raphson methods – Regula Falsi method – Solutions of linear algebraic equations: Gauss Elimination method and Gauss Jordan method

Unit II: Numerical Differentiation, Integration and Curve Fitting (Problems & Programs)

Newton's forward and backward interpolation – Lagrange's interpolation – principle of least squares – fitting a straight line and exponential curve – trapezoidal rule – Simpson's 1/3 and 1/8 rule

Unit III: Tokens and Expressions

Tokens – Keywords – Identifiers and Constants – Basic data types – User defined datatypes–Deriveddatatypes–Symbolicconstants–Declarationofvariables–Dynamic

initialization of variables – Reference variables – Operators in C++ – Scope resolution operator – Memory management operators – Manipulators – Expressions and their types – Control structures.

Unit IV: Functions, Classes and Objects

Introduction–Themainfunction–Functionprototyping–Callbyreference–Return   by reference – Inline functions – Default arguments.

Specifying class – A simple class example – Creating objects – Accessing class members – Defining member functions – Nesting of member functions – Private member functions – Arrays within a class – Arrays of objects – Objects as function arguments – Returning object.

Unit V: Constructors, Inheritance and file

Constructors – Parameterized constructors – Multiple constructors in a class – Copy constructors – Dynamic constructor – Destructors.

Defining derived class – Single inheritance – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance.

Classes for file stream operations – Opening and closing a file.

Text Book:
1. Numerical methods, Singaravelu, Meenakshi publication, 4thEdn. 1999.
2. Balagurusamy E. *Object oriented programming with C++*. New Delhi: Tata McGraw-Hill publishing company Ltd. 4th Reprint,2015.

Book for Reference:
1. Numerical Analysis, M.K.Venkatraman, NPH, 2013
2. Numerical Analysis, B.D.Gupta, Knar Publishers, New Delhi, 2013
3. Ravichandran D. *Programming in C++*. New Delhi: Tata Mc. Graw Hill Publishing company Ltd.

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CO-1	3	3	1	1	1	2	1	1	1	2
CO-2	3	3	2	1	1	2	2	2	2	2
CO-3	3	3	2	1	2	3	3	2	2	2
CO-4	3	3	3	2	1	3	3	3	2	2
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	3	3	2.2	1.4	1.4	2.6	2.4	2.2	2	2.2

SEMESTER- V			
Core Practical V - Non Electronics I			
Course Code: 23UPHCR5	**Hrs/Week: 3**	**Hrs/ Semester: 45**	**Credits : 2**

Objective:

- To demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

Minimum of Seven Experiments from the list:

1. Diffraction grating Normal incidence – sodium lamp
2. Double refraction (μ_e and μ_o)
3. Dispersive power of plane diffraction grating.
4. Spectrometer– Grating - Normal incidence - Wavelength of Mercury spectral lines.
5. Spectrometer – (i-d) curve.
6. Potentiometer – E.M.F of a thermocouple.
7. Carey Foster's bridge - Temperature coefficient of resistance of the coil.
8. Conversion of a galvanometer into ammeter and voltmeter
9. B. G – Absolute determination of mutual inductance
10. B. G – High resistance by leakage

SEMESTER- V
Core Practical VI – Electronics I

Course Code: 23UPHCR6	Hrs/Week: 3	Hrs/ Semester: 45	Credits: 2

Objective:

- To perform basic experiments on characteristics of electronic devices and then get into the applications such as amplifiers, oscillators, multivibrators.

Minimum of Seven Experiments from the list:

1. Zener diode – voltage regulations

2. Bride rectifier using diodes

3. RC coupled CE transistor amplifier - single stage.

4. Colpitt's oscillator -transistor

5. Hartley oscillator - transistor

6. Astable multivibrator - transistor

7. FET - characteristics

8. Low pass filter and High Pass filter

9. AC circuits with LCR -Series resonance

10. AC circuits with LCR - Parallel resonance

SEMESTER- V
Core Practical VII - C++ programming

Course Code: 23UPHCR7	Hrs/Week: 3	Hrs/ Semester: 45	Credits: 2

Objectives:

- To perform fundamental programs on programming in C++ and learn to write programs by themselves.

Minimum of Seven Experiments from the list:

1. Simple arithmetic operations (i.e. addition, subtraction, multiplication and division) using do-while loop

2. Name of the day in a week using Switch–case statement

3. Validity of any entered character (whether it belongs to the alphabetical set or a number or a special character) using if else

4. Quadratic equation

5. Matrix addition and its transpose

6. Multiplication of two matrices

7. Fibonacci numbers using constructor

8. Student details using inheritance concept

9. Period of a pendulum of given length L

10. Young's modulus from the data obtained from uniform bending method

SEMESTER- V			
Discipline Specific Elective I	**Mathematical Physics**		
Course Code: 23UPHE51	**Hrs./Week: 4**	**Hrs./Sem: 60**	**Credits: 3**

Objective:

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

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the fundamental mathematical concepts spanning across matrices, vector calculus, orthogonal curvilinear coordinates, Fourier series and transforms and applications of partial differential equations	K1
CO-2	Interpret the various mathematical operations including characteristic equations, eigen values, gradient, curl, Laplace transforms and Fourier integral theorem.	K2
CO-3	Apply mathematical technique in diverse scenarios, such as diagnolisation of symmetric matrices, applications of vector calculus and to apply mathematical knowledge and skill to real world problems such as analysing vibration in elastic strings and heat flow equations and interpreting solutions in physical contexts.	K3
CO-4	Analyze the concepts of similarity transformations, vector fields, periodic functions and separation of variables.	K4
CO-5	Evaluate the mathematical results, proofs, and theorems including the physical significance of mathematical operations in matrices, vector fields, the validity of Fourier series and the solutions obtained from partial differential equations.	K5

SEMESTER- V			
Discipline Specific Elective I	**Mathematical Physics**		
Course Code: 23UPHE51	**Hrs./Week: 4**	**Hrs./Sem: 60**	**Credits: 3**

Unit I: Matrices

Types of matrices – symmetric, Hermitian, unitary and orthogonal matrices– characteristic equation of a matrix – Eigen values and Eigen vectors of a matrix – Cayley-Hamilton theorem – inverse of matrix by Cayley-Hamilton theorem – similarity transformations – diagonalization of 2x2 real symmetric matrices.

Unit II: Vector Calculus

Vector differentiation – directional derivatives –definitions and Physical significance of gradient, divergence, curl – Laplace operators– vector identities – line, surface and volume integrals – statement, proof and simple problems for Gauss's divergence theorem, Stoke's theorem, Green's theorem.

Unit III: Orthogonal Curvilinear Coordinates

Tangent basis vectors – scale factors – unit vectors in cylindrical and spherical coordinate systems –gradient of a scalar –divergence and curl of a vector – Laplacian in these coordinate systems.

Unit IV: Fourier Series &Fourier Transforms

Periodic functions –Dirichlet's conditions – general Fourier series – even and odd functions and their Fourier expansions – Fourier cosine and sine – half range series – change of length of interval. Fourier analysis of square wave, saw-tooth wave, half wave/full wave rectifier wave forms.

Fourier Integral theorem (Statement only)–Fourier, Fourier sine and Fourier cosine transforms – Fourier transform of single pulse – trigonometric, exponential and Gaussian functions – inverse Fourier transform – convolution theorem.

Unit V: Applications of Partial Differential Equations (PDE):

PDE for transverse Vibrations in elastic strings (one dimensional wave equation) –one dimensional heat flow equation – solutions to these PDE's by method of separation of variables – problems based on boundary conditions and initial conditions.

Text Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
2. Mathematical Physics – P. K. Chattopadhyay, New Age International Publishers.
3. Mathematical Physics – B. D. Gupta.
4. Mathematical Physics – H. K. Das, S. Chand and Co, New Delhi.

Reference Books:

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

Mapping with program outcomes and Programme Specific Outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	3	1	1	1	2	1	2	1	1
CO-2	2	3	1	1	1	2	1	2	2	2
CO-3	3	3	2	2	2	3	2	2	2	2
CO-4	3	3	2	2	1	3	2	3	2	2
CO-5	3	3	2	2	2	3	2	3	3	3
Ave.	2.6	3	1.6	1.6	1.4	2.6	1.6	2.4	2	2

	SEMESTER- V			
Discipline Specific Elective I	**Material Science**			
Course Code: 23UPHE52	**Hrs./Week: 4**	**Hrs./Sem: 60**		**Credits: 3**

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

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Understand the fundamentals of crystal imperfections, material deformation, strengthening methods, optical materials and mechanical testing.	K1
CO-2	Summarise the underlying principles and mechanisms governing crystal imperfection, elastic behaviour of materials, deformation process, optical absorption and mechanical testing methods including their implications.	K2
CO-3	Apply the acquired knowledge and understanding to solve practical problems in various engineering and scientific contexts.	K3
CO-4	Analyse complex scenarios and systems involving the concepts of materials science to identify patterns and trends.	K4
CO-5	Critically evaluate the effectiveness and limitations of different approaches, techniques and methodologies used in crystal imperfection analysis, material deformation assessment, permanent deformation mitigation, strengthening strategy implementation, optical material utilisation and mechanical testing protocol selection.	K5

SEMESTER- V			
Discipline Specific Elective I	**Material Science**		
Course Code: 23UPHE52	**Hrs./Week: 4**	**Hrs./Sem: 60**	**Credits: 3**

Unit I: Crystal Imperfections

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

Unit II: Material Deformation

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

Unit III: Permanent Deformation and Strengthening Methods of Materials

Introduction –plastic deformation: tensile stress-strain curve – plastic deformation by slip – creep: mechanism of creep – creep resistant materials – strengthening methods: strain hardening, grain refinement – solid solution strengthening – precipitation strengthening.

Unit IV: Optical Materials

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

Unit V: Mechanical Testing

Destructive testing: tensile test, compression test, hardness test – non-destructive testing (NDT): radiographic methods, ultrasonic methods – thermal methods of NDT: thermography – equipment used for NDT: metallurgical microscope.

Text Books:
1. Material science and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition, 2015
2. Materials science, V. Rajendran, McGraw Hill publications 2011.

Reference Books:
1. William D. Callister, Jr., Material Science and Engineering – An Introduction, 8th Edition, John Wiley and Sons, Inc., 2007
2. W. Bolton, "Engineering materials technology", 3rd Edition, Butterworth and Heinemann, 2001.
3. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", 5th Edition, Thomson Learning, First Indian Reprint, 2007.
4. William F. Smith, "Structure and Properties of Engineering Alloys", Mc-Graw-Hill Inc., U.S.A, 2nd edition, 1993.

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	1	1	1	2	1	1	2	2
CO-2	2	2	2	1	1	2	1	2	2	2
CO-3	3	3	2	2	2	3	2	2	3	2
CO-4	3	3	3	2	2	3	2	3	3	2
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	2.6	2.6	2.2	1.6	1.6	2.6	1.8	2.2	2.6	2.2

SEMESTER V			
Ability Enhancement Course III Environmental Studies			
Course Code: 23UAEV51	Hrs/ week: 2	Hrs/Sem:30	Credits: 1

Course Outcomes:
Upon completion of this course, the students will be able to
  1 Recognize the biotic and abiotic components of ecosystem and how they function.
  2 Use natural resources more efficiently and know more sustainable ways of living.
  3. Acquire an attitude of concern for the environment.
  4. Participate in improvement and protection of environment.
  5. Manage unpredictable disasters.
  6. Create awareness about environmental issues to the public.

Unit I :

Environment and Ecosystem: Aim and need for Environmental Awareness - Components of Environment Ecosystem - Components of Ecosystem: Abiotic and biotic factors (Producer, Consumer and   Decomposer) – Food Chain, Tropic Levels - Food Web, Energy flow and Ecological pyramids

Unit II :
 Natural Resources: Renewable and non-renewable resources – Water Resources: Uses and Conservation of Water – Rain Water Harvesting – Forest Resources: Importance of Forests - Major and Minor forest produces - Conservation of Forest Energy Resources: Solar Fossil Fuel – Wind – Role of individuals in the conservation of natural resources

Unit III :
Environmental Pollution: Pollutants – Types of pollution: Air, Water, Noise and Plastic Pollution – Causes, effects and Control measures – Global warming and Climate Change

Unit IV:
Human Population and Environment: Effect of human population on environment   – Population Explosion problems related to population explosion – Involvement of population in conservation of environment – Measures adopted by the Government to control population growth – Environment and human health

Unit V:
Disaster   Management: Floods–Drought–Earthquakes– Cyclones – Landslide–Tsunami– Control measures

SEMESTER- V
Self-Study Course (Optional)- Body Mechanics and Sensory Physics

Course Code: 23UPHSS2	**Credits :+2**

Objectives:

- Apply physics to understand human kinematics and dynamics
- Explore tactile sensation and mechanical interactions

Unit I: Physics of Body mechanics

Introduction –terminologies used in body mechanicswith examples -Basic physiology – Newton's laws of motion – Torque – Joints and Levers – Artificial muscles

Unit II :Importance of body mechanics

Introduction – Guidelines for proper body mechanics – use of correct body mechanics – use of correct body mechanics – good postures – lifting with knees – posture while setting – standing with feet – Alignment of body when moving or turning

Unit III: Physics of the ear and hearing

Introduction -Principle -Parts of the ear – sensitivity– Testing the hearing – deafness and hearing aids – causes of reduced hearing – conduction hearing loss – Nerve hearing loss

Unit IV: Physics behind speech production

Anatomy of speech production – organs involved in the process of speech production -classification of articulators – individuality of human voice – Phonetics of speech and its branches- mode of phonation – classification of phonemes – place of articulation

Unit V: Physics of vision

Mechanism of vision – steps involved in the formation of image – Structure of Human eye – Factors involved in the physics of vision–controlling the amount of light – forming a focussed image – sensitivity of the eye – Types of light sensitive cells – colour vision – spatial resolution.

Text Book:

Material prepared by the physics department

<table>
<tr><td colspan="4" align="center">SEMESTER- VI</td></tr>
<tr><td>Core VIII</td><td colspan="3" align="center">Relativity and Quantum Mechanics</td></tr>
<tr><td>Course Code: 23UPHC61</td><td>Hrs./Week: 4</td><td>Hrs./Sem: 60</td><td>Credits: 4</td></tr>
</table>

Objectives:

- To acquire knowledge about 4D space and apply it to various physical problems
- To understand the concepts of wave mechanics and its dualistic nature
- To understand the physical interpretation of wave functions, expectation value, linkage between classical and quantum physics
- To apply Schrodinger equation to 1D and 3D physical system

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall the fundamental principles and theories in relativity and quantum mechanics including general theory of relativity, Lorentz transformation, De-Broglie's hypothesis, Compton effect, Schrodinger wave equation and development of quantum mechanics.	K1
CO-2	Develop a deep understanding of the concepts underlying relativity and quantum mechanics including relativistic momentum, wave particle duality, Continuous and characteristic spectrum, Eigen function and stability of an atom.	K2
CO-3	Apply the principles of relativity and quantum mechanics to solve problems and analyse various phenomena in day-to-day life.	K3
CO-4	Analyse experimental evidence and theoretical framework including the Michelson-Morley experiment, the photoelectric effect and the black body radiation spectrum to understand their implications and limitations.	K4
CO-5	Evaluate the consequences and interpretations of key principles including the mass energy equivalence, the Laue - Rotating crystal and powder methods, the interpretation of wave functions and the quantization of energy levels in atoms assessing their consistency with experimental observations and theoretical predictions.	K5

SEMESTER- VI			
Core VIII	**Relativity and Quantum Mechanics**		
Course Code: 23UPHC61	**Hrs./Week: 4**	**Hrs./Sem: 60**	**Credits: 4**

Unit I: Relativity

General theory – Michelson –Morley experiment – Postulates of special theory of relativity – Lorentz transformation – Length contraction – Time dilation – Relativistic conditionofvelocities–Simultaneity–Relativisticmass–Relativisticmomentum–Massand energy equivalence – Relation between total energy and rest mass, rest mass energy and momentum - Mass energy equivalence - Minkowski's Four-dimensional space.

Unit II: Wave Properties of Matter

Wave particle duality – De-Broglie's Hypothesis for Matter waves – Concept of group velocity – Concept of Phase velocity – Relation connecting them – Analytical Expression for group of waves - Nature of radiation – Derivation of De-Broglie's wavelength – VelocityofDe-Broglie'swave-Relationbetweenthephasevelocityandthewavelengthof De-Broglie's wavelength – Diffraction of particles – Davisson and Germer's experiment-G.P. Thomson's experiment- Interference of electrons – Consequences of De-Broglie's concepts.

Unit III: Diffraction studies

X rays – Production – Properties - X ray spectra - Continuous and characteristic spectrum - Mosley's Law (Statement, explanation and importance) - Compton effect - Expression for change of wavelength.

Diffraction of X-rays - Bragg's law – Derivation of Bragg's equation - Experimental methods of X-ray study – Laue - Rotating crystal and powder methods.

Unit IV: Schrodinger's Wave Equation

Introduction — Wave function for a free particle - Derivation of time dependent and time independent Schrodinger's equation - Physical interpretation of the wave function – limitation - Normalization of the wave function – Operators in quantum mechanics – Eigen functions, Eigen values and Eigen value equations – Operators for momentum, energy and total energy – Basic postulates of quantum mechanics – Orthogonality of Eigen Function-Proof- Expectation values.

Unit V: Development of Quantum Mechanics

Introduction–Blackbodyradiation–Theoreticallawsofblackbodyradiation–Plank's quantum theory – Photo-electric effect – Einstein explanation of photo electric effect - The Ritz combination principle in spectra – Stability of an atom, Bohr's quantization of angular momentum and its application to the hydrogen atom – Particle in one dimension and three-dimensional box.

Text Books:

1. Murugeshan R and Kiruthiga Sivaprasath. *Modern Physics*. S. Chand & Co. Ltd. 18th revised edition2016.
2. Kamal Singh and Singh S. P. *Quantum Mechanics*. S. Chand & Co Ltd.1998.

Books for Reference:
1. Barilla and Subramanian. *Modern Physics*. 8th edition2007.
2. Rajam J. B. *Atomic Physics*. S. Chand & Co. 8thedition1981.

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CO-4	3	3	3	2	2	3	3	3	3	2
CO-5	3	3	3	3	2	3	3	3	3	3
Ave.	2.6	2.6	2	1.8	1.6	2.6	2.2	2	2.2	2

SEMESTER VI			
Core IX	**Digital Electronics**		
Course code: 23UPHC62	**Hrs/Week: 4**	**Hrs./Sem: 60**	**Credits: 4**

Objectives:
- To gain knowledge about the binary numbers, Boolean Algebra and Flip Flops.
- To study the construction and working of Registers, Counters, A/D and D/A Converters.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Recall different number systems, basic logic gates and recognise the operations of flip flops, shift registers and describe the principles of Karnaugh maps.	K1
CO-2	Discuss the principles behind the significance of different number systems, role of logic gates, operation of multivibrators, understand logic circuits using karnaugh maps and grasp the functions of counters.	K2
CO-3	Apply conversion techniques to convert numbers between different systems, design combinational circuits, shift registers, flip flops and implement Boolean algebra.	K3
CO-4	Analyse the efficiency, effectiveness, performance, complexity, functionality and timing characteristics of various logic and conversion circuits.	K4
CO-5	Evaluate the accuracy, precision, design choices, reliability, robustness and suitability of various conversion circuits for specific applications.	K5

SEMESTER VI			
Core IX	Digital Electronics		
Course code: 23UPHC62	Hrs/Week: 4	Hrs./Sem: 60	Credits: 4

Unit I: Number System and Logic Gates

Decimal, binary, hexadecimal, binary-coded decimal numbers – conversion of one into another – addition, subtraction of binary numbers by 2's complement method. Digital circuits – logic gates–positive logic and negative logic systems–Basic logic gates–AND, OR, NOT gates – characteristics of logic gates-NOR, NAND gates – Exclusive OR gate –Boolean equation of logic circuits– Boolean equation and logic circuits from truth table– standard forms of expressing logic functions–Boolean algebra–De Morgan's law– NAND, NOR as universal building block–Binary adder– Half adder – Full adder – Half subtractor – Full subtractor.

Unit II: Karnaugh Map and Binary adders

Karnaugh map –Two variable map –Three variable map – four variable map–method of addressing a cell in map–preparation of truth table from Karnaugh map–Don't care conditions–simplification of product of sums (Karnaugh map using Max terms) – Parallel subtractor using 2's complement system – BCD adder – Excess 3-code – Excess-3 Adder – Parity checker.

Unit III: Operational Amplifier

Operational amplifier basic ideas – inverting amplifier – summing amplifier – differential amplifier – integrator & differentiator using Opamp – instrumentation amplifier using Opamp – Differential instrumentation amplifier using transducer bridge – application to measurement of temperature ans as analog weight scale – Multivibrator (A stable, Monostable and Bistable using opamp) - Schmitt trigger using opamp – Schmitt trigger using opamp – applications.

Unit IV: Flip –Flops and 555 Timer

IC 555 Timer as Monostable and Astable Multivibrator – RS Flip flop – clocked RS flip flop – JK Flip flop – JK Master Slave Flip flop – Divide by 2 counters with D Flip flop –T Flip flop.

Unit V: Counters and Registers

Binary counter–Decade counter–Updown counter –Synchronous and asynchronous counters –reing counters – Ripple counter – mod-5 counter – mod-10 counter Shift register– Registers with parallel load –serial transfer in register- A/D and D/A converter.

Text Book:
1. Jose Robin G and Ubald Raj A. *Digital Electronics.* Marthandam: Indira publications. Reprint,2018.
2. Albert Paul Malvino and Donald P. Leach *Digital principles and applications.* 7th edition 2013.

Books for Reference:
1. Millman and Taub. *Integrated Electronics.* International student edition(TMH).
2. Jain R.P. *Modern digital Electronics.* Tata Mc Graw Hill Pvt. Ltd. 4th Reprint,1988.

Mapping with program outcomes and Programme Specific Outcomes:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and Programme Specific Outcomes **(PSO)** in the 3-point scale of HIGH (**3, ≥ 70%**), MEDIUM (**2, ≥ 40%** and < **70%**) and LOW (**1, <40%**).

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	1	1	2	1	1	1	1
CO-2	2	2	2	1	1	2	1	1	2	1
CO-3	3	3	2	2	1	3	3	2	2	2
CO-4	3	3	3	2	2	3	3	3	3	2
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	2.6	2.6	2.4	1.6	1.4	2.6	2.2	2	2.2	1.8

Core X	Solid State Physics		
Course code: 23UPHC63	**Hrs/Week: 4**	**Hrs./Sem: 60**	**Credits: 3**

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

Course outcomes:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Explain the fundamentals of bonding in solid, crystal structures, diffraction phenomena, magnetic properties, dielectric properties, ferroelectric and superconducting behaviours and professional components.	K1
CO-2	Discuss the underlying principles behind various bonding types, diffraction processes, magnetic behaviours, dielectric phenomena and superconductivity as well as the significance of professional components in the field of solid state physics.	K2
CO-3	Apply knowledge of bonding principles, diffraction techniques, magnetic and dielectric properties, ferroelectric and superconducting behaviours to analyse and solve problems in solid state physics and engineering contexts.	K3
CO-4	Analyse experimental data related to bonding, diffraction, magnetic, dielectric, ferroelectric and superconducting properties to draw conclusions and make predictions about material behaviours.	K4
CO-5	Evaluate the experimental approaches related to solid state physics and the assess the impact of professional components on the understanding and advancement of solid state physics.	K5

SEMESTER VI			
Core X	Solid State Physics		
Course code: 23UPHC63	Hrs/Week: 4	Hrs./Sem: 60	Credits: 3

Unit I: Bonding In Solids, Crystal Structure

Types of bonding –ionic bonding – bond energy of NaCl molecule –covalent bonding – metallic bonding – hydrogen bonding – Van-der-Waals bonding – crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais' lattices – Miller indices – procedure for finding them –packing of BCC and FCC structures – structures of NaCl and diamond crystals –reciprocal lattice – reciprocal lattice vectors – properties – reciprocal lattices to SC, BCC and FCC structures – Brillouin zones

Unit II: Magnetic Properties of Solids

Permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para, ferro, ferri and anti-Ferro magnetism –Langevin's theory of diamagnetism – Langevin's theory of para magnetism – Curie-Weiss law – Weiss theory of ferromagnetism (qualitative only) – Heisenberg's quantum theory of ferromagnetism – domains – discussion of B-H curve –hysteresis and energy loss – soft and hard magnets – magnetic alloys.

Unit III: Dielectric Properties of Materials

Polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – polarization processes: electronic polarization– calculation of polarisability – ionic, orientational and space charge polarization –internal field –Clausius-Mosotti relation –frequency dependence of dielectric constant –dielectric loss – effect of temperature on dielectric constant – dielectric breakdown and its types – classical theory of electric polarisability.

Unit IV: Ferroelectric Properties of Materials

Ferroelectric effect: Curie-Weiss Law – ferroelectric domains, P-E hysteresis loop – *elementary band theory:* Kronig-Penny model – band gap (no derivation) – conductor, semiconductor (P and N type) and insulator –conductivity of semiconductor – mobility – Hall Effect – measurement of conductivity (four probe method) - Hall coefficient.

Unit V: Superconducting Properties of Materials

Experimental results –critical temperature –critical magnetic field – Meissner effect – type-I and type-II superconductors – London's equation and penetration depth – isotope effect – idea of BCS theory (no derivation) - flux quantisation – Josephson's effect– application of superconductors – high Tc superconductor.

Text Books:

1. Solid state Physics – P.K. Palanisamy, Copy right (2003) Scitech publication (India) Pvt. Ltd., Chennai. 3rd Reprint (2008).
2. Introduction to Solid State Physics,Kittel, Willey Eastern Ltd (2003).
3. Solid state Physics, Rita John,1st edition, TataMcGraw Hill publishers (2014).
4. Solid State Physics , R L Singhal, Kedarnath Ram Nathand Co., Meerut (2003)
5. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India

Reference Books:

1. PuriandBabber – Solid State Physics – S.ChandandCo. New Delhi.
2. Raghavan - Materials science and Engineering, PHI

3. Azaroff - Introduction to solids, TMH
4. S. O. Pillai - Solid State Physics, Narosa publication
5. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India

Web Resources:
1. https://nptel.ac.in/courses/115105099/
2. https://nptel.ac.in/courses/115106061/

Mapping with program outcomes and Programme Specific Outcomes:

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	1	1	2	1	1	2	2
CO-2	2	2	2	2	1	2	1	1	2	2
CO-3	3	3	2	2	2	3	3	2	2	2
CO-4	3	3	3	2	2	3	3	3	3	2
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	2.6	2.6	2.4	2	1.8	2.6	2.2	2	2.4	2.2

SEMESTER VI			
Core Practical VIII	**Non Electronics II**		
Course Code: 23UPHCR8	**Hrs/Week: 3**	**Hrs/ Semester: 45**	**Credits: 2**

Objective:
- To demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.

Minimum of Seven Experiments from the list:

1. Diffraction grating minimum deviation – Sodium lamp

2. Forbe's method – Thermal conductivity of a metal rod.

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

4. Spectrometer – (i-i′) curve.

5. Spectrometer – Narrow angled prism.

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

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

8. Spectrometer – Hartmann's formula

9. Verification of Network's theorem – Thevenin's and Norton's theorem

10. B. G – Comparison of mutual inductance.

SEMESTER VI			
Core Practical IX	**Electronics II**		
Course Code : 23UPHCR9	**Hrs/Week: 3**	**Hrs/ Semester: 45**	**Credits : 2**

Objective:
- To perform basic experiments on characteristics of electronic devices and then get into the applications such as amplifiers and gates.

Minimum of Seven Experiments from the list:
1. Operational amplifier - inverting amplifier and summing.

2. Operational amplifier - differentiator and integrator.

3. Operational amplifier - D/A converter by binary resistor method.

4. 5V, IC Regulated power supply.

5. Construction of seven segment display.

6. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR

7. Verification of De Morgan's theorem using ICs –NOT, OR, AND

8. NAND as universal building block.

9. NOR as universal building block.

10. Half adder / full adder using basic logic gate ICs

SEMESTER VI			
Core XI	**Project and Viva Voce**		
Course Code: 23UPHP61	**Hrs./Week: 6**	**Hrs./Sem: 90**	**Credits: 4**

GUIDE LINES:

The objective of the course is to train the students to gain confidence to carry out independent work, group work and get experience in handling of various equipments.

A maximum of five students combine together to do a project. Students are given freedom to choose the topic of the project. It may be theoretical or practical and may be from any one of the following areas

        a) Physics–Theoretical
        b) Physics –Experimental
        c) Electronics
        d) Computational Physics
        e) Micro Processor
        f) Interdisciplinary projects involving concepts of physics

Students carry out the project in about 30 hours in a laboratory. The students present the first oral report at the end of the first month, the second oral report at the end of the second month and final report at the end of approximately the third month. Students submit a group project report (dissertation) with a minimum of 25pages.

Students are encouraged to take it as challenges of that the result of the project shall be approved for publication in a leading journal.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Develop a deep understanding of the chosen topic including theoretical concepts, experimental techniques, electrical and electronic circuits, computational methods, microprocessor applications or interdisciplinary concepts.	K1
CO-2	Interpret and explain the underlying principles and theories relevant to the chosen project topic, demonstrating a clear understanding of how they apply to real world situations.	K2
CO-3	Apply theoretical knowledge and practical skills to design and conduct experiments and simulations utilising various equipment and techniques in the laboratory setting.	K3
CO-4	Analyse experimental data, computational results or theoretical models to draw meaningful conclusions and insights, identifying patterns within the data or theoretical framework.	K4
CO-5	Assess the quality and validity of experimental results, computational simulations or theoretical models, critically evaluating the methodology, accuracy and significance of the findings and presenting the results in a clear and concise manner suitable for publication in a leading journal.	K5

	SEMESTER VI			
Discipline Specific Elective II	**Advanced Physics**			
Course Code :23UPHE61	**Hrs./Week: 4**	**Hrs./Sem: 60**		**Credits: 3**

Objectives:

- To know about laser and its application in medicine industry
- To study 'what is thin film, its importance and applications
- To know about polymers, superconductors and nuclear space materials

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Demonstrate comprehensive understanding of the principles of nanomaterials, thin films and polymer materials, microprocessor architecture and programming model.	K1
CO-2	Interpret the significance and implications of the role of nanomaterials in various applications and the methods of thin film deposition, functions of input and output devices in data processing and the execution of instructions.	K2
CO-3	Apply theoretical knowledge to practical situations and relate to real world applications based on their properties and design simple programs interfacing input and output devices.	K3
CO-4	Break down complex systems and processes to identify key components, interactions and underlying principles and analyse the effects of different instructions and operations in executing the programs.	K4
CO-5	Assess the effectiveness and limitations of various techniques, materials and processes in advanced Physics, different programming techniques, instruction sets and hardware configurations in microprocessor based systems.	K5

SEMESTER VI			
Discipline Specific Elective II	**Advanced Physics**		
Course Code :23UPHE61	**Hrs./Week: 4**	**Hrs./Sem: 60**	**Credits: 3**

Unit I: Nanomaterials

Nanomaterials: Synthesis – Plasma arcing – Chemical vapour deposition – Sol gels – Electro deposition – Ball milling – Properties of nano particles and applications. Carbon nano tubes: Fabrication – Arc method – Pulsed laser deposition – Chemical vapour deposition – Structure – Properties – Applications.

Unit II: Thin film

Introduction – Nature of thin film – Resistance heating: Thermal evaporation, Flash evaporation, Multi evaporation – Rf or induction heating – Electron beam method – Cathodic sputtering: Glow discharge sputtering, R.F sputtering – Chemical vapour deposition – Substrate cleaning.

Unit III: Polymer Materials

Introduction – Polymerisation Mechanism: Addition, Condensation, Electrochemical polymerization – Degree of polymerization – Classification of polymers: Natural, Synthetic-Structure of polymer: One, Two, three dimensional polymers – Polymer processing – Properties of the polymers –Applications.

Unit IV: Microprocessor Architecture

Microprocessor – Microprocessor instruction set and computer language – Microprocessor architect and its operations – Input and output devices – 8085 MPU.

Unit V: Programming the 8085

8085 programming model – Instruction classification – Instruction and data format - How to write, assemble and execute simple programs – Instruction set – Data transfer operations – Arithmetic operations – Logical operations – Branching operations

Text Books:

1. Dr. P. Mani, A text book of Engineering Physics II, Dhanam Publications.
2. Coswami A. *Thin film fundamentals*. New Age International Publishers. Reprint, 2017.
3. Rajendran V. *Materials Science*. New Delhi: Mc Graw Hill Education Pvt Ltd. Reprint, 2018.
4. Ramesh Gaonkar. *Microprocessor Architecture Programming and Applications with the 8085*. India: Penram International Publishing Private Limited. Fifth edition2011.

Books for Reference:

1. *Physics education*, volume 19, No.1, April – June2002.
2. Dr. Mani P. *A text book of Engineering Physics II*. Dhanam Publications.

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	1	1	1	2	1	1	1	1
CO-2	2	2	2	1	1	2	1	1	2	2
CO-3	3	3	2	1	1	3	3	2	2	2
CO-4	3	3	2	2	2	3	3	3	3	2
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	2.6	2.6	2	1.4	1.4	2.6	2.2	2	2.2	2

SEMESTER VI			
Discipline Specific Elective II	**Lasers and Fiberoptics**		
Course Code : 23UPHE62	**Hrs/Week:4**	**Hrs/Sem:60**	**Credits:3**

Objectives:

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

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	Cognitive Level
CO-1	Define spontaneous and stimulated emission, Solid state lasers, laser welding, total internal reflection and absorption loss	K1
CO-2	Understand the different pumping mechanisms such as optical, electrical, and laser pumping, various types of lasers, diverse applications of lasers in metrology, optical communication and material processing (e.g., welding, cutting), basic components of optical fiber communication systems and fabrication processes involved in producing optical fibers,	K2
CO-3	Compare two and three level laser system, laser welding and laser melting, single mode and multi-mode fiber and absorption loss and scattering loss measurements	K3
CO-4	Classify the pumping mechanism of lasers, chemical lasers, applications of laser in various field, types of fiber and fiber materials	K4
CO-5	Evaluate advanced laser techniques such as Q-switching, mode-locking, and cavity dumping, advantages and limitations of using lasers in different applications, maintenance of fiber optic networks for various applications.	K5

SEMESTER VI			
Discipline Specific Elective II	**Lasers and Fiberoptics**		
Course Code : 23UPHE62	**Hrs/Week:4**	**Hrs/Sem:60**	**Credits:3**

Unit I: Fundamentals of laser

Basic principles: spontaneous and stimulated emission – Einstein's coefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two and three level laser system – resonator configuration – quality factor – threshold condition – concept of Q-switching–Theory of mode locking– cavity dumping.

Unit II: Types of Laser

Solid state laser: rubylaser, Nd:YAG laser, Nd:Glass laser– semiconductor laser: intrinsic semiconductor laser, doped semiconductorlaser, injection laser – dye laser – chemical laser: HCL laser, DF- CO_2, CO chemical laser. Gas laser: neutral atom gas laser (He-Ne laser), CO_2laser, Copper vapour laser.

Unit III: Applications of laser

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

Unit IV: Fiberoptics

Basic components of optical fiber communication – principles of light propagation through fiber – total internal reflection – optical fiber – coherent bundle – numerical aperture and skew mode – phase shift and attenuation during total internal reflection – types of fiber: single mode and multi-mode fiber – step index and graded index fiber – fiberoptic sensors – application of fiberoptics..

Unit V: Characteristics and Fabrication of Optical fiber:

Fiber characteristics: mechanical and transmission characteristics – absorption loss and scattering loss measurements – dispersion – connectors and splicers – fiber termination – optical time domain reflectometer (OTDR) and its uses – fiber material – fiber fabrication – fiber optic cables design.

Text Books:

1. B.B. Laud - Laser and Non-linear Optics, New Age International Publications Third Edition, New Delhi.
2. An Introduction to laser, theory and applications by Avadhunulu, M.N.S.,Chand and Co, New Delhi
3. J. Wilson and J.F.B. Hawkes. 'Introduction to Opto Electronics', Pearson Education, 2018.

Book for Reference:

1. A.Sennaroglu,"PhotonicsandLaserEngineering:Principles,DevicesandApplications"McGraw-HillEducation,2010.
2. K.R.Nambiar, "Lasers: Principles, Typesand Applications", New Age International, 2004.
3. Optic, AjoyGhatak, McGraw-Hill Education (India) Pvt, Ltd, 6th Edn., 2017.

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	1	1	1	2	1	1	1	1
CO-2	3	2	2	1	1	2	1	1	2	2
CO-3	3	3	2	2	1	3	3	2	2	2
CO-4	3	3	3	2	2	3	3	3	2	2
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	2.8	2.6	2.2	1.6	1.4	2.6	2.2	2	2	2

SEMESTER VI
Skill Enhancement Course VI   Microprocessor 8085 (Practical)

Course Code: 23UPHSE6	**Hrs./Week: 2**	**Hrs./Sem: 30**	**Credits: 2**

Objective:

- To perform fundamental experiments on microprocessor 8085 and learn to write programs by themselves.

Minimum of Seven Experiments from the list:

1. Addition of two 8 bit data using immediate addressing mode

2. Subtraction of two 8 bit data using immediate addressing mode

3. Multiplication of two 8 bit data using immediate addressing mode

4. Largest number in a given set of numbers

5. Transfer the given set numbers in reverse order

6. Perform ORA B function

7. Perform XRA B function

8. Perform CMA functions

9. Square of any 8 bit numbers

10. Square root of any 8 bit numbers

11. Ascending/descending numbers in a given set of numbers

12. Fibonacci series